JUNAGADH AGRICULTURAL UNIVERSITY

RECOMMENDATIONS/TECHNOLOGY DEVELOPED BY THE UNIVERSITY DURING LAST 13 YEARS (2004-05 TO 2016-17)

New technologies were developed in the different disciplines. Nearly 466 recommendations / new technologies / package of practices were developed in various disciplines as described below.

I. CROP PRODUCTION

A. Nutrient Management

Year: 2004-05

Bajra and Mustard

The farmers of North Saurashtra Agro-climatic Zone growing *bajra* (*kharif*)-mustard (*rabi*) crop sequence are advised to apply 100 per cent RDF + 10 t FYM/ha to *bajra* and only 50 per cent RDF to mustard crop to obtain higher yield and net return of the sequence.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Sesame and Cotton

The farmers of North Saurashtra Agro-climatic Zone adopting sesame based intercropping system are advised to fertilize sesame + Hy. cotton (3:1) with 100 per cent RDF of main and intercrop as per area for getting higher yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Marvel Grass

The farmers of North Saurashtra Agro-climatic Zone are advised to grow marvel grass with application of 60-30 NP kg/ha (30 kg N as a basal and 30 kg N at 30 DAS) for obtaining economically maximum green biomass and dry matter yield in marginal lands under rainfed condition. (Grassland Research Station, JAU, Dhari)

Groundnut

The farmers of North Saurashtra Agro-climatic Zone growing groundnut (GG-20) under dry-farming condition in *kharif* season are advised to apply recommended dose of N and P through DAP and urea with gypsum (18.75 kg S/ha) for getting maximum pod yield and higher net return. (Grassland Research Station, JAU, Dhari)

Garlic and Groundnut

The farmers of South Saurashtra Agro-climatic Zone adopting garlic-groundnut crop sequence on calcareous black soils having low Zn and medium to high K status are advised to apply 25 kg $ZnSO_4$ + 75 Kg K_2O per hectare in addition to recommended dose of N and P before sowing of garlic crop and recommended dose of N and P to *kharif* groundnut for getting higher yield and net return from garlic-groundnut crop sequence.

(Department of Agril. Chem. & Soil. Sci., JAU, Junagadh)

Year: 2005-06

Groundnut (*Summer*)-sea weeds liquid fertilizer

The farmers of Middle Gujarat Agro-climatic Zone–III (AES-II), growing summer groundnut (GG-2) on soils having marginal status of Zn and Fe are advised to spray 1 % of multi micronutrients mixture (Fe 2 %, Mn 0.5 %, Zn 4.0 %, Cu 0.3 % and B 0.5 % equivalent to Govt. notified general Grade-I) or sea weed liquid fertilizer (SLF) @ 1.5 per cent at 15, 30 and 45 days after sowing to get higher groundnut yield and profit.

(Fisheries Research Station, JAU, Okha)

Groundnut (GG-2)-sea weeds liquid fertilizer

The farmers of North Saurashtra Agro-climatic Zone(AER-2) growing *kharif* groundnut (GG-2) on Zn and Fe deficient soils are advised to spray the crop with sea weeds liquid fertilizer (SLF) @ 3.5 per cent at 15, 30 and 45 days after sowing to get higher groundnut yield and net realization.

(Fisheries Research Station, JAU, Okha)

Cotton–organic manure

The farmers of North Saurashtra Agro-climatic Zone growing hybrid Cotton-8 in *kharif* season under dry farming condition are advised to adopt 30 cm deep tillage every year for the highest seed cotton yield, net return and moisture conservation. They are also advised to apply FYM @ 10 t/ha for higher yield, net return and moisture conservation. Recommended dose (80:0:0 NPK kg/ha) of fertilizer should be applied to the crop

(Grassland Research Station, JAU, Dhari)

Castor

The farmers of South Saurashtra Agro-climatic Zone growing hybrid castor GCH-6 under irrigated condition are advised to fertilize castor crop with 40 kg P_2O_5 ha^{-1} besides the recommended dose of N for getting maximum castor seed yield and net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Sesame

The farmers of North Saurashtra Agro-climatic Zone are advised to apply recommended dose of chemical fertilizer (50:25:00 NPK kg/ha) + 20 kg S/ha for getting higher return

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Year: 2006-07

Groundnut (*kharif)*

The farmers of the coastal area of South Saurashtra Agro-climatic Zone growing *kharif* groundnut on saline-sodic soil are advised to apply gypsum @ 5 t /ha (50 % of GR) besides recommended dose of fertilizer for obtaining higher net return.

(Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Cotton

The farmers of South Saurashtra Agro-climatic Zone growing cotton in medium black calcareous soils are advised to apply 120 kg K_2O and 50 kg $ZnSO_4$ per hectare as basal in addition to recommended dose of nitrogen for getting maximum net return.

(Department of Agril. Chem. & Soil Science, JAU, Junagadh and Cotton Research Station, JAU, Junagadh)

Legumes

The farmers of North Saurashtra Agro-climatic Zone applying enriched compost @ 6 t/ha or vermicompost @ 2 t/ha need not to apply inorganic fertilizers in legumes.

(Main Dry Farming Research Station, JAU, Targhadia)

Pearl millet

The farmers of North Saurashtra & West Gujarat Agro-climatic Zones growing *kharif* pearl millet in saline sodic soil with marginal sulphur status are advised to apply 250 kg gypsum/ha in addition to recommended dose of fertilizer (80:40 kg NP/ha) for obtaining higher yield and net realization.

(Main Dry Farming Research Station, JAU, Targhadia)

Pearl millet (*kharif*)

The farmers of North Saurashtra Agro-climatic Zone growing *kharif bajra* (var. GHB-558) on soil deficient in available Fe and Zn are advised to follow soil application of $FeSO_4$ @ 15 kg/ha and $ZnSO_4$ @ 8 kg/ha or micronutrient mixture grade having Fe-2 %, Mn-0.5 %, Zn-

5 %, Cu-0.2 % and B-0.5 % equivalent of Govt. notified Grade-V as soil application @ 20 kg/ha at the time of sowing to get higher yield and net return. Alternatively, farmers are advised to spray 1 % foliar grade of multi-micronutrients having Fe 4 %, Mn 1 %, Zn 6 %, Cu 0.5 % and B 0.5 % equivalent of Govt. notified Grade-IV (for Fe and Zn deficiency) at 20, 30 and 40 DAS.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Onion (*rabi*)

The farmers of South Saurashtra Agro-climatic Zone utilizing urea as a source of nitrogen in *rabi* onion are recommended to apply 20 kg sulphur/ha through phospho gypsum at the time of sowing or as elemental sulphur at 20 to 25 days before transplanting for getting higher bulb yield.

(Vegetable Research Station, JAU, Junagadh & Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Onion (*kharif*)

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* onion (Agri Found Dark Red) are recommended to apply 75:50:25 kg NPK/ha. Of which 50 per cent nitrogen and full doses of phosphorus and potash should be applied as basal and remaining 50 per cent nitrogen should be top dressed one month after transplanting for getting higher yield.

(Vegetable Research Station, JAU, Junagadh)

Year: 2007-08

Evaluation of potentiality of organic farming for groundnut (kharif)-wheat (rabi) crop sequence

The farmers of South Saurashtra Agro-climatic Zone adopting groundnut-wheat crop sequence are advised to apply soil test based recommended dose of fertilizer to both the crops for realizing higher net return. Application of nutrients only through organic sources was not found economical.

(Dept. of Agronomy and Dept. of Agril. Chem. & Soil. Sci., JAU, Junagadh)

Evaluation of potentiality of organic farming under groundnut (*kharif*)-onion (*rabi*) crop sequence

The farmers of South Saurashtra Agro-climatic Zone adopting groundnut-onion crop sequence are advised to apply recommended dose of N through FYM on equivalent N basis to both the crops.

Under the situation of inadequate availability of FYM; farmers should follow soil test based fertilizer application to both the crops.

(Dept. of Agronomy and Dept. of Agril. Chem. & Soil. Sci., JAU, Junagadh)

Evaluation of potentiality of organic farming under pearlmillet (kharif)-wheat (rabi) crop sequence

The farmers of South Saurashtra Agro-climatic Zone adopting pearl millet-wheat crop sequence are advised to apply chemical fertilizers as per soil test to both the crops for realizing higher net return. Application of nutrients only through organic sources was not found economical.

(Dept. of Agronomy and Dept. of Agril. Chem. & Soil. Sci., JAU, Junagadh)

Effect of sulphur with and without potassium on yield, nutrient uptake and quality of pigeonpea in relay inter cropping system

The farmers of South Saurashtra Agro-climatic Zone adopting pigeon pea + groundnut relay cropping in medium black calcareous soils are advised to apply 40 kg sulphur (one month

prior to sowing) and 50 kg K_2O per hectare as basal in addition to recommended doses of N and P to pigeon pea for higher yield and net return.

(Department of Agril. Chem. & Soil. Sci., JAU, Junagadh)

Integrated nutrient supply system for rainfed semi-arid tropics

The farmers of North Saurashthra Agro-climatic Zone following pearl millet-groundnut cropping system under rainfed conditions are advised not to follow mono cropping and apply N @ 80 kg/ha to pearl millet only for obtaining higher yield and net return.

(Main Dry Farming Research Station, JAU, Targhadia)

Nutrient management in sesame

The farmers of North Saurashtra Agro-climatic Zone are advised to apply FYM @ 5 t/ha + NP fertilizer (25:25 kg NP/ha) to sesame crop for getting higher yield and net realization.

Alternatively, the farmers are advised to apply FYM @ 5 t/ha + NP (12.5:12.5 kg/ha) through chemical fertilizers along with seed inoculation of PSM + *Azotobacter* each @ 625 g/ha to sesame crop.

(Main Dry Farming Research Station, JAU, Targhadia and Dry Farming Research Station, JAU, Nanakandhasar)

Response of pearl millet to zinc application

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet (GHB-558) during *kharif* on Zn deficient soils are advised to apply 20 kg/ha zinc sulphate at the time of sowing followed by 0.2 per cent spray of $ZnSO_4$ at pre-flowering stage to obtain higher grain yield and net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Integrated nutrient management in black seeded sesame under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone growing black seeded sesame (G.Til-10) in *kharif* are advised to apply 25 kg N + 25 kg P_2O_5/ha as basal and 25 kg N/ha as top dressing at 30 DAS or apply FYM 10 t/ha + *Azotobacter* and PSB each @ 5 kg/ha as soil application for getting higher yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Efficacy of multi-micronutrient formulation in improving crop production in sesame

The farmers of North Saurashtra Agro-climatic Zone growing sesame during *kharif* in soils with marginal to deficient in available Fe and Zn are advised to apply mixture grade of multi-micronutrients @ 20 kg/ha (Fe-2.0 %, Mn-0.5 %, Zn-5.0 %, Cu-0.2 % and B-0.5 %) equivalent to Government notified general grade-V as soil application for obtaining higher yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Study the response of sesame to micronutrients in combination with organic manure

The farmers of North Saurashtra Agro-climatic Zone growing sesame on soils marginal to deficient in Zn and Fe are advised to apply 2.5 t FYM/ha with $ZnSO_4$ @ 20 kg/ha and $FeSO_4$ at 25 kg/ha in addition to the recommended fertilizer dose (50:25:00 NPK kg/ha) for getting higher yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Year: 2008-09

Integrated nutrient management in *kharif* pearl millet

The framers of North Saurashtra Agro-climatic Zone (AES-X) growing *kharif* pearl millet are advised to apply 50 per cent RDF (40:20 NP kg ha^{-1}) along with 2.5 t ha^{-1} compost and 500 kg castor cake ha^{-1} for obtaining higher yield and net realization.

((Main Dry Farming Research Station, JAU, Targhadia and Dry Farming Research Station JAU, Jamkhambhalia)

Integration of bio-inoculants with inorganic and organic sources of nutrients for yield maximization of sesame

The farmers of North Saurashtra Agro-climatic Zone growing sesame (G.Til 3) in *kharif* are advised to apply RDF (50:25 NP kg ha^{-1}) as 25 kg N +25 kg P_2O_5 ha^{-1} as basal and 25 kg N ha^{-1} as top dressing to sesame for getting higher yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Effect of FYM and castor cake on the productivity of sesame

The farmers of North Saurashtra Agro-climatic Zone growing sesame (G.Til-2) during *kharif* are advised to apply 1.0 t castor cake ha^{-1} or 7.5 t FYM + 750 kg castor cake ha^{-1} for getting higher yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Response of summer sesame to N-P fertilizers

The farmers of North Saurashtra Agro-climatic Zone growing sesame (G.Til-2) in summer are advised to apply 25 kg N + 25 kg P_2O_5 ha^{-1} as basal and 25 kg N ha^{-1} as top dressing at 30 DAS for getting higher yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Effect of sulphur on yield and oil content of sunflower

The farmers of North Saurashtra Agro-climatic Zone growing sunflower (G. Sunflower 1) in *kharif* are advised to apply 40 kg S ha^{-1} through gypsum besides application of chemicals fertilizers (90:50 NP kg ha^{-1}).

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Fertilizer requirement of sunflower

The farmers of North Saurashtra Agro-climatic Zone growing Sunflower (G. Sunflower 1) in *kharif* are advised to apply 45 kg N + 60 kg P_2O_5 ha^{-1} as basal and 45 kg N ha^{-1} as top dressing for getting higher yield and net returns.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Integrated nutrient management in castor (*rabi*)-groundnut (*kharif*) crop sequence

The farmers of South Saurashtra Agro-climatic Zone adopting castor (*rabi*)-groundnut (*kharif*) crop sequence are advised to treat the castor seed with *Azospirilium* and PSB cultures in addition to 100 per cent RDF (NP 75:50 kg ha^{-1}) for obtaining higher yield and net return.

(Central Experimental Research Station, Sagadiwidi, & Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Effect of potassium with and without Zn on yield and nutrient uptake by castor

The farmers of South Saurashtra Agro-climatic Zone growing castor in medium black calcareous soil deficient to marginal in K and Zn availability are advised to apply 50 kg K_2O + 50 kg $ZnSO_4$ ha^{-1} as basal in addition to recommended fertilizer dose (75:50 NP kg ha^{-1}) for getting higher yield and net return.

(Dept. of Agril. Chem. & Soil Science and Main Oilseed Research station, JAU, Junagadh)

The interaction effect of Zn, Fe, and K in wheat-groundnut crop sequence in calcareous black soil

The farmers of South Saurashtra Agro-climatic Zone adopting wheat-groundnut crop sequence in medium black calcareous soils (low to marginal in available K and Zn) are advised to apply 80 kg K_2O + 25 kg $ZnSO_4$ ha^{-1} to wheat crop only as basal in addition to RDF (NP 120:60 and 12.5:25 kg ha^{-1} to wheat and groundnut, respectively) for getting higher yield of crops in wheat-groundnut sequence.

(Dept. of Agril. Chem. & Soil Science and Wheat Research Station, JAU, Junagadh)

Response of cotton to nitrogen sources

The farmers of South Saurashtra Agro-climatic Zone growing hybrid cotton in medium black calcareous soil are advised to apply recommended dose of nitrogen in form of urea only.

(Dept.of Agril. Chem. & Soil Science and Central Experimental Research Station, sagadiwidi, JAU, Junagadh)

Year: 2009-10

Crop rotation studies in respect of sustaining crop yield and increasing total productivity under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone are recommended to adopt integrated nutrient management practices (25% RDF for the respective crop + compost @ 5 t/ha + castor cake @ 500 kg/ha + *Azotobacter* and PSM @ 5 g/kg of seed) in groundnut based crop rotation with groundnut or sesame or pearl millet for getting higher yield and net realization.

(Main Dry Farming Research Station, JAU, Targhadia)

Nutrient management practices for sustaining groundnut yield and productivity of sandy loam soils

The farmers of North Saurashtra Agro-climatic Zone (AES-10) growing *kharif* groundnut GG-7 are advised to apply 50% RDF (6.25:12.50 NP kg/ha) along with castor cake @ 500 kg /ha for obtaining higher yield and net realization.

(Main Dry Farming Research Station, JAU, Targhadia)

Possibilities of organic farming in Pearl millet-wheat sequence

The farmers of North Saurashtra Agro-climatic Zone following pearl millet (*Kharif*) – wheat (*Rabi*) crop sequence are advised to apply 50% RDF to both the crops + FYM @ 5 t/ha + seed inoculation with PSB + *Azospirillum* to pearl millet and *Azotobacter* for wheat to obtain higher yield and net return.

OR

Alternatively, they should apply 100% RDF + 20 K_2O kg/ha to both the crops for securing higher yield and net return.

(Main Millet Research Station, JAU, Jamnagar)

Response of castor to levels and sources of S

The farmers of South Saurashtra Agro-climatic Zone growing irrigated castor are recommended to apply 20 kg S/ha through gypsum (150 kg/ha) along with recommended dose (75:40 NP kg/ha) as urea and DAP.

OR

The crop should be fertilized with RDF (75:40 NP kg/ha) through urea and SSP for obtaining higher yield and net return**.**

(Main Oilseeds Research Station, JAU, Junagadh)

Impact of foliar application of KNO3 on yield and quality of Cotton

The farmers of South Saurashtra Agro-climatic Zone growing cotton Bt Hybrid (VICH 5) under irrigated condition are advised to spray 3% KNO3 in addition to RDN (160 kg/ha) at flowering, boll initiation and 50% boll formation to get higher yield and net income.

(Cotton Research Station, JAU, Junagadh)

Year: 2010-11

Effect of foliar application of nutrients on growth, yield & quality of onion

The farmers of AES-VI of South Saurashtra Agro-climatic Zone growing onion for bulb production (Var. Gujarat White Onion-1) during *rabi* season are recommended to apply NPK (19:19:19) @ 0.5 per cent as foliar spray at 30, 45 and 60 days after planting in addition to recommended dose of fertilizer (75:60:50 NPK kg/ha) for higher yield and net return.

(Vegetable Research Station, JAU, Junagadh)

Response of tomato to foliar application of micronutrients

The farmers of AES-VI of South Saurashtra Agro-climatic Zone growing tomato crop (Var. Gujarat Tomato-1) during *rabi* season are recommended to apply micronutrient mixture of boric acid, zinc sulphate, copper sulphate, ferrous sulphate and manganese sulphate each @ 100 ppm, and ammonium molybdate @ 50 ppm at 40, 50 and 60 days after planting in addition to recommended dose of fertilizer (75:37.5:62.5 kg NPK/ha) for getting higher fruit yield and net return.

(Vegetable Research Station, JAU, Junagadh)

Integrated nutrient management in tomato

The farmers of AES-VI of South Saurashtra Agro-climatic Zone growing tomato crop (Var. Gujarat Tomato-1) during *rabi* season are advised to apply NPK @ 120:60:80 kg/ha + FYM @ 10 t/ha + S @ 25 kg/ha + *Azotobactor* @ 5 kg/ha as soil application at the time of planting and foliar spray of micronutrient mixture of boric acid, zinc sulphate, copper sulphate, ferrous sulphate and manganese sulphate each @100 ppm, and ammonium molybdate @ 50 ppm at 50 days after planting for getting higher fruit yield net return.

(Vegetable Research Station, JAU, Junagadh)

Fertilizer management in cotton + sesame (1:1) intercropping system under dry farming condition

The farmers of AES-IV of North Saurashtra Agro-climatic Zone adopting hybrid cotton (G. Cot. Hy.-8) + sesame (1:1) intercropping system are advised to apply 80 kg nitrogen/ha to cotton and 100 per cent RDF on half of the area basis 25 kg nitrogen and 12.5 kg phosphorus/ha to sesame crop for getting higher yield and net returns under dry farming condition.

(Dry Farming Research Station, JAU, Targhadia)

Balance use of fertilizer in pearl millet based crop sequence (Pearl millet-Mustard)

The farmers of AES-II of North Saurashtra Agro-climatic Zone following pearl millet (*kharif*)-mustard (*rabi*) crop sequence are advised to apply 5 t FYM/ha and 100% RDF (80:40 kg N:P_2O_5/ha) to pearl millet crop and apply 100% RDF (50:50 kg N:P_2O_5/ha) + K_2O 30 kg + gypsum 100 kg + $ZnSO_4$ 10 kg + $FeSO_4$ 10 kg/ha to mustard crop for obtaining higher net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Integrated nutrient management in summer pearl millet

The farmers of AES-II of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during summer season in Zn deficient soil are advised to apply recommended dose of fertilizer (120:60:0 NPK kg/ha) along with 20 kg $ZnSO_4$ per hectare (basal) to obtain higher yield and net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Nitrogen management in summer pearl millet

The farmers of AES-II of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during summer are advised to apply nitrogen @ 120 kg/ha in three splits i.e., $^1/_3$ as basal, $^1/_3$ at tillering stage (25-30 DAS) and $^1/_3$ at boot stage (40-45 DAS) to obtain higher yield and net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Response of sesame (*Sesamum indicum* Linn.) to potassium fertilization under rainfed condition

The farmers of AES-VIII of North Saurashtra Agro-climatic Zone growing sesame (G.Til-3) in *kharif* are advised to apply 40 kg K_2O/ha in addition to the recommended dose of fertilizer (50:25 NP kg/ha) for getting higher yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Effect of foliar spray on seed yield and economics of sesame

The farmers of AES-VIII of North Saurashtra Agro-climatic Zone growing sesame (G.Til-2) in *kharif* are advised to apply recommended dose of fertilizer (50:25:00 NPK kg/ha) with two foliar sprays of urea @ 2% at flowering and capsule formation stages for getting higher yield and net return. Foliar spray of DAP was not found beneficial.

(Agricultural Research Station, JAU, Amreli)

Nutrient management in onion under salt stress condition

The farmers of South Saurashtra Agro-climatic Zone growing white onion under saline irrigation water (EC 6.00 dSm^{-1}) are advised to apply FYM @ 20 t/ha + Gypsum 7 t/ha (50% GR) + 75 kg K_2O/ha in addition to recommended dose of fertilizer (75 kg N + 60 kg P_2O_5 /ha) to obtain higher yield and net income.

(Department of Ag. Chem. & Soil Sci., JAU, Junagadh)

Development of technology for rapid composting of cotton residues under rainfed agriculture

The farmers are advised to recycle cotton stalk (which are either burned or wasted) by chopping into small pieces of 5-6 cm using cotton shredder and composting with addition of compost culture @ 500 g per tonne, urea (N @ 0.5%) and cow dung @ 20% as well as 500 g each of *Azotobacter* and PSM per tonnes during first turning of to get enriched compost within 120 days having higher content of all the plant nutrients.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2011-12

Fertilizer management in cotton + sesame (1:1) intercropping system under dry farming condition

The farmers of North Saurashtra Agro-climatic Zone (AES XV) adopting hybrid cotton + sesame (1:1) intercropping system under rainfed condition are advised to apply 40 kg N/ha to cotton and 25 kg N/ha + 12.5 kg P_2O_5/ha to sesame for getting higher yield and net return.

(Main Dry Farming Res. Station, JAU, Targhadia & Agril. Res. Station, JAU, Nana Kandhasar)

Fertilizer management in cotton + sesame (1:1) intercropping system under dry farming condition

The farmers of North Saurashtra Agro-climatic Zone (AES X) adopting cotton + sesame (1:1) intercropping system under rainfed condition are advised to apply 80 kg N/ha to cotton and 25 kg N/ha +12.5 kg P_2O_5/ha to sesame crop for getting higher yield and net return.

(Main Dry Farming Res. Station, JAU, Targhadia & Agril. Res. Station, JAU, Jam Khambhalia)

Effect of nitrogen and bio fertilizer on yield of shaniar grass (*Sehima nervosum*)

The farmers of North Saurastra Agro-climatic Zone growing *shaniar* grass (*kharif*) are advised to apply 60 kg N/ha in two equal splits first at 10 days after first rain and second at 30 days after first application for getting higher fodder yield**.**

(Grassland Research Station, JAU, Dhari)

Effect of phosphorus with and without K2O on yield of anjan grass

The farmers of North Saurashtra Agro-climatic Zone growing *anjan* grass (*kharif)* are advised to apply 60 kg P_2O_5/ha as a basal dose along with recommended dose of 20 kg N/ha (10 kg as basal + 10 kg/ha at 30 DAS) for getting higher fodder yield.

(Grassland Research Station, JAU, Dhari)

Effect of potassium and zinc on yield and quality of fodder jowar under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone (AES-XIV) growing fodder sorghum (*kharif)* are advised to apply 40 kg K_2O + 20 kg $ZnSO_4$/ha along with recommended dose of fertilizers (80:40 kg NP/ha) for getting higher fodder yield.

(Grassland Research Station, JAU, Dhari)

Effect of application of potassium and zinc on growth, yield and nutrients uptake by onion and its residual effect on kharif groundnut in medium black calcareous soil

The farmers of South Saurashtra Agro-climatic Zone adopting onion-groundnut sequence in medium black calcareous soil are advised to apply 75 kg K_2O/ha in two splits i.e. ½ K_2O as basal + ½ at 30 DAS besides 25 kg $ZnSO_4$/ha and recommended fertilizer dose (75:60 kg NP/ha) to onion crop for getting higher yield and net return.

(Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Bt. cotton response to potash with and without zinc

The farmers of South Saurashtra Agro-climatic Zone growing irrigated Bt. cotton on medium black calcareous soil are advised to apply potassium @ 150 kg/ha as basal or in two splits (i.e. 1/2 as basal + 1/2 at 30 DAS) along with 50 kg zinc sulphate per hectare in addition to recommended fertilizer dose (N 160 kg/ha^{-1}) for getting higher yield and net return.

(Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Balance fertilization in Bt. cotton

The farmers of South Saurashtra Agro-climatic Zone growing Bt. cotton on medium black calcareous soil are advised to apply 10 t FYM/ha + 240 kg N/ha (four splits, 25% at sowing and remaining three equal splits at 30, 60 and 90 DAS) and @ 50 kg P_2O_5/ha as basal for getting higher yield and net return.

(Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Effect of soil amendments on different genotypes of gram under salt affected soil

The farmers of South Saurashtra Agro-climatic Zone having sodic soil are recommended to grow gram variety GG-4 or GG-1 and apply 10 t FYM/ha + gypsum @ 50% G.R. for getting higher yield and net return.

(Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Integrated nutrient management in garlic on sandy loam soil of Saurashtra

The farmers of North Saurashtra Agro-climatic Zone (AES-X) growing garlic are advised to apply 75 % RDF (37.5:37.5:37.5 NPK kg/ha) along with either 2.5 t FYM/ha or castor cake 300 kg/ha for obtaining higher yield and net realization**.**

(Main Dry Farming Research Station, JAU, Targhadia & Dry Farming Research Station JAU, Jam Khambhalia)

Integrated nutrient management for *bajra*-cotton rotation under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone (AES-XV) adopting *bajra*-cotton rotation are recommended to apply 50 per cent of recommended dose of fertilizers (*bajra*

40:20 NP kg/ha and cotton 40 kg N/ha) along with castor cake @ 900 kg/ha for getting higher yield and net realization.

(Main Dry Farming Research Station, JAU, Targhadia & Dry Farming Research Station JAU, Nana Kandhasar)

Evaluation for the potentiality of bio-fertilizer and organic resources for sustaining sesame yield under rainfed condition

The farmers of Western *Bhal* and Coastal Zone (AES-1(a), 1(b) and 3) growing sesame under rainfed condition are advised to apply 50% of recommended dose of fertilizers i.e. 12.5:12.5 kg NP/ha along with 500 kg castor cake/ha and besides seed treatment of *Azotobacter* and PSB (CFU 10^8/g) each of 30 g/kg seed for getting higher yield and net realization along with 50% saving of fertilizers.

(Main Dry Farming Research Station, JAU, Targhadia and Dry Farming Research Station, JAU, Vallabhipur)

Year: 2012-13

Evaluation of potentiality of organic farming for groundnut (*kharif*) -garlic (*rabi*) cropping sequence

The farmers of South Saurashtra Agro-climatic Zone - VII adopting groundnut (*kharif*)-garlic (*rabi*) cropping sequence under organic farming are advised to apply FYM @ 2.5 t/ha to groundnut and 10 t/ha to garlic on sequence basis for securing higher net realization and maintaining soil fertility.

(Department of Agronomy, JAU, Junagadh and Department of Agril. Chemistry & Soil Science, JAU, Junagadh)

Permanent plot experiment on integrated nutrient supply system for a cereal based crop sequence

The farmers of South Saurashtra Agro-climatic Zone - VII adopting pearl millet (*kharif*)-wheat (*rabi*) cropping sequence are advised to apply FYM @ 8 t/ha and 50% RDF (40:20:25 $N:P_2O_5:K_2O$ kg/ha) to pearl millet and 120:60:25 $N:P_2O_5:K_2O$ kg/ha to wheat to get higher yield and net realization as well as to maintain soil fertility.

(Department of Agronomy, JAU, Junagadh)

Integrated nutrient management in okra

The farmers of South Saurashtra Agro-climatic Zone - VII growing okra during summer season are advised to apply FYM @ 10 t/ha + half RDF (75:25:25 $N:P_2O_5:K_2O$ kg/ha) to get higher yield and net profit.

(Vegetable Research Station, JAU, Junagadh)

Integrated nutrient management in ridge gourd

The farmers of South Saurashtra Agro-climatic Zone - VII growing ridge gourd during summer season are advised to apply FYM @ 5 t/ha and 25:12.5:12.5 $N:P_2O_5:K_2O$ kg/ha to get higher yield and net return.

(Vegetable Research Station, JAU, Junagadh)

Feasibility of the organic farming in respect to sustain soil productivity under rainfed agriculture

The farmers of North Saurashtra Agro-climatic Zone - VI (AES-IV) interested to follow groundnut-sesame crop rotation under organic farming during kharif are advised to apply compost @ 1.25 t/ha + vermicompost @ 165 kg/ha + castor cake @ 75 kg/ha to groundnut and compost @ 5 t/ha + vermicompost @ 650 kg/ha + castor cake @ 300 kg/ha to sesame along with groundnut shell mulching @ 1 t/ha, biofertilizer (Rhizobium & Azotobacter) to both the crops @ 1.5 kg/ha and Trichoderma @ 2.5 kg/ha for obtaining higher net returns and sustaining soil fertility under rainfed condition.

(Dry Farming Research Station, JAU, Targhadia)

Irrigation and nutrient management in *rabi* bajra

The farmers of South Saurashtra Agro-climatic Zone - VII growing bajra in *rabi* season are advised to apply nine irrigations i.e. two common irrigations for germination and the remaining seven irrigations at 10 days interval to get higher yield and net realization. Farmers are also advised to apply fertilizer @ 120:60 N: P_2O_5 kg/ha and potassium on soil test basis.

(Department of Seed Science & Technology, JAU, Junagadh and Main Millet Research Station, JAU, Jamnagar)

Effect of multi-micronutrient formulations on wheat

The farmers of South Saurashtra Agro-climatic Zone - VII growing wheat are advised to apply multi-micronutrients mixture Grade-V @ 40 kg/ha or apply micronutrients on soil test basis beside the recommended dose of fertilizer (120:60 N:P_2O_5 kg/ha) to get higher yield and net returns.

(Department of Agril. Chemistry & Soil Sci., JAU, Junagadh and Wheat Research Station, JAU, Junagadh)

Efficacy of multi-micronutrient formulations for improving crop production in castor

The farmers of South Saurashtra Agro-climatic Zone -VII growing castor are recommended to apply micronutrients on soil test basis or four sprays of multi-micronutrients mixture Grade-IV @ 1% at 45, 60, 75 and 90 DAS besides recommended dose of fertilizer (75:50:50 N:P_2O_5:K_2O kg/ha) to get higher yield and net returns.

(Department of Agril. Chemistry & Soil Sci., JAU, Junagadh and Main Oilseeds Research Station, JAU, Junagadh)

Effect of multi-micronutrient formulations on pigeonpea

The farmers of South Saurashtra Agro-climatic Zone -VII growing pigeonpea are advised to apply micronutrients on soil test basis or multi-micronutrient mixture Grade-V @ 40 kg/ha besides recommended dose of fertilizer (25:50:0 N:P_2O_5:K_2O kg/ha) to get higher yield and net returns.

(Department of Agril. Chemistry & Soil Sci., JAU, Junagadh and Pulses Research Station, JAU, Junagadh)

Balance nutrient management in groundnut (monsoon)–wheat (winter) cropping sequence on LTFE basis

The farmers of South Saurashtra Agro-climatic Zone -VII adopting groundnut (*kharif*)-wheat (*rabi*) cropping sequence are advised to apply FYM @ 10 t/ha + 6.25:12.5 N:P_2O_5 kg/ha through fertilizer to groundnut and 120:60:60 N:P_2O_5:K_2O kg/ha through fertilizer only to wheat for securing higher net return and maintaining soil fertility.

(Department of Agril. Chemistry & Soil Sci., JAU, Junagadh and Department of Agronomy, JAU, Junagadh)

Year: 2013-14

Evaluation of potentiality of organic farming for groundnut (*kharif*)-wheat (*rabi*) cropping sequence

The farmers of South Saurashtra Agro-climatic Zone adopting groundnut (*kharif*)-wheat (*rabi*) cropping sequence under organic farming are advised to apply FYM @ 2.5 t/ha to groundnut and 24 t/ha to wheat for obtaining higher yield and net return along with maintaining soil fertility.

(Department of Agronomy, JAU, Junagadh)

Nutrients requirement for bold seeded summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing bold seeded summer groundnut are advised to fertilize the crop with 50 kg N, 25 kg K_2O and 20 kg S (120 kg gypsum/) per hector with recommended dose of P_2O_5 (50 kg/ha) for securing higher yield and net realization.

(Main Oilseeds Research Station, JAU, Junagadh)

Yield maximization in groundnut through nutrient management practices during kharif season

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut are advised to apply FYM 7.5 t/ha + recommended dose of fertilizer (12.5:25 kg N:P_2O_5/ha) + 25 kg $ZnSO_4$/ha as basal for obtaining higher yield and net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Effect of biofertilizer along with molybdenum application on yield of chickpea

The farmers of South Saurashtra Agro-climatic Zone growing irrigated chickpea are advised to treat seeds with *Rhizobium* culture @ 25 g/kg seed + phosphate solubilizing bacterial culture (*Bacillus subtilis*) 30 g/kg seed along with recommended dose of fertilizers (20:40 N:P_2O_5 kg/ha) for securing higher yield and net return. Application of molybdenum in chickpea was not found advantageous (Confirmation of earlier recommendation).

(Pulses Research Station, JAU, Junagadh)

Effect of different organic, inorganic and bio-fertilizers on groundnut-pigeonpea relay cropping system

The farmers of South Saurashtra Agro-climatic Zone following groundnut + pigeonpea (2:1) relay cropping system are advised to apply recommended dose of fertilizers to both the crops to obtain higher yield and net returns or 50% RDF + FYM 5 t /ha along with seed treatment of *Rhizobium* and phosphate solubilizing bacteria (each 25-30 g/kg seed) to groundnut only to reduce the dose of chemical fertilizers.

(Pulses Research Station, JAU, Junagadh)

Integrated nutrient management in rainfed cotton

The farmers of North Saurashtra Agro climatic zone (AES-VI) growing rainfed Bt. cotton are advised to apply 80 kg N +10 t compost +500 kg castor cake/ha along with bio-fertilizer (*Azotobacter* + PSB) for obtaining higher yield and net return beside improving soil fertility.

(Main Dry Farming Research Station, JAU, Targhadia)

Effect of K application on yield of summer groundnut in calcareous soil

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut in medium black calcareous soil are advised to apply potassium @ 50 kg/ha as basal in addition to recommended dose of fertilizer (25:50 N:P_2O_5 kg/ha) for securing higher yield and net return.

(Department of Agril. Chemistry & Soil Science, JAU, Junagadh)

Potassium fertilization to *kharif* groundnut in calcareous soil

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut in medium black calcareous soil are advised to apply potassium @ 50 kg/ha as basal in addition to recommended dose of fertilizer (12.5:25 N:P_2O_5 kg/ha) for securing higher yield and net return.

(Department of Agril. Chemistry & Soil Science, JAU, Junagadh)

Year: 2014-15

Studies on the effect of water soluble foliar grade fertilizers on the growth and yield of summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are recommended to fertilize the crop with FYM 7.5 t/ha + 60 % RDF (i.e. 15-30 kg N-P_2O_5/ha) for obtaining higher yield and net realization.

(Main Oilseeds Research Station, JAU, Junagadh)

Effect of bio-phos on the performance of castor

The farmers of South Saurashtra Agro-climatic Zone growing irrigated castor are recommended to apply 40 kg P_2O_5/ha and treat the seeds with phosphate solubilizing microorganism (*Chaetomium globosum*) @ 30 g/50 g seed along with recommended dose of nitrogen (120 kg/ha) for obtaining higher seed yield and net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Nutrient management in groundnut-Bt. cotton intercropping system

The farmers of South Saurashtra Agro-climatic Zone adopting groundnut - Bt. cotton inter-cropping system (in 3:1 ratio) are recommended to apply 50 per cent RDF (i.e.6.25-12.5-0 kg N-P_2O_5-K_2O/ha) to the groundnut crop and 100 per cent recommended dose of fertilizer (i.e. 160 kg N/ha) to the cotton crop for obtaining higher yield and net realization.

(Main Oilseeds Research Station, JAU, Junagadh)

Effect of integrated nutrient management on yield, quality and nutrient uptake by garlic under salt affected soil

The farmers of South Saurashtra Agro-climatic Zone growing garlic in salt affected soil are recommended to apply 50 % RDF (i.e. 25-25-25 kg N-P_2O_5-K_2O/ha) along with FYM @ 10 t/ha for obtaining higher bulb yield and net return.

(Dept. of Agril. Chem. & Soil Sci., CoA, JAU, Junagadh)

Year: 2015-16

Effect of potassium fertilizer on castor hybrid

The farmers of South Saurashtra Agro-climatic Zone growing irrigated castor are recommended to apply potash @ 50 kg K_2O/ha (25 kg/ha as basal and 25 kg/ha at 45 days after sowing) along with recommended dose of nitrogen and phosphorus (120:50 N:P_2O_5 kg/ha) for obtaining higher seed yield and net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Nutrient management in Bt cotton under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone (AES-10) growing Bt cotton are recommended to apply 20 kg P_2O_5, 40 kg K_2O and 20 kg sulphur (150 kg gypsum/ha) along with recommended dose of nitrogen (80 kg N/ha) for obtaining higher yield and net return as well as maintaining soil fertility under rainfed condition.

(Main Dry Farming Research Station, JAU, Targhadia & Dry Farming Research Station, JAU, Jamkhambhalia)

Effect of potassium and sulphur on growth and yield of wheat crop

The farmers of South Saurashtra Agro-climatic Zone growing wheat are recommended to apply 60 kg potash and 40 kg sulphur (through gypsum) per hectare as basal in addition to recommended dose of N and P (120:60 N:P_2O_5 kg/ha) to wheat crop for getting higher yield and net return.

(Department of Agril. Chem. & Soil Sci. & Wheat Research Station, JAU, Junagadh)

Effect of multi-micronutrient formulations on okra

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* okra in medium black calcareous soil are recommended to apply micronutrients as per soil test value as basal in addition to recommended dose of fertilizers (150:50:50 N:P_2O_5:K_2O kg/ha) to okra for getting higher yield and net return.

Alternatively, foliar spraying of multi-micronutrient formulation Grade IV (Fe-Mn-Zn-Cu-B, 4.0-1.0-6.0-0.5-0.5 %) @ 1% at 45, 60, 75 and 90 DAS in addition to recommended dose of fertilizers (150:50:50 N:P2O5:K2O kg/ha) to okra is recommended for getting higher yield and net return.

(Dept. of Agril. Chem. & Soil Sci. & Vegetable Research Station, JAU, Junagadh)

Efficacy of multi-micronutrient formulations in improving crop production in Bt cotton

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton in medium black calcareous soil are recommended to apply micronutrients as per soil test value as basal in addition to recommended dose of fertilizers (240-50-150 N-P_2O_5-K_2O kg/ha) to Bt cotton for getting higher yield and net return.

Alternatively, foliar spraying of multi-micronutrient formulation Grade IV (Fe-Mn-Zn-Cu-B, 4.0-1.0-6.0-0.5-0.5 %) @ 1% at 45, 60, 75 and 90 DAS in addition to recommended dose of fertilizers (240-50-150 N-P_2O_5-K_2O kg/ha) is recommended to Bt cotton for getting higher yield and net return.

(Department of Agril. Chem. & Soil Sci. & Cotton Research Station, JAU, Junagadh)

Year: 2016-17

Response of castor to potash at varying crop geometry

The farmers of South Saurashtra Agro-climatic Zone growing irrigated castor in soil having medium status of potash are advised to sow castor at spacing of 150 cm x 60 cm with an application of potash @ 40 kg/ha along with recommended dose of nitrogen and phosphorus (120-50 kg NP/ha) for obtaining higher seed yield and net return.

(Main Oilseed Research Station, JAU, Junagadh)

Phosphorus management in sesame under rain fed condition

The farmers of North Saurashtra Agro-climatic Zone growing rainfed sesame are advised to fertilize the crop with 25 kg P_2O_5/ha as basal through SSP along with recommended dose of nitrogen (50 kg N/ha) for getting higher yield and net return.

(Main Dry Farming Research Station, JAU, Targhadia)

Effect of foliar fertilizer in Bt. cotton. G. Cot. Hy. 8 (BG-II)

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton under irrigated condition are advised to apply recommended dose of fertilizer 240:50:150 NPK kg/ha) and spray water soluble fertilizer 1 % (19:19:19 NPK) at flowering, boll formation and boll development stage of the cotton to obtain higher seed cotton yield and net return.

(*Cotton Research Station, JAU, Junagadh)*

Effect of multi-micronutrient formulations on tomato

The farmers of South Saurashtra Agro-climatic Zone growing tomato in medium black calcareous soil are recommended to apply micronutrients as per soil test value as basal in addition to recommended dose of fertilizers (75-37.5-62.5 N-P_2O_5-K_2O kg/ha) to tomato for getting higher yield and net return. OR Foliar spraying of multi-micronutrient formulation Grade IV (Fe-Mn-Zn-Cu-B, 4.0-1.0-6.0-0.5-0.5 %) is recommended @ 1% at 45, 60 and 75 DAS in addition to recommended dose of fertilizers (75-37.5-62.5 N-P_2O_5-K_2O kg/ha) to tomato for getting higher yield and net return.

(Department of Agril. Chem. & Soil Sci. and Vegetable Research Station, JAU, Junagadh)

Effect of multi-micronutrient formulations on garlic

The farmers of South Saurashtra Agro-climatic Zone growing garlic in medium black calcareous soil are advised to apply micronutrients as per soil test value as basal in addition to recommended dose of fertilizers (50-50-50 N- P_2O_5-K_2O kg/ha) for getting higher yield and net return. OR Soil application of multi-micronutrient formulation Grade V (Fe-Mn-Zn-Cu-B, 2.0-0.5-5.0-0.2-0.5 %) is recommended @ 40 kg/ha in addition to recommended of fertilizers (50-50-50 N- P_2O_5-K_2O kg/ha) to garlic for getting higher yield and net return. OR Apply foliar spray of multi-micronutrient formulation Grade IV (Fe-Mn-Zn-Cu-B, 4.0-1.0-6.0-0.5-0.5 %) @ 1% at 60, 75 and 90 DAS in addition to recommended dose of fertilizers (50-50-50 N- P_2O_5-K_2O kg/ha) to garlic for getting higher yield and net return.

(Department of Agril. Chem. & Soil Sci. and Vegetable Research Station, JAU, Junagadh)

B. Cropping System

Year: 2004-05

Cotton

The farmers of North Saurashtra Agro-climatic Zone growing hybrid cotton (G.Cot.Hy-8) at the distance of 120 cm are advised to adopt intercropping with sesame (G. Til-2) or green gram (K-851) in the row ratio of 1:1 for getting higher yield and net return under dry farming condition.

(DFRS, Nanakandhasar, Jamkhambhakia; Grassland, Dhari & DFRS, JAU, Targhadia)

Anjan Grass

The farmers of North Saurashtra Agro-climatic Zone growing grasses are advised to use seed mixture of Anjan grass (2.66 kg/ha) and *Stylosanthes scabra* (1.66 kg/ha) for obtaining economical maximum green biomass and dry matter production on marginal lands under rainfed condition. Alternatively instead of *S.scabra, Clitoria* Sp. (5 kg/ha) can also be used.

(Grassland Research Station, JAU, Dhari)

C. Water Management

Year: 2004-05

Sesame

The farmers of North Saurashtra Agro-climatic Zone growing sesame in *kharif* are advised to apply one irrigation at 50 per cent flowering during dry spell for getting maximum sesame yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Year: 2005-06

Brinjal (*summer*)

The farmers of South Saurashtra Agro-climatic Zone growing brinjal (*Lila gota*) in *summer* season are advised to irrigate the crop with drip system at 1.0 PEF laying lateral at 90 cm distance in each row and drippers of 4.0 LPH at 60 cm distance on each lateral and operate the system at an alternate day with a pressure of 1.2 kg / cm^2 for one hour and 50 minutes on alternate day for getting more net realization with higher water use efficiency.

Under constraint of irrigation water, they are advised to adopt drip irrigation at 0.8 PEF to save 20 % water and bring about 0.21 ha additional area of this crop under irrigation. Farmers are also advised to apply wheat straw mulch @ 5 t/ha for getting more net realization.

(Department of Agronomy, JAU, Junagadh)

Coriander

The farmers of South Saurashtra Agro-climatic Zone growing coriander are advised to irrigate the crop with mini sprinkler at 0.8 PEF with laying lateral at 1.8 m distance in paired row (30-60-30 cm) and sprinkler of 35 LPH at 2.5 m distance on each lateral, and operating the system at an alternate day with a pressure of 1.2 kg/cm^2 for getting higher net realization.

(Department of Agronomy, JAU, Junagadh)

Year: 2006-07

Pearl millet

The farmers of North Saurashtra Agro-climatic Zone (AES-X) growing hybrid pearl millet (GHB-558) in summer are advised to give 13 irrigations each of 40 mm depth at 6-7 days interval for obtaining higher yield and net return. Under limited water availability, they are advised to give 11 irrigations each of 40 mm depth at 7-8 days interval.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Year: 2007-08

Effect of supplementary irrigation on productivity of groundnut-castor inter cropping system

The farmers of South Saurashtra Agro-climatic Zone adopting bunch groundnut + castor (3:1) intercropping system are advised to irrigate castor crop at 1.0 IW/CPE ratio (four irrigations). First irrigation should be given at 20 days after harvesting of groundnut and remaining at an interval of 10 days for getting higher net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Response of wheat varieties to restricted irrigations

The farmers of South Saurashtra Agro-climatic Zone growing irrigated wheat are advised to prefer wheat variety GW-322 and give 7 irrigations *i.e.* at sowing, CRI, tillering, boot, flowering, milky and dough stages for getting higher yield and net return. Under limited water availability, farmers can apply 6 irrigations by skipping irrigation at boot stage without affecting yield.

(Wheat Research Station, JAU, Junagadh)

Year: 2008-09

Feasibility of micro irrigation and organic manures in tomato

The farmers of South Saurashtra Agro-climatic Zone growing tomato (Gujarat Tomato-1) in *rabi* season are advised to irrigate the crop with drip system at 1.0 PEF for getting higher yield and net realization.

Farmers are also advised to apply recommended dose of fertilizer i.e. 75.00:37.50:62.50 NPK kg/ha along with FYM @ 10 t ha^{-1} for getting more net realization.

The system details are:

1. Lateral spacing =90cm
2. Dripper spacing=60cm
3. Dripper discharge = 4 lph
4. Operating time = 1 hour and 45 minutes at alternate day.
5. Operating pressure = 1.2 kg cm^{-2}

(Department of Agronomy, JAU, Junagadh)

Year: 2009-10

Relative salinity tolerance of groundnut genotype

The farmers of Saurashtra region growing summer groundnut variety *viz*., GG-4, GG-5, GG-6 can irrigate with water having salinity around 2 dS/m.

(Department of Agri. Chem. & Soil Science, JAU, Junagadh)

Year: 2010-11

Drip irrigation studies in onion crop (seed production)

The farmers of AES-VI of South Saurashtra Agro-climatic Zone growing onion for seed production (Var. Pilipatti) during *rabi* season are recommended to grow bulbs under drip irrigation with 4.0 LPH dripper at 0.5 m spacing on lateral with 1.45 m lateral spacing for getting higher seed yield. The system should be operated daily at 75 % PEF for 47 minutes.

(Vegetable Research Station, JAU, Junagadh)

Year: 2012-13

Response of chickpea to drip irrigation and integrated nutrient management

The farmers of South Saurashtra Agro-climatic Zone - VII growing chickpea are advised to irrigate the crop through drip system at 0.8 PEF and apply recommended dose of fertilizer i.e. 20:40 N:P_2O_5 kg/ha along with FYM @ 1 t/ha to get higher yield and net realization.

The system details are as under

1.	Type of drip system	:	In line
2.	Lateral diameter	:	16 mm
3.	Lateral spacing	:	90 cm
4.	Dripper spacing	:	60 cm
5.	Dripper discharge	:	4 LPH
6.	Operating pressure	:	1.2 kg/cm^2
7.	Operating frequency	:	Alternate day
8.	Operating time	:	65 minutes

(Department of Agronomy, JAU, Junagadh)

Response of summer sesame to drip irrigation and nitrogen levels

The farmers of South Saurashtra Agro-climatic Zone - VII growing sesame in summer season are advised to irrigate the crop through drip system at 1.0 PEF with laying in paired row (30-60-30 cm) and apply 40 kg N/ha along with 25 kg P_2O_5/ha to get higher yield and net return**.**

The system details are as under

1.	Type of drip system	:	In line
2.	Lateral diameter	:	16 mm
3.	Lateral spacing	:	90 cm
4.	Dripper spacing	:	60 cm
5.	Dripper discharge	:	4 LPH
6.	Operating pressure	:	1.2 kg/cm^2
7.	Operating frequency	:	Alternate day
8.	Operating time	:	2 hrs and 35 minutes

(Department of Agronomy, JAU, Junagadh)

Year: 2014-15

Effect of crop geometry and irrigation levels on sugarcane

The farmers of South Saurashtra Agro-climatic Zone growing sugarcane are recommended to adopt drip method of irrigation and plant the crop in paired rows (60-90-60 cm) and irrigate the crop at 0.9 PEF with laying laterals in each paired rows for securing higher cane yield and net return. Nitrogen and potassium should be applied at 80 per cent of recommended dose (i.e. 200-100 N-K_2O kg/ha) under drip irrigation in 10 equal splits starting from 45 DAP at an interval of 20 days.

Drip system details:

Details	**Operating time-Alternate days**	
	Month	**Minutes**
Dripper spacing: 60 cm	March-May	2 Hrs. 20 min
Dripper discharge: 4lph	June	2 Hrs. 10 min
Operating pressure: 1.2 kg/cm2	July-September	1 Hr. 30 min
Operating frequency: Alternate days	October-November December-January	1 Hr. 40 min 1 Hr. 25 min

(Main Sugarcane Research Station, JAU, Kodinar)

Year: 2016-17

Response of cumin to drip irrigation and integrated nutrient management

The farmers of South Saurashtra Agro-climatic Zone growing cumin are advised to irrigate the crop with drip system at 0.6 PEF for getting higher yield and net realization which saves 12.4 % water. Farmers are also advised to apply 75% recommended dose of fertilizer (22.5-11.2-0 kg NPK/ha) along with FYM @ 5 t/ha for getting maximum yield and net return.

The system details as under:

Details
Lateral spacing: 60 cm
Dripper spacing: 45 cm
Dripper discharge rate: 4 lph
Operating pressure: 1.2 kg/cm^2
Operating frequency: Alternate day

Operating time	
Month	**Minutes**
Dec.-Jan.	20
Feb.-March	30

(Department of Agronomy, CoA, JAU, Junagadh)

Drip irrigation and fertilizer in drilled *rabi* fennel

The farmers of South Saurashtra Agro-climatic Zone growing *rabi* drilled fennel are advised to irrigate the crop with drip system at 0.8 PEF and apply 120-45-0 NPK kg/ha out of which full dose of phosphorus and 25 % nitrogen as basal and remaining 75% nitrogen in three equal splits at 20 DAS interval after sowing through drip for getting higher yield and net return.

The system details as under:

Details
Lateral spacing: 120 cm (45-75-45 cm paired row)
Dripper spacing: 45 cm
Dripper discharge rate: 4 lph
Operating pressure: 1.2 kg/cm^2
Operating frequency: Alternate day

Operating time	
Month	**Minutes**
December	58
January	62
February	75
March	95
April	120

(Department of Agronomy, CoA, JAU, Junagadh)

Evaluation of drip fertigation on castor productivity

The farmers of South Saurashtra Agro-climatic Zone growing castor are advised to irrigate the crop at 0.8 PEF through drip irrigation and apply nitrogen @ 90 kg/ha (20 kg N/ha as a basal and remaining 70 kg N/ha through drip in form of urea in five equal splits at an interval of 12 days starting after cessation of monsoon) along with recommended dose of phosphorus (50 kg/ha) as basal for obtaining higher yield and net return.

The system details are as under:

Details
Lateral spacing : 120 cm
Dripper spacing : 60 cm
Dripper discharge rate : 4 lph
Operation pressure : 1.2 kg/cm^2
Operation frequency: Every 3rd day irrigation

Operating time	
Month	**Minutes**
October	110-125
November	100-110
Dec.-Jan.	95-105
-	-
-	-

(Main Oilseeds Research Station, JAU, Junagadh)

Response of summer groundnut to fertilizer dose and plant population under drip and check basin method

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are advised to apply initially two normal irrigations and remaining through drip at 0.8 PEF (20 DAS) and apply water soluble fertilizer (N-P-K:17-44-0) @ 75 % of RDF (18.75-37.5 kg NP/ha) in five equal splits through fertigation at an interval of 8 days starting from 20 DAS and maintain spacing 20 cm x 10 cm (plant population @ 5.00 lakh/ha) for higher yield and net return which gives 23 per cent water and 25 per cent fertilizer saving.

The system details are as under:

Details
Lateral spacing : 60 cm
Dripper spacing : 45 cm
Dripper discharge rate : 4 lph
Operation pressure : 1.2 kg/cm^2

Operating time	
Month	**Minutes**
February	75-80
March	100-110
April	120-125
May	130-135

Operation frequency : Alternate day	-	-

(Main Oilseeds Research Station, JAU, Junagadh)

D. Bio-fertilizers

Year: 2004-05

Sorghum

The farmers of North Saurashtra Agro-climatic Zone growing sorghum as fodder crop in *kharif* are advised to choose sorghum variety GFS-5 and fertilize with 80 kg N/ha (40 kg as basal and 40 kg at 30 DAS) and *Azotobacter* and *Azospirillum* bio-fertilizer treatment (5 packets/ha each of 250 g) for getting maximum fodder yield.

(Grassland Research Station, JAU, Dhari)

Anjan Grass

The farmers of North Saurashtra Agro-climatic Zone growing Anjan grass in *kharif* season are advised to apply 20 kg N/ha (10 kg as basal and 10 kg at 30 DAS) along with *Azotobacter* 5 packets/ha (each of 250 g) for getting economically optimum green and dry matter yield in marginal lands under rainfed condition.

(Grassland Research Station, JAU, Dhari)

Groundnut and Wheat

The farmers of North Saurashtra Agro-climatic Zone adopting groundnut-wheat crop sequence are advised to apply 50 per cent recommended dose of fertilizer (6.25:12.5 kg NP/ ha) + *Rhizobium* culture (250 g/10 kg seeds) + FYM 10 t/ha to groundnut and recommended dose of fertilizer (120:60:0 kg NPK/ha) to wheat for maximum yield and net return.

(Grassland Research Station, JAU, Dhari)

Year: 2005-06

Groundnut

The farmers of coastal area of South Saurashtra Agro-climatic Zone growing groundnut crop are advised to apply half recommended dose of NPK (12.5:25:0 kg/ha) in the form of urea and rock phosphate with seed inoculation of bacterium EBJ-3 (*Azotobacter* sp.) @ 25 ml/kg seed of groundnut to obtain higher net return.

(Dept. of Agril. Chemistry & Soil Science, JAU, Junagadh)

Pearl millet

The farmers of coastal area of South Saurashtra Agro-climatic Zone growing *bajra* crop are advised to apply half recommended dose of fertilizer in the form of urea and rock phosphate with seed inoculation of bacterium EBKH-1 (*Azotobacter* sp.) @ 25 ml/kg seed to obtain higher net return.

(Dept. of Agril. Chemistry & Soil Science, JAU, Junagadh)

E. Dry Farming

Year: 2005-06

Groundnut-alley cropping

The farmers of North Saurashtra Agro-climatic Zone are advised to grow groundnut GG 20 with *Glyricidia* at the alley width of 9.6 m along with an application of FYM @ 5 t/ha for getting higher yield of groundnut and net return in the alley cropping system under dry farming condition.

(Main Dry Farming Research Station, JAU, Targhadia)

Groundnut-organic manure

The farmers of North Saurashtra Agro-climatic Zone are advised to carry out ploughing up to 20 cm depth in alternate furrows in alternate year and apply FYM @ 5 t/ha and recommended dose of NPK (12.5:25:0 kg/ha) for getting higher yield of groundnut and net return under dry farming condition.

(Main Dry Farming Research Station, JAU, Targhadia)

Pasture legumes in combination of grasses

The farmers of North Saurashtra Agro-climatic Zone growing grasses are advised to grow Clitoria (*Clitoria ternatea)* with Marvel grass/*Zinzvo* (*Dichanthium annulatum)* in 1:2 row ratio for obtaining economically maximum green biomass and dry matter yields under rainfed condition.

(Grassland Research Station, JAU, Dhari)

F. Weed Management

Year: 2004-05

Sesame

The farmers of North Saurashtra Agro-climatic Zone growing sesame are advised to adopt two hand weeding at 15 and 30 days after sowing or one hand weeding at 15 days after sowing supplemented with one inter-culturing at 30 days after sowing. Under paucity of labourers, pre-emergence application of alachloar (1.5 kg/ha) or post emergence application of quizalofop ethyl (0.05 kg/ha at 15 DAS) supplemented with one inter-culturing at 30 days after sowing is recommended for efficient weed management, higher yield and better return.

(Agricultural Research Station, JAU, Amreli)

Coriander

For effective and economical weed management in coriander crop, farmers of South Saurashtra Agro-climatic Zone are advised to follow hand weeding at 15, 30 and 45 days after sowing. Under paucity of labourers, they can apply trifluralin @ 0.75 kg/ha in 500 liters of water as pre-emergence or fluchloralin 0.6 kg/ha in 500 liters of water as pre-emergence + 1 HW at 30 days.

(Department of Agronomy, JAU, Junagadh)

Year: 2005-06

Groundnut (*kharif*)

Among different organic materials tested for weed management in *kharif* groundnut, wheat straw incorporated in soil @ 5 t/ha before sowing was found comparable to pre emergence application of fluchloralin @ 0.9 kg/ha. Hence, farmers of South Saurashtra Agro-climatic Zonecan incorporate wheat straw in place of fluchloralin as a component of integrated weed management.

(Department of Agronomy, JAU, Junagadh)

Year: 2006-07

Groundnut

The farmers of South Saurashtra Agro-climatic Zone harvesting wheat through combined harvester are advised to incorporate wheat straw in soils using rotavator for better weed control and net return along with maintenance of soil fertility in *kharif* groundnut.

(Department of Agronomy, JAU, Junagadh and Dept. of Agril. Chemistry & Soil Science, JAU, Junagadh)

Garlic

The farmers of North Saurashtra Agro-climatic Zone (AES-X) growing garlic (GG-3) in *rabi* season are advised to apply oxyflurofen @ 0.12 kg/ha or pendimethalin @ 0.6 kg/ha as pre emergence + one hand weeding at 40 DAS. If laborers are available, the crop should be kept weed free through hand weeding for obtaining higher yield of garlic and additional net return.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2007-08

Integrated weed management in summer pearlmillet

The farmers of South Saurashtra Agro-climatic Zone growing summer pearl millet are advised to keep their fields weed free through hand weeding and interculturing at 20, 40 and 60 days after sowing. However, under shortage of labourers, they are advised to apply atrazine 0.5 kg/ha (Atracil 50 % WP 1.0 kg/ha) as pre-emergence by dissolving it in 500 liters of water followed by one hand weeding and interculturing at 40 days after sowing for effective weed management.

(Department of Agronomy, JAU, Junagadh)

Efficacy of post emergence herbicides in *kharif* groundnut

Under the circumstances of labourer shortage or not able to spray pre-emergence herbicide; the farmers of South Saurashtra Agro-climatic Zonegrowing *kharif* groundnut are advised to spray quizalofop-ethyl 40 g/ha (Targa Super 5 % EC, 800 ml/ha) by dissolving it in 500 liters of water as post-emergence at 25 days after sowing to control monocot weeds. It should be followed by a hand weeding and interculturing at 45 days after sowing for effective weed management.

(Department of Agronomy, JAU, Junagadh)

Year: 2009-10

Integrated weed management in brinjal

The farmers of South Saurashtra Agro-climatic Zone growing *rabi* brinjal are advised to keep their fields weed free by four hand weedings at 20, 40, 60 and 80 and three interculturing at 20, 40 and 60 days after transplanting.

OR

Under shortage of labourers, apply pendimethalin @ 0.9 kg/ha dissolved in 500 liters of water as pre-emergence + one hand weeding and interculturing at 45 days after transplanting followed by application of pendimethalin @ 0.9 kg/ha with irrigation water for getting higher yield and net realization as well as effective weed control.

(Department of Agronomy, JAU, Junagadh)

Evaluation of post emergence herbicides in groundnut

The farmers of South Saurashtra Agro-climatic Zone growing groundnut in *kharif* season are advised to keep crop weed free by three hand weeding and interculturings at 20, 40 and 60 DAS. Under paucity of farm labourers, they are advised to apply pendimethalin @ 1.0 kg/ha as pre emergence and quizalofop ethyle @ 0.050 kg/ha or imazethapyr @ 0.075 kg/ha as post emergence at 20 DAS after sowing for effective weed control and net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Year: 2011-12

Weed management in *kharif* pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during *kharif* season are advised to keep their field weed free through pre emergence application of atrazine @ 0.5 kg/ha (dissolve in 500 liters water) to obtain higher yield and net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Year: 2012-13

Integrated weed management in summer sesame

The farmers of South Saurashtra Agro-climatic Zone - VII growing summer sesame are advised to keep the crop weed free by hand weeding and interculturing. Under the shortage of labourers, apply quizalofop-ethyl 5% EC 40 g/ha (16 ml/10 lit.) as post-emergence at 20-25 DAS + 1 HW & IC at 45 DAS or pendimethalin 30% EC 0.45 kg/ha (30 ml/10 lit.) as pre-

emergence + 1 HW & IC at 30 DAS to get higher yield and net realization as well as effective weed management.

(Department of Agronomy, JAU, Junagadh)

Integrated weed management in castor under irrigated condition

The farmers of South Saurashtra Agro-climatic Zone - VII growing castor are advised to keep the crop weed free by hand weeding and interculturing. Under paucity of farm labourers, they are advised to apply pendimethalin 30% EC 1 kg/ha (67 ml/10 lit.) as pre-emergence + quizalofop-ethyl 5% EC 0.05 kg/ha (20 ml/10 lit.) as post emergence (25 days after sowing) for effective weed control as well as to get higher yield and net returns.

(Main Oilseeds Research Station, JAU, Junagadh)

Year: 2014-15

Weed management in cumin

The farmers of South Saurashtra Agro-climatic Zone growing cumin are recommended to apply oxadiargyl 75 g/ha (6 EC 25 ml/10 lit) as early post-emergence application at 7 DAS followed by hand weeding at 45 DAS for achieving higher yield and net realization as well as effective weed management.

(Department of Agronomy, JAU, Junagadh)

Evaluation of pre and post emergence herbicides for irrigated Bt. cotton

The farmers of South Saurashtra Agro-climatic Zone growing Bt. cotton are recommended to apply pendimethalin 900 g/ha (30 EC 60 ml/10 lit) as pre-emergence followed by hand weeding and interculturing at 30 and 60 days after sowing (DAS) or pendimethalin 900 g/ha (30 EC 60 ml/10 lit) as pre-emergence followed by quizalofop 40 g/ha (5 EC 16 ml/10 lit) at 45 DAS for achieving higher yield and net realization as well as effective weed management.

(Department of Agronomy, JAU, Junagadh)

Weed management in *kharif* urdbean

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* urdbean are recommended to apply quizalofop-ethyl 40 g/ha (5 EC 16 ml/10 lit water) at 20 days after sowing (DAS) and hand weeding at 40 DAS for obtaining higher yield and net realization as well as effective weed management.

(Pulses Research Station, JAU, Junagadh)

Year: 2015-16

Integrated weed management in summer sweet corn

The farmers of South Saurashtra Agro-climatic Zone growing sweet corn in summer season are recommended to apply atrazine 500 g/ha (50% WP 20 g/10 l) as pre-emergence followed by one interculturing and hand weeding at 40 DAS for effective weed management along with higher yield and net realization.

(Department of Agronomy, JAU, Junagadh)

Year: 2016-17

Integrated weed management in organically grown groundnut

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut under organic farming are advised to adopt stale seedbed technique (pre-sowing irrigation + killing of weed flush by harrowing) and kept weed free condition throughout the crop growth period

or carry out hand weeding and interculturing at 15, 30 and 45 days after sowing for effective control of weeds and securing higher net realization.

(Department of Agronomy, CoA, JAU, Junagadh)

Weed management practices in spring planted sugarcane–based intercropping system

The farmers of South Saurashtra Agro-climatic Zone interested to grow spring–planted sugarcane with intercropping system are advised to grow one row of sesame or green gram or black gram as intercrop without fertilizer application in sugarcane planted at 90 cm row spacing for securing higher yield and net return. Weed control should be done with two hand weeding at 20 and 40 days after sowing of intercrop.

(Main Sugarcane Research Station, JAU, Kodinar)

G. Cropping System Diversification

Year: 2006-07

Groundnut (*kharif*)-Onion (*rabi*)-Green gram (summer)

The farmers of South Saurashtra Agro-climatic Zone having assured irrigation facility are advised to adopt groundnut (*kharif*)-onion (*rabi*)-green gram (summer) sequence for obtaining higher production and net returns.

(Department of Agronomy, JAU, Junagadh)

H. Soil Management

Year: 2007-08

Reclamation of sodic soil under rainfed condition in cotton

The farmers of coastal area of South Saurashtra Agro-climatic Zone growing *kharif Dhummad* cotton are advised to apply gypsum @ 75 % of GR in addition to recommended dose of N (40 kg/ha) under sodic soil condition for getting higher yield and net return.

(Dept. of Agril. Chemistry & Soil Science, JAU, Junagadh)

Year: 2014-15

Effect of soil amendments on different genotypes of castor under salt affected soil

The farmers of South Saurashtra Agro-climatic Zone growing castor with saline irrigation water are recommended to select variety GC 3 and apply FYM @ 10 t/ha and gypsum 50% GR (3 t/ha) along with recommended dose of fertilizers.

(Dept. of Agril. Chem. & Soil Sci., CoA, JAU, Junagadh)

I. Cultural Practices

Year: 2004-05

Cotton

The farmers of North Saurashtra Agro-climatic Zone (AES-15) growing cotton under rainfed condition are advised to sow cotton var. G. Cot. Hy.8 at row spacing of 120 cm for getting higher seed cotton yield and net return.

(DFRS, JAU, Nanakandhasar & Dry Farming Research Station, JAU, Targhadia)

Sesame and Groundnut

The farmers of North Saurashtra Agro-climatic Zone growing sesame and groundnut crops in *kharif* season are advised to open the furrow after each three rows for sesame. The ridges and furrow method should be followed for groundnut crop at 20-30 days after sowing for obtaining maximum yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Groundnut

The farmers of North Saurashtra Agro-climatic Zone growing groundnut in *kharif* are advised to adopt deep ploughing every third year besides tractor harrowing every year to prepare the field for obtaining maximum yield and net return.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Onion

The farmers of coastal area of South Saurashtra Agro-climatic Zone growing *rabi* onion in saline soil with poor quality well water are advised to apply mulch (pearl millet husk) @ 5 t/ha during 15 to 20 days after planting in flat bad for getting higher net return.

(Department. of Agril. Chem. & Soil Science, JAU, Junagadh)

Year: 2007-08

Amelioration of drought stress in pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet (GHB-558) during *kharif* are advised to sow the crop in paired row at 30 cm x 60 cm to get higher yield and net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)

J. Package of Practices

Year: 2007-08

Optimization of castor production under resource constraints

The farmers of South Saurashtra Agro-climatic Zone growing irrigated castor are advised to apply 75:40:00 NPK kg/ha along with two inter culturing, two hand weedings and two sprays of insecticide to control sucking pest and semi looper for getting higher yield and net return.

Among the various package of practices, fertilizer application is the most critical practice followed by weeding and plant protection which could reduce seed yield by 45.30, 32.43 and 23 per cent, respectively.

(Main Oilseeds Research Station, JAU, Junagadh)

Effect of irrigation and sowing methods on yield and economics of groundnut-pigeonpea intercropping

The farmers of South Saurashtra Agro-climatic Zone interested in adopting semi-spreading groundnut + pigeon pea intercropping system are advised to open the furrow at 40 cm distance and sow two rows of groundnut (GG-20) and one row of pigeon pea (Vaishali). They are also advised to apply 4 irrigations at an interval of 10 days (1.0 IW/CPE) to pigeon pea after harvest of groundnut for realizing higher net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Optimization of plant density of groundnut crop under rainfed condition

The farmers of South Saurashtra Agro-climatic Zone growing rainfed groundnut (cv. GG-20) are advised to sow the crop at 60 cm x 7.5 cm with bullock drawn automatic seed drill using 120 kg seed/ha treated with mancozeb @ 3.0 g/kg seed and soil application of FYM based *Trichoderma viridii* (2.5 kg/ha) at the time of sowing for getting higher pod yield and net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Year: 2008-09

Effect of tillage on rainfed groundnut

The farmers of South Saurashtra Agro-climatic Zone are recommended to cultivate their field by cultivator followed by harrowing and sow rainfed groundnut (GG 20) on broad bed and furrow method (90 cm width followed by 30 cm wide and 15 cm deep furrow) for getting higher yield and net return.

(Department of Agronomy, JAU, Junagadh)

Use of *Rhizobium* and varying levels of nitrogen and phosphorus in groundnut-pigeonpea relay cropping system

The farmers of South Saurashtra Agro-climatic Zone growing pigeonpea as a relay crop in groundnut are advised to treat pigeonpea seed with *Rhizobium* culture prior to sowing (@ 25 g kg^{-1})seed and apply 75 per cent RDF (20:37.5 NP kg ha^{-1}). The N should be applied in two equal splits i.e. first at time of sowing and the second at the time of earthing up i.e. before first irrigation for getting higher yield and net return.

(Research Scientist (Chickpea), JAU, Junagadh)

Effect of planting and methods of fertilizer application on yield of onion seed

The farmers of South Saurashtra Agro-climatic Zone growing *rabi* onion (Gujarat White Onion 1) for seed production are recommended to plant bulbs on ridges by keeping spacing of 30 cm x 30 cm for getting higher seed yield and net profit.

(Vegetable Research Station, JAU, Junagadh)

Relative salinity tolerance of castor genotypes

The farmers of South Saurashtra agro climatic zone having irrigation water salinity up to 2 dSm^{-1} are advised to prefer castor variety GC 3.

(Department. of Agril. Chem. & Soil Science, JAU, Junagadh)

Year: 2009-10

Evolution of tillage practices in castor

The farmers of South Saurashtra Agro-climatic Zone are advised to prepare the land by ploughing followed by cultivator and blade harrowing and sow the *kharif* castor at 90 x 60 cm spacing for getting higher yield and net realization.

(Department of Agronomy, JAU, Junagadh)

Evolution of bunch groundnut cultivars for late sown conditions

The farmers of South Saurashtra Agro-climatic Zone growing bunch groundnut are advised to select variety from the following varieties on priority basis under delayed onset of monsoon situation for realizing higher yield and net return.

Order of preference:

Groundnut variety: GG-5, GG-2, J-11, GG-7, TG-37A.

(Main Oilseeds Research Station, JAU, Junagadh)

Agronomic evaluation of Bt Cotton hybrid (RCH 2)

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton (RCH 2) under irrigated condition are advised to follow spacing of 120 x 45 cm and apply 160 kg N/ha to get higher yield and net income.

(Cotton Research Station, JAU, Junagadh)

Year: 2010-11

Effect of date of sowing and weather parameters on growth and yield of wheat under South Saurashtra Agro-climatic Zone

On the basis of the results obtained using heat unit concept, it is recommended to the farmers of AES-VI of South Saurashtra Agro-climatic Zone interested for early sowing of wheat i.e., during first fortnight of November (Minimum temperature 12 to 13^{o} C and Maximum temperature 30 to 31^{o} C) should prefer variety GW-366 for getting higher yield and net profit.

(Agril. Met. & Wheat Research Scientist, JAU, Junagadh)

Identification of innovative Bt. cotton based cropping systems (Irrigated)

The farmers of AES-VI of South Saurashtra Agro-climatic Zone, who are growing irrigated Bt. cotton, are recommended to sow fodder sorghum or maize in *rabi* and sesame or groundnut (bunch) in summer after Bt. cotton to get higher net return.

(Cotton Research Station, JAU, Junagadh)

Performance of sesame varieties to pair row sowing under rainfed condition

The farmers of AES-VIII of North Saurashtra Agro-climatic Zone are advised to grow *kharif* sesame var. G Til-10 or G. Til-3 and adopt paired row sowing at 30:60 cm for getting higher yield and net return

(Agricultural Research Station, JAU, Amreli)

Year: 2011-12

Evaluation of different seed pellets on production of pasture grasses

The farmers of North Saurastra Agro-climatic Zone growing *anjan* grass *(kharif)* are advised to prepare small balls containing seeds (40,000 balls/ha) using 200 kg soil + 200 kg FYM + 4 kg seeds mixture to get higher germination and fodder yield.

(Grassland Research Station, JAU, Dhari)

Year: 2012-13

Effect of sowing time and spacing on summer sesame

The farmers of South Saurashtra Agro-climatic Zone - VII growing summer sesame are advised to sow the crop in second week of February by keeping 30 cm row spacing for obtaining higher yield and net realization.

(Department of Agronomy, JAU, Junagadh)

Evaluation of tillage practices in pigeonpea

The farmers of South Saurashtra Agro-climatic Zone - VII growing pigeonpea are advised to till the field by cross cultivation followed by blade harrowing and subsoiling between two rows to get higher yield and net realization**.**

(Department of Agronomy, JAU, Junagadh)

Response of summer sesame to date of sowing and row spacing

The farmers of North Saurashtra Agro-climatic Zone - VI growing sesame in summer season are advised to sow the crop in third week of February at a spacing of 30 cm x 10 cm to get higher yield and net return.

(Agril. Research Station, JAU, Amreli)

Response of sugarcane varieties to wider row spacing

The farmers of South Saurashtra Agro-climatic Zone - VII interested to grow sugarcane at wider row spacing are advised to plant sugarcane variety CoN 05071 at 90 cm distance or in paired rows (30:150 cm) to get higher cane yield and net returns.

(Main Sugarcane Research Station, JAU, Kodinar)

Study of intercropping system with bunch groundnut under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone - VI (AES-XV) growing bunch groundnut under rainfed condition may also take either greengram or sesame as intercrop by keeping row ratio of 1:1 or 3: 1 to get higher yield and net return. The mothbean cultivation either as sole crop or intercrop with groundnut was not found remunerative.

(Dry Farming Research Station, JAU, Targhadia)

Year: 2013-14

Impact of tillage practices and sowing pattern on Bt cotton

The farmers of South Saurashtra Agro-Climatic Zone growing Bt cotton are advised to prepare the field by ploughing followed by blade harrowing & planking and sow the crop on ridges (120 cm apart) for achieving higher seed cotton yield and net realization.

(Department of Agronomy, JAU, Junagadh)

Relay cropping of castor in soybean

The farmers of South Saurashtra Agro-climatic Zone growing soybean are advised to adopt relay intercropping system with castor by sowing castor 30 days after sowing of soybean with row ratio of 1 : 2 (castor : soybean) for securing higher yield and net return.

(Main Oilseeds Research Station, JAU, Junagadh)

Optimization of kharif groundnut production under resource constraints

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut are advised to follow recommended practices of weed control, plant protection and fertilizer management for obtaining higher yield and net return. However, under the situation of resource constraints, farmers are advised to prioritize their resources in order of weed control > plant protection > fertilizer management.

(Main Oilseeds Research Station, JAU, Junagadh)

Effect of time of sowing and hybrids on productivity of summer pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during summer are recommended to sow the crop during second fortnight of February (30 ºC average maximum temperature) to obtain higher yield and net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Time of planting and harvesting for early and midlate varieties of sugarcane

The farmers of South Saurashtra Agro-Climatic Zone growing sugarcane (CoC 671 and CoN 91132) are advised to plant the crop during last week of October to last week of November. The early maturing variety CoC 671 should be harvested between 11 to 12 months of planting and midlate maturing variety CoN 91132 should be harvested between 12 to 14 months of planting for securing higher cane yield and net return.

(Main Sugarcane Research Station, JAU, Kodinar)

Evaluation of chickpea varieties under different dates of sowing under irrigated condition

The farmers of South Saurashtra Agro-climatic Zone growing irrigated chickpea are advised to sow the crop during first fortnight of November (mean minimum temperature 19.9 °C and mean maximum temperature 34.7 °C) for securing higher yield and net return.

(Pulses Research Station, JAU, Junagadh)

Response of fennel to plant geometry under North Saurashtra Agro- climatic Zone

The farmers of North Saurashtra Agro-climatic Zone (AES-XV) growing *rabi* fennel are advised to sow the crop at 60 cm x 20-30 cm spacing for securing higher yield and net return.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2014-15

Evaluation of preparatory and secondary tillage practices in rainfed groundnut

The farmers of South Saurashtra Agro-climatic Zone growing rainfed groundnut are recommended to adopt in-row subsoiling (20 cm depth) before sowing, interculturing at 15, 30, 45 and 60 days after sowing (DAS) and apply pendimethalin@ 900 g/ha (30 EC 60 ml/10 lit) as pre-emergence with hand weeding at 30 and 45 DAS for achieving higher yield and net realization as well as effective moisture conservation and weed management.

(Department of Agronomy, JAU, Junagadh)

Studies of possibilities of organic farming in pearl millet–gram crop sequence

The farmers of North Saurashtra Agro-climatic Zone adopting pearl millet-gram crop sequence and interested in organic farming are recommended to apply FYM 7.5 t/ha every year to pearl millet only for securing higher net realization and to maintain soil fertility.

(Main Pearl millet Research Station, JAU, Jamnagar)

Optimization of nutrients for pearl millet production in *kharif* season

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during *kharif* season are recommended to apply 100 kg N and 30 kg P_2O_5/ha for obtaining higher yield and net return.

(Main Pearl millet Research Station, JAU, Jamnagar)

Nutrient management through organic and inorganic sources for major and trace elements in rainfed pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during *kharif* season are recommended to apply $ZnSO_4$ and $FeSO_4$ @ 20 kg/ha each, along with recommended dose of fertilizers (80-40-0 kg N-P_2O_5-K_2O/ha) and FYM 5 t/ha for obtaining higher yield and net return as well as for improving grain quality.

(Main Pearl millet Research Station, JAU, Jamnagar)

Year: 2015-16

Development of organic farming packages for system based high value crops (Groundnut-Onion)

The farmers of South Saurashtra Agro-climatic Zone adopting Groundnut (*kharif*)-Onion (*rabi*) cropping sequence are recommended to apply 50% RDF (6.25-25 N-P_2O_5 kg/ha) for groundnut and 37.5-60-50 N-P_2O_5-K_2O kg/ha for onion + 50% RDN as FYM to groundnut (1250 kg/ha) and onion (7500 kg/ha) for securing higher groundnut equivalent yield and net realization along with maintenance of soil fertility.

Farmers interested in adopting Groundnut (*kharif*) - Onion (*rabi*) cropping sequence under organic farming are recommended to follow nutrient management system as 50% RDN as FYM (1250 and 7500 kg FYM/ha for groundnut (*kharif*) and onion (*rabi*), respectively) + biofertilizer (*Rhizobium* / *Azotobacter* @ 1250 ml/ha) for N + rock phosphate to meet P requirement of crops (100 kg/ha in groundnut and 600 kg/ha in onion) + PSB (1250 ml/ha) for higher groundnut equivalent yield and net income along with maintenance of soil fertility.

(Department of Agronomy, JAU, Junagadh)

Effect of sowing time and spacing on summer clusterbean

The farmers of South Saurashtra Agro-climatic Zone growing summer cluster bean are recommended to sow the crop in second week of February at 45 cm x 15 cm spacing for obtaining higher yield and net realization.

(Department of Agronomy, JAU, Junagadh)

Evaluation of potentiality of organic farming for groundnut (*kharif*)-chickpea (*rabi*) cropping sequence

The farmers of South Saurashtra Agro-climatic Zone adopting groundnut (*kharif*)-chickpea (*rabi*) cropping sequence under organic farming are recommended to apply FYM (1.25 t/ha) + castor cake (139 kg/ha) to groundnut and vermicompost (667 kg/ha) + castor cake (222 kg/ha) to chickpea in furrow before sowing for securing higher net realization and maintaining soil fertility.

(Dept. of Agronomy & Dept. of Agril. Chemistry & Soil Science, JAU, Junagadh)

Identification of suitable row ratio for sesame with pigeonpea and soybean intercropping system

The farmers of North Saurashtra Agro-climatic Zone growing sesame with intercropping system in *kharif* are recommended to sow pigeon pea as an intercrop with sesame in the row ratio of 2:1 with 60 cm distance between two rows to get higher yield and net return.

(Agricultural Research Station, JAU, Amreli)

Year: 2016-17

Optimizing spacing for medium duration pigeon pea varieties under pigeon pea + Uradbean inter cropping system

The farmers of South Saurashtra Agro-climatic Zone adopting pigeon pea + uradbean (without fertilizer) inter cropping system are advised to sow pigeon pea at 120 cm x 30 cm spacing and two rows of uradbean in between two rows of pigeon pea for getting higher yield and net return.

(Pulses Research Station, JAU, Junagadh)

Suitability of pearl millet hybrids under varying time of sowing during semi *rabi* season

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during semi *rabi* season are recommended to sow the pearl millet early maturing variety GHB 538 during first week of October to obtain higher yield and net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)

K. Low Cost Techniques

Year: 2007-08

Effect of dry seeding on the performance of castor under rainfed condition

The farmers of South Saurashtra Agro-climatic Zone growing rainfed castor are advised to soak the seed in one per cent sodium chloride solution for three hours and sow at onset of monsoon to get higher seed yield and net return.

(Main Oilseeds Research Station, JAU, Junagadh)

***In-situ* moisture conservation technique and seed priming for improving sesame productivity**

The farmers of North Saurashtra Agro-climatic Zone growing sesame are advised to adopt seed soaking technique (8 hours soaking of seed in water (1:1) and drying in shade for 12 hours) before sowing followed by one hand weeding at 15 DAS and mulching with dust (soil mulch) for getting higher seed yield and net return.

(Agricultural Research Station, JAU, Amreli)

L. Contingency Crop Planning

Year: 2009-10

Contingency crop planning for varying onset of monsoon situations

The farmers of North Saurashtra Agro-climatic Zone are advised to select crop from the following crops for securing higher income under delayed onset of monsoon situations.

Order of preference

Short duration crops: Bunch groundnut, Sesame, Pearl millet, Black gram.

Long duration crops: Castor, Spreading groundnut, Pigeonpea, Cotton.

(Main Dry Farming Research Station, JAU, Targhadia)

M. Castor Hybrid Seed Production for Farmers/Seed Producers

Year: 2009-10

Suppression of interspersed staminate flowers (ISF) in non-environmental sensitive (NES) pistillate line for quality hybrid seed production of castor hybrid GCH-6

Castor hybrid seed producers are recommended to apply two spray of ethrel @ 0.05 per cent on pistillate parent (JP-65) at 45 and 65 days after sowing. This significantly reduce the number of interspersed staminate flowers (ISF) in racemes of female parent that culminates in reduction of selfing in hybrid seed plot. It has less labour requirements and also more genetic purity of resultant hybrid seed.

(Main Pearl Millet Research Station, JAU, Jamnagar)

N. Soil health

Year: 2010-11

Evaluation of crop sequence and nutrient management in respect to sustain agriculture and soil health under rainfed condition

The farmers of AES-X of North Saurashtra Agro-climatic Zone are recommended to adopt cotton-cotton rotation with integrated nutrient management practices (25% RDF + compost @ 5 t/ha + castor cake @ 500 kg/ha + *Azotobacter* and PSM @ 5 g/kg of seed) or cotton-groundnut rotation with RDF for each crop (12.5:25 N:P for groundnut and 40 kg N for cotton/ha) for getting higher yield and net realization along with maintaining soil fertility under rainfed condition.

(Main Dry Farming Research Station, JAU, Targhadia)

II. PLANT PROTECTION

A. Agricultural Entomology

Year: 2004-05

Chickpea

For the eco-friendly management of *Halicoverpa armigera* in chickpea in South Saurashtra Agro-climatic Zone, two spraying of kadvi mehadi leaf extract (ICBR 1:5.12) or mamejva leaf extract (ICBR 1:4.67) or Jatropha leaf extract (ICBR 1:4.41) or five per cent neem leaf extract (ICBR 1:4.12) or cartap hydrochloride 0.1 per cent (ICBR 1:1.93) at 15 days interval from the date of pest infestation is recommended.

(Department of Entomology, JAU, Junagadh)

Coriander

Integrated pest management module for coriander aphid comprising of sowing of coriander in 1st week of October and releasing coccinellid predators @ 400 adults/ha (ICBR 1:8.10) or IPM module comprising of sowing of coriander in 1st week of October and spray of endosulfan 0.07 per cent at ETL of 1.0 aphid index / plant (ICBR 1:5.00) is recommended for South Saurashtra Agro-climatic Zone.

(Department of Entomology, JAU, Junagadh)

Summer Okra

For the control of sucking pests (jassid and aphid) in summer okra, seed treatment of thiamethoxam @ 2.8 g/kg seeds (ICBR 1:12.28) or imidacloprid @ 5 g/kg seed (ICBR 1:11.51) is recommended for South Saurashtra Agro-climatic Zone.

(Department of Entomology, JAU, Junagadh)

Fenugreek

For the control of pest complex (jassid, thrips and leaf-miner) of fenugreek in South Saurashtra Agro-climatic Zone, two sprays of dimethoate 0.03 per cent (ICBR 1:7.97) or

methyl-o-demeton 0.03 per cent (ICBR 1:5.68) at 15 days interval starting from pest infestation are recommended.

(Department of Entomology, JAU, Junagadh)

Pomegranate

For the control of fruit borer (*Virachola isocrates*) of pomegranate in South Saurashtra Agro-climatic Zone, two sprays of endosulfan 0.07 per cent or dichlorvos 0.05 per cent or monocrotophos 0.04 per cent or malathion 0.05 per cent at 15 days interval starting from pest infestation are recommended.

(Department of Entomology, JAU, Junagadh)

Groundnut

The farmers of North Saurashtra Agro-climatic Zoneare advised to apply karanj cake (ICBR 1:6.86) or castor cake (ICBR 1:5.62) @ 250 kg/ha in furrow at the time of sowing for the management of pod borer (*Penthicoides seriatoporus* Fairmaire) in groundnut under dry farming condition.

(Main Dry Farming Research Station, JAU, Targhadia)

Pigeonpea

The farmers of North Saurashtra Agro-climatic Zone are advised to adopt the bio-intensive module consisting of the first spray of HaNPV @ 250 LE/ha at ETL of 10 larvae/20 plants followed by second spray of neem seed kernel extract 5 per cent after 15 days of first spray (ICBR 1:1.95).

(Main Dry Farming Research Station, JAU, Targhadia)

Pigeonpea

The farmers of North Saurashtra Agro-climatic Zone are recommended to adopt the insecticidal module consisting of the first spray of endosulfan 35 EC 0.07 per cent applied at ETL of 10 larvae/20 plants followed by second spray of monocrotophos 36 EC, 0.036 per cent after 15 days of first spray (ICBR 1:7.97) for the management of pod borer (*Helicoverpa armigera*) and pod fly (*Melanagromyza obtusa*) in pigeonpea cultivated in dry farming areas.

(Main Dry Farming Research Station, JAU, Targhadia)

Cotton

For the control of pink bollworm in cotton, farmers of Saurashtra region are advised to spray quinalphos 25 EC @ 500 g a.i./ha (ICBR 1:3.18) or spinosad 45 SC @ 50 g a.i./ha (ICBR 1:3.10) as and when pest crosses the ETL (10 male moths/pheromone trap/day).

(Cotton Research Station, JAU, Junagadh)

IPM – Cotton

For the management of insect pests of cotton, the following IPM strategies are recommended for farmers of South Saurashtra Agro-climatic Zone (ICBR 1:5.70).

1. Seed treatment with imidacloprid @ 10 g/kg seeds.
2. Collection of infested shoots of spotted bollworm in the early stage.
3. Installation of pheromone trap @ 5/ha one week after germination.
4. Early three releases of *Chrysoperla* @ 10,000 eggs/1st instar larvae/ha.
5. Spraying of neem formulation (Azadirachtin 0.0035 %) or NSKE 5 per cent.
6. Four times releases of *Trichogramma* @ 1.5 lakh/ha with the intiation of egg laying of the pest.
7. Spraying of HaN PV @ 450 LE/ha for *Helicoverpa armigera*.
8. Hand collection of eggs and larvae of *Helicoverpa armigera*.
9. Planting of maize as intercrop (10:1), marigold and castor as trap crops in and around the cotton field.

10. Need based application of insecticides for sucking pests and bollworms based on ETL.

(Cotton Research Station, JAU, Junagadh)

Mustard

The farmers of South Saurashtra Agro-climatic Zone growing mustard crop are advised to apply first spray of insecticide cypermethrin + profenofos 44 EC 0.04 per cent (ICBR 1:9.65) or acephate 75 WP 0.05 per cent (ICBR 1:8.92) or imidacloprid 17.8 SL 0.005 per cent (ICBR 1:7.68) or methyl-o-demeton 25 EC 0.03 per cent (ICBR 1:5.92) or carbosulfan 25 EC 0.03 per cent (ICBR 1:5.17) at appearance of aphids and second spray after 15 days of first spray.

(Main Oilseeds Research Station, JAU, Junagadh)

Year: 2005-06

Sesame

The farmers of North Saurashtra Agro-climatic Zone cultivating sesame crop under rainfed condition are advised to initiate the control measures against leaf roller through adoption of alternate spray of endosulfan 0.07 per cent and monocrotophos 0.04 per cent when the population reach at the ETL of 5 larvae/20 plants (ICBR,1:4.81).

(Main Dry Farming Research Station, JAU, Targhadia)

Chickpea

The farmers of South Saurashtra Agro-climatic Zone are advised to apply low volume spray of endosulfan 0.21 per cent (Endosulfan 1.2 liter in 200 l water/ha) through power sprayer (ICBR,1:7.66) twice, starting from 50 per cent flowering and second at 15 days after first spray for effective and economic control of pod borer in chickpea.

(Pulses Research Station, JAU, Junagadh)

Coriander seeds

The farmers of South Saurashtra Agro-climatic Zone are advised to store the well dried coriander seeds in plastic coated jute bag (ICBR 1:11.57)or high density polyethylene (HDPE) bag 35 micron (ICBR 1:7.23) to protect from the infestation of cigarette beetle (*Lasioderma serricorne* Fab.) up to 10 months of storage after harvesting.

(Department of APE, CAET, JAU, Junagadh)

Year: 2006-07

Coriander

For effective and economical management of aphid in coriander, farmers of South Saurashtra region are advised to apply seed treatment with thiamethoxam 70 WS @ 4.2 g/kg seed (CBR 1:4.94). (Department of Entomology, JAU, Junagadh)

Fenugreek

For effective and economical management of jassid in fenugreek, farmers of South Saurashtra region are advised to treat the seed with thiamethoxam 70 WS@ 2.8 gm/kg seed (CBR 1:2.12).

(Department of Entomology, JAU, Junagadh)

Sesame

The farmers of North Saurashtra Agro-climatic Zone growing sesame are advised to take plant protection measures from 28 days after sowing (DAS) for the control if leaf roller and 42 DAS for gall fly. Moreover, the farmers are further advised to take care that the leaf roller infestation is found more when there is more rainfall/rainy days and gall fly infection is more when there is low rain/dry period.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Chickpea

For effective and economic management of *Heliothis armigera* in chickpea, farmers of South Saurashtra Agro-climatic Zone are advised to spray fenvalerate 0.02 % at 50 per cent

flowering followed by second spray of endosulfan 0.07 % at 50 per cent pod formation (CBR 1:9.85). (Pulse Research Station, JAU, Junagadh)

Chickpea

For effective and economic management of gram pod borer in chickpea, farmers of South Saurashtra Agro-climatic Zone are advised to apply three sprays of profenophos @ 750 g a.i./ha.(1.5 litre/ha) (CBR 1:2.47) or go for alternate spray of NSKE 5 %, Bt 1 kg/ha and profenophos 750 g a.i./ha (1.5 litre/h) (CBR 1:1.98) at 10 days interval stating from 50 per cent flowering. (Pulse Research Station, JAU, Junagadh)

Year: 2007-08

Dillseed

For effective and economical management of aphid in dillseed, seed treatment with thiamethoxam 70 % WS @ 4.2 g/kg seed (CBR 1:5.29) or imidacloprid 70 % WS @ 10 g/kg seed (CBR 1:1.69) is recommended under South Saurashtra region.

(Department of Entomology, JAU, Junagadh)

Cumin

For effective and economical management of thrips in cumin, seed treatment with thiamethoxam 70 % WS @ 4.2 g/kg seed (CBR 1:9.22) or imidacloprid 70 % WS @ 10 g/kg seed (CBR 1: 2.58) is recommended under South Saurashtra region.

(Department of Entomology, JAU, Junagadh)

Tomato

Seed treatment with thiamethoxam 70 % WS @ 4.2 g/kg seed or imidacloprid 70 % WS @ 7.5 g/kg seed is recommended under South Saurashtra region for effective management of whitefly and leaf miner attacking tomato nursery and there by to obtain higher numbers of transplantable seedlings.

(Department of Entomology, JAU, Junagadh)

Groundnut (*kharif*)

For effective and economical management of white grubs in *kharif* groundnut, seed treatment with chlorpyriphos 20EC @ 25 ml/kg seed (CBR1:11.00) or furrow application of phorate 10G @ 25 kg/ha (CBR 1:7.69) at the time of sowing or drenching of chlorpyriphos 20EC (0.1 %) (50 ml/10 lit water) in plant row after 15 days of germination (CBR 1:4.67) is recommended under South Saurashtra region.

Note: General treatments of spraying of carbaryl 0.2 % on host trees *viz*., babul, neem and ber trees surrounding the field within three to four days of pre-monsoon rain, spraying of crop with monocrotophos 0.05 % and installation of light trap are to be followed.

(Department of Entomology, JAU, Junagadh)

Custard apple

For effective management of mealy bugs in custard apple, the module comprising dusting methyl parathion 2 % dust @ 25 kg/ha on the ground; spraying with methyl parathion 50EC (10 ml/10 lit water) on the stem and spraying of quinalphos 25EC (20 ml/10 lit water) at pest appearance on shoots followed triazophos 40EC (10 ml/10 lit water) after 15 days of first spray is recommended under South Saurashtra region.

(Department of Entomology, JAU, Junagadh)

Castor

For effective and economical management of wireworm in castor, seed treatment of carbaryl 50WP @ 5 g/kg seed (CBR 1:507) or carbosulfan 25 DS @ 5 g/kg seed (CBR 1:118) or imidacloprid 70WS @ 5 g/kg seed (CBR 1:37) is recommended under South Saurashtra region.

(Main Oilseeds Research Station, JAU, Junagadh)

Castor

For effective and economical management of thrips in castor, spraying of acephate, 0.05 %, (CBR 1:17.86) or dimethoate, 0.03 %, (CBR 1:14.01) or profenophos 40 % + cypermethrin 4 %, 0.044 %, (CBR 1:12.24) at appearance of pest is recommended.

(Main Oilseeds Research Station, JAU, Junagadh)

Castor

The farmers of North Saurashtra Agro-climatic Zone cultivating castor under rainfed condition are advised to apply granulosis virus @ 300 LE/ha at ETL (4 larvae/plant) for control of semi looper. The spray should be done in late evening hours and wetting agent (Sandovit) @ 10 ml and UV protectant (Ranipal) 1 g should be mixed in 10 lit of spray solution.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2008-09

Management of thrips in onion (bulb purpose) through newer insecticides

The farmers of South Saurashtra Agro-climatic Zone growing onion for bulb purpose in *rabi* season are advised to apply two sprays of profenophos 40 % + cypermethrin 4 % EC 0.044 per cent (10 ml/10 lit.) or endosulfan 0.07 per cent (20 ml/10 lit.) or profenophos 0.05 per cent (10 ml/10 lit.) or carbosulfan 0.05 per cent (20 ml/10 lit.) at 10 days interval starting from initiation of thrips infestation for its effective and economical management.

(Department of Entomology, JAU, Junagadh)

Integrated pest management in okra

Considering the effectiveness and economics of different IPM modules for okra under South Saurashtra region, IPM module comprising seed treatment with thiamethoxam 70% WS @ 2.8 g/kg seed, clipping of the infested shoots, installation of 20 pheromone traps with Erias pheromone lures and spraying of endosulfan 35 EC 0.07 per cent (20 ml/10 lit.) on need base is recommended to manage the major insect pests of okra.

(Department of Entomology, JAU, Junagadh)

Chemical control of stem borer Chilo partellus (S) of pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing bajra crop are advised to spray fenvalerate 10 EC 0.01 per cent (10 ml/10 lit.) or endosulfan 35 EC 0.07 per cent (20 ml/10 lit.) or cypermethrin 10 EC 0.01 per cent (10 ml/10 lit.) or indoxacarb 14.5 SC 0.0075 per cent (5 ml /10 lit.) at 20 and 40 days after germination for the effective management of stem borer (*Chilo partellus*).

(Main Pearl Millet Research Station, JAU, Jamnagar)

Year: 2009-10

Field efficacy of bio-pesticides against thrips in onion (bulb purpose)

The farmers of South Saurashtra Agro-climatic Zone are advised to apply two sprays of *Beauveria bassiana* @ 2.0 kg/ha **or** *Metarhizium anisopliae* @1.5 kg/ha at 10 days intervals starting from pest infestation for effective and economical bio-pesticide based management of thrips in *rabi* onion (bulb purpose).

(Department of Entomology, JAU, Junagadh)

Management of pest complex in brinjal through bio-pesticides

The farmers of South Saurashtra Agro-climatic Zone are advised to apply two sprays of *Metarhizium anisopliae* @1.0 kg/ha combined with endosulfan 35 EC 0.035 % (10 ml/ 10 l) **or** *Beauveria bassiana* @1.0 kg/ha combined with endosulfan 35 EC 0.035 % (10 ml/ 10 l) **or** *Metarhizium anisopliae* @ 2.0 kg/ha at 10 days intervals starting from pest infestation for effective and economical bio-pesticide based management of brinjal sucking pests i.e. jassid and whitefly in *rabi* season.

(Department of Entomology, JAU, Junagadh)

Management of shoot fly and stem borer in *bajra* crop

The farmers of North Saurashtra Agro-climatic Zone growing *bajra* crop are advised to apply two sprays of endosulfan 35 EC 0.07% (20 ml/10 l) **or** profenophos 50 EC 0.05% (10 ml/10 l) **or** fenobucarb 50 EC 0.1% (20 ml/10 l) at 20 and 40 days after germination for the control of shoot fly and stem borer.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Development of low cost protection technology for sorghum shoot fly, *Atherigona soccata*

The farmers of North Saurashtra Agro-climatic Zone growing sorghum for fodder purpose in *kharif* season are advised to give seed treatment with imidacloprid 70 WS @ 5 g/kg seeds and two sprays of Neem Seed Kernel Extract 5% at 7 and 14 days after germination for the management of shoot fly.

(Grass land Research Station, JAU, Dhari)

Management of sesame leaf webber/capsule borer through insecticides

The farmers of North Saurashtra Agro-climatic Zone growing sesame in *kharif* season are advised to apply three sprays of endosulfan 35 EC 0.07% (20 ml/10 l) at vegetative i.e. 30 days, flowering i.e. 45 days and capsule i.e. 60 days of crop for effective and economical management of leaf webber.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Testing of newer molecules if pesticides against sucking insect pests if groundnut

The farmers of North Saurashtra Agro-climatic Zone cultivating groundnut under rainfed condition are advised to apply imidacloprid 17.8 SL 0.007 % (4 ml/10 l) **or** thiamethoxam 25 WG 0.01 % (4 g/10 l) **or** acetamiprid 20 SP 0.004 % (2 g/10 l) at ETL of aphid (1.5 aphid index/plant) and jassid (3 nymphs/3 top leaves) for effective and economical control of these pests.

(Main Dry Farming Research Station, JAU, Targhadia)

Integrated management of insect pests and diseases of groundnut under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone cultivating groundnut under rainfed condition are advised to spray the tank mixture of insecticides and fungicides in schedule i.e. schedule 1: dimethoate 30 EC @ 10ml + mancozeb 75 WP @ 26 g/10 l at 35 days after sowing (DAS), methyl-o-demeton 25 EC @10ml + carbendazim 50 WP @ 5 g/10 l at 50 DAS, and endosulfan 35 EC @ 20 ml + mancozeb 75 WP @ 26 g/10 l at 65 DAS or schedule 2: thiamethoxam 25 WG @ 4 g + hexaconazole 5 EC @10ml/10 l at 35 DAS, acetamiprid 20 SP@ 2 g + chlorothalonil 75 WP @ 25 g/10 l at 50 DAS and imidacloprid 17.8 SL@ 4ml + carbendazim 50 WP @ 5 g + mancozeb 75 WP@ 26 g/10 l at 65 DAS for effective and integrated management of the sucking insect pests i.e. aphid, jassid and thrips and diseases i.e. tikka and rust.

(Main Dry Farming Research Station, JAU, Targhadia)

Testing of new insecticides against sucking pests in groundnut

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut are advised to give seed treatment with imidacloprid 600 FS @ 3 g/kg seed **or** thiamethoxam 70 WS @ 1 g/kg seed **or** dimethoate 30 EC 0.06% (20 ml/10 l) as foliar spray at 15 and 30 days after sowing for effective and economical management of thrips and jassid.

(Main Oilseeds Research Station, JAU, Junagadh)

Bio-efficacy of insecticides against thrips in groundnut

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut are advised to spray profenophos 40 % + cypermethrin 4 % 0.044 % (10 ml/10 l) **or** thiamethoxam 25 WG 0.006 % (2.4 g/10 l) **or** imidacloprid 17.8 SL 0.005 % (2.8 ml/10 l) **or** methyl-o-demeton 25

EC 0.025 % (10 ml/10 l) **or** endosulfan 35 EC 0.07 % (20 ml/10 l) at the initiation of the pest for effective and economical management of thrips.

(Main Oilseeds Research Station, JAU, Junagadh)

Year: 2010-11

Efficacy of newer insecticides against sucking pests of coriander

For effective and economical management of aphids in coriander, one spray of acetamiprid 20% SP 0.004 % (2 g/10 l water) or imidacloprid 17.8 % SL 0.005% (2.80 ml/10 l water) or dimethoate 30 % EC 0.03 % (10 ml/10 l water) at the appearance of aphid infestation is recommended under South Saurashtra Agro-climatic Zone.

(Department of Entomology, JAU, Junagadh)

Management of eriophyid in coconut cv. T x D

For effective and economical management of eriophyid mite in coconut, root feeding application of azadiracatin 2.5% @ 15 ml with equal water quantity per palm at two months interval throughout the year is recommended under South Saurashtra Agro-climatic Zone.

(Agricultural Research Station, (FC), JAU, Mahuva)

Testing efficacy of bio-pesticides for the control of sesame leaf webber/capsule borer (*Antigastra catalaunalis*)

For effective and economical bio-pesticide based management of leaf webber/capsule borer in *kharif* sesame, three sprays of *Beuaveria bassiana* (2 x 10^8 cfu/mg), 5 g/l or neem seed kernel extract 5 % (500 g/ 10 l water) at 15 days interval starting from the pest infestation are recommended for the farmers of North Saurashtra Agro-climatic Zone.

(Agricultural Research Station (Ag. Botany), JAU, Amreli)

Year: 2011-12

Efficacy of newer insecticides against cabbage aphid

For effective and economical management of cabbage aphids under South Saurashtra Agro-climatic Zone, two spray of acetamiprid 20 SP 0.004% (2 g/10 liter water) at 15 day interval starting from aphid infestation are recommended. The waiting period of acetamiprid 20% SP (15 g. a.i./ha) should be maintained 7 days between last spray and harvesting of the crop.

(Department of Entomology, JAU, Junagadh)

Monitoring of *bajra* worm *Helicoverpa armigera* (Hubner) through sex pheromones during *kharif*

The farmers of North Saurashtra Agro-climatic Zone growing *kharif bajra* are advised to install sex pheromone traps for monitoring of adult male moths of ear head worm (*Helicoverpa armigera* Hubner) @ 5 traps/ha at 1 ft height above earhead after the formation of earhead.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Management of Eriophyid mites in coconut cv. D x T with nutrient and fertilizers

For the effective and economical management of eriophyid mite in hybrid coconut (D x T Mahuva), application of half dose of recommended chemical fertilizers (NPK-0.750: 0.375: 0.750 kg/palm/year) with 50 kg FYM, 1.5 kg gypsum and 0.075 kg borax/palm/year in June and remaining half dose of recommended chemical fertilizers (NPK 0.750:0.375:0.750 kg/palm/year) in October is recommended under South Saurashtra Agro-climatic Zone.

(Agricultural Research Station (Fruit Corps), JAU, Mahuva)

Year: 2012-13

Field efficacy of newer acaricides for the management of mites in garlic

For effective and economical management of mite in garlic under South Saurashtra Agro-limatic Zone, two sprays of abamectin 1.9 EC @ 0.003 % (16 ml / 10 litre water) or

carbosulfan 25 EC @ 0.05 % (20 ml/ 10 litre water) or difenthiuron 50 WP @ 0.07 % (14 g /10 litre water) at 15 days interval starting from mite infestation are recommended.

The pre-harvest interval of 27 days is recommended for abamectin, carbosulfan and difenthuron.

(Department of Entomology, JAU, Junagadh)

Field efficacy of bio-pesticides against pest complex of okra

For effective and economical bio-pesticide based management of *Kharif* okra pests *viz.*, jassid and fruit and shoot borer, two sprays of *Metarhizium anisopliae* (cfu 1 x 10^7/g) @ 4 g/lit 15 days interval starting from the pest infestation are recommended under South Saurashtra Agro-climatic Zone.

(Department of Entomology, JAU, Junagadh)

Bio efficacy of newer miticides against mites in cluster bean

For effective and economical management of mites in cluster bean under South Saurashtra Agro-climatic Zone, two sprays of difenthiuron 50 WP @ 0.07 % (14.0 g/10 lit water) or abamectin 1.9 EC @ 0.003 % (16 ml/ 10 litre water) or buprofezin 25 EC @ 0.025% (10 ml/ 10 litre water) at 15 days interval starting from mite infestation are recommended.

The pre-harvest interval of 10, 1, 10, 1 day (s) is recommended for difenthiuron, abamectin, buprofezin and dicofol, respectively.

(Department of Entomology, JAU, Junagadh)

Field efficacy of bio-pesticides against inflorescence pests of mango

For higher fruit setting and effective management of inflorescence sucking pests *viz.* hopper, thrips and flower bug in mango orchard under South Saurashtra Agro-climatic Zone, two sprays of bio-pesticides, *Beauveria bassiana* (cfu 1x10^7/g) @ 20 g/ 10 lit water or *Verticillium lecanii* (cfu 1 x10^7/g) @ 20 g/ 10 lit water at 15 days interval starting from pests infestation are recommended.

(Department of Entomology, JAU, Junagadh)

Field efficacy of different insecticides against the leaf webber of mango

For effective management of leaf webber in mango orchard under South Saurashtra Agro-climatic Zone, two sprays of profenophos 50 EC @ 0.05 % (10 ml/10 litre water) or novaluron 10 EC @ 0.01 % (10 ml /10 litre water) or spinosad 45 SC @ 0.015 % (3 ml /10 litre water) or quinalphos 25 EC @ 0.05 % (20 ml /10 litre water) or carbaryl 50 WP @ 0.2 % (40 g/10 litre water) at 15 days interval starting from leaf webber infestation are recommended.

(Department of Entomology, JAU, Junagadh)

Ecofriendly management of sesame leaf webber, *Antigastra catalaunalis* Duponchel under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone, cultivating sesame under rainfed condition are advised to give two sprays of cartap hydrochloride 50 SP 0.075 % (15 g/10 lit water) or Neem Seed Kernel Extract 3% (300 g / 10 lit water) for effective and economic control of the leaf webber. The first spray should be applied when the pest population reach at 5 larvae / 20 plants (ETL) and second spray at 15 days after the first spray.

The residue of cartap hydrochloride in sesame seeds at 30 days after second spray was found below detection limit.

(Main Dry Farming Research Station, JAU, Targhadia)

Chemical control of sucking pests through foliar application of new insecticides in cotton

Farmers of South Saurashtra Agro-climatic Zone, growing cotton are advised to apply three sprays of imidacloprid 200 SL @ 40 g a.i. /ha (4 ml/10 litre water) or thiamethoxam 25 WG @ 25 g a.i./ha (2 g/ 10 litre water) or acephate 75 SP @ 750 g a.i./ha (20 g / 10 litre water) for effective and economic control of sucking pests (jassids and whitefly) at 15 days interval starting from the pest infestation. The waiting period of thiamethoxam 25 WG @ 25 g a. i/ha should be maintained 21 days between last spray and harvesting of the crop. The residue of imidacloprid 200 SL @ 40 g a.i. /ha and acephate 75 SP @ 750 g a.i./ha after first and second picking was found below detection level in the cotton lint and seeds.

The pre-harvest interval of 104 days is recommended for imidacloprid, thiamethoxam and acephate.

(Cotton Research Station, JAU, Junagadh)

Year: 2013-14

Testing Bio-efficacy of insecticides against sucking pest in summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are advised to spray imidacloprid 17.8 SL 0.005 % (3 ml/ 10 litre water; 25 g a.i./ha) twice at 15 days interval starting after initiation of pest for effective and economical management of sucking pests in groundnut. The pre harvest Interval (PHI) of this insecticide is 40 days.

(Main Oilseed Research Station, JAU, Junagadh)

Management of shoot fly and stem borer in bajra crop

The farmers of North Saurashtra Agro-climatic Zone growing *kharif* pearl millet are advised to treat the seeds with thiamethoxam 35 FS @ 9.0 ml/kg (3.15 g a.i./kg) or imidacloprid 600 FS @ 8.75 ml/kg (5.25 g a.i./kg) seed at the time of sowing followed by spray of either profenophos 40% + cypermethrin 4.0%, 44 EC 0.044% (10 ml/10 litre water; 220 g a.i./ha) or cartap hydrochloride 50 SP 0.05% (10 g/ 10 litre water; 250 g a.i./ha) or thiodicarb 75 WP 0.015% (2 g/10 litre water; 75 g a.i./ha) at 30 days after germination of the crop for the effective management of shoot fly and stem borer. The PHI for these insecticides is 61 days.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Chemical control of thrips (*Thrips tabaci* L.) in onion through newer insecticides

For effective and economical management of thrips in onion, two sprays of spinosad 45 SC 0.009% (2 ml / 10 litre water; 45 g a.i./ha) or chlorfenapyr 10 EC 0.008% (7.5 ml /10 litre water; 37.5 g a.i./ha) or fipronil 5 SC 0.007% (14 ml / 10 litre water; 35 g a.i./ha) at 10 days interval starting from thrips infestation are recommended under North Saurashtra Agro-Climatic Zone. The PHI for spinosad, chlorfenapyr and fipronil is 34 days.

(Grassland Research Station, JAU, Dhari)

Management of sucking pests of *kharif* groundnut through newer insecticides

For effective and economical management of sucking pests in *kharif* groundnut, two sprays of imidacloprid 17.8 SL 0.005% (2.8 ml/10 litre water; 25 g a.i./ha) or fipronil 5 SC 0.007% (14 ml / 10 litre water; 35 g a.i./ha) or difenthiuron 50 SP 0.05% (10 g/10 litre water; 250 g a.i./ha) at 15 days interval starting from the pest infestation are recommended under North Saurashtra Agro-climatic Zone . The PHI for imidacloprid, fipronil and difenthiuron is 27 days.

(Grassland Research Station, JAU, Dhari)

Efficacy of new molecules against Helicoverpa armigera in chickpea

For effective and economic control of pod borer *(Helicoverpa armigera*) in chickpea crop, farmers of South Saurashtra Agro-climatic Zone are advised to apply two sprays of chlorantraniliprole 20 SC 0.003% (1.5 ml/ 10 liter water; 15 g a.i./ha) or emamectin benzoate 5 SG 0.001% (2 g/ 10 liter water; 5 g a.i./ha) or profenophos 50 EC 0.1% (20 ml/ 10 liter water 500 g a.i./ha). First spray should be appliled at 50% flowering and second at 15 days after first spray. The PHI for these insecticides is 27 days.

(Pulse Research Station, JAU, Junagadh)

Testing bio-efficacy of certain insecticides against pod borer complex on pigeonpea

The farmers of South Saurashtra Agro-climatic Zone are advised to apply two sprays of spinosad 45 SC 0.009% (2 ml/ 10 litre water; 45 g a.i/ha) or thiodicarb 75 WP 0.075% (10 g/ 10 litre water; 375 g a.i/ha) or flubendiamide 48 SC 0.0096% (2 ml/ 10 litre water; 48 g a.i/ha) or chlorantraniliprole 20 SC 0.003% (1.5 ml/ 10 liter water; 15 g a.i./ha) starting from 50 per cent flowering and second spray at 15 days after first spray for the control of pod borer complex in pigeonpea. The PHI for these insecticides is 30 days.

(Pulse Research Station, JAU, Junagadh)

Year: 2014-15

Management of sucking pests through insecticides in brinjal

For effective and economical control of brinjal whitefly, three sprays of chlorantraniliprole 18.5 SC, 0.002 %, 1.08 ml/10 litre water at 15 days interval starting from the pest infestation are recommended under South Saurashtra Agro climatic Zone. The PHI for chlorantraniliprole 18.5 SC, 0.002 % is one day.

(Dept. of Entomology, CoA, JAU, Junagadh)

Storage potential of bio-agent under refrigerator conditions

Farmers are advised to store the field collected ladybird beetles (*Coccinella septempunctata* (L.)) in jar containing folded papers under domestic refrigerator conditions (6.0 to 7.5 ^{0}C) up to 120 days with the survival rate of 84 per cent without hampering their longevity and fecundity. These stored predatory beetles can be released in field crops for biological control of insect pests.

(Dept. of Entomology, CoA, JAU, Junagadh)

Storability of HaNPV and SNPV under refrigerator condition

Farmers are advised for biological control of *Helicoverpa armigera* and *Spodoptera litura* through Nuclear Polyhedrosis Virus (NPV) to store the field collected NPV infected larvae under domestic refrigerator conditions (6.0 to 7.5 ^{0}C). These NPV infected larvae can be stored up to 8 months of storage period with 100 per cent virulence, which can be utilized for the biological management of respective pest.

(Dept. of Entomology, CoA, JAU, Junagadh)

Studies on effect of drip v/s flood irrigation on the incidence of important mango pests

Mango growers of South Saurashtra Agro-climatic Zone are informed that the lower incidence of gall midge, hopper and thrips is found in drip irrigated orchard as compared to flood irrigated orchard.

(Dept. of Entomology, CoA, JAU, Junagadh)

Testing of efficacy of different newer insecticides against shoot fly and stem borer in pearl millet

Farmers of North Saurashtra Agro-climatic Zone growing *kharif* pearl millet are advised to treat the seeds with imidacloprid 600 FS, 8.75 ml/kg seeds, 4.20 g a.i./kg seeds at the time of

sowing followed by spray with imidacloprid 17.8 SL, 0.009 % (5.0 ml/10 liter water, 45.39 g a.i./ha) at 35 days after germination of the crop for effective management of shoot fly and stem borer. The PHI for these insecticides is 42 days.

(Pearl Millet Research Station, JAU, Jamnagar)

Storage study of wheat harvested by combine harvester

The farmers storing wheat are advised that wheat harvested by combine harvester (up to 6 % mechanically damaged grain) to be stored with the treatment of castor oil (15 ml/1.0 kg grain) and can be kept in GI bin container to keep safe against lesser grain borer up to eight months of storage as it reduces pest population, grain damage, weight loss as compared to untreated wheat kept in jute bags.

(Dept. of Processing & Food Engg., CAET, JAU, Junagadh)

Testing bio-efficacy of certain insecticides against pod borer complex on urdbean

Farmers of South Saurashtra Agro-climatic zone are advised to apply two sprays of chlorantraniliprole 18.5 SC, 0.006 % (3 ml/ 10 litre water) or flubendiamide 48 SC, 0.0096 % (2 ml/ 10 litre water), first spray at 50 per cent flowering and second at 15 days interval for the control of pod borer complex in urdbean.

The PHI for chlorantraniliprole 18.5 SC is 20 days, whereas 11 days for flubendiamide 48 SC.

(Pulses Research Station, JAU, Junagadh)

Year: 2016-17

Field efficacy of different insecticides against citrus pests

The farmers of South Saurashtra Agro-climatic Zone growing citrus are advised to apply two sprays of imidacloprid 17.8 SL 0.0072 % (4 ml/10 lit. water), first spray at starting of pests infestation and second15 days after the first spray for effective management of leaf miner and black fly.

(Department of Entomology, JAU, Junagadh)

Evaluation of botanicals, bio-pesticides and insecticides against gram pod borer

The farmers of South Saurashtra Agro-climatic Zone growing chickpea are advised to apply alternate spray of *HaNPV* 2 x 10^9 POBs/ml (5 ml/10 lit. water) and chlorantraniliprole 18.5 SC 0.004 % (2 ml/10 lit. water) for effective and economic control of pod borer (*Helicoverpa armigera*) in chickpea crop. First spray to be started at 50 % flowering and second at 15 days after first spray.

The PHI for Chlorantraniliprole 18.5 SC is 11 days.

(Pulse Research Station, JAU, Junagadh)

Integrated cotton crop management with emphasis on biotic stress

The farmers of South Saurashtra Agro-climatic Zone growing cotton are advised to apply the following Integrated Pest Management module for control of mealy bug and conservation of lady bird beetle. However, IPM module also reduced the population of aphids, jassid, thrips, whitefly, mite, mirid bug and maintain population of predators i.e. chrysopa and spider as compared to CFP module but they were non-significant.

1. Seed treatment with *Pseudomonas fluorescens* @ 10g / kg of seed
2. Sowing of castor as a trap and maize as a border crop (10:1)
3. Sowing of black gram as intercrop
4. Fertilizer application of FYM 10 t/ha + 180-37.50-112.50 NPK kg/ha in three split at basal, 30 DAS and 60 DAS

5. Need based application of insecticides in sequence *viz.*, Acephate 75 SP (0.113%) 750 g a.i/ha (20 g /10 lit. water), Flonicamid 50 WG (0.015%) 75 g a.i/ha (3 g /10 lit. water), Fipronil 5 SC (0.008%) 40 g a.i/ ha (16 ml /10 lit. water) and Buprofezin 25 SC (0.05%) 250 g a.i/ha (20 ml /10 lit. water).
6. Pre-emergence application of pendimethalin 30 EC (0.20%) @ 1000 g a. i./ha (67 ml/10 lit. water) and Quizalofop ethyl 5 EC (0.01%) @ 50g a. i./ha (20 ml/10 lit. water) 30 DAS for weed control.
7. Installation of yellow sticky trap @ 5 traps/ha for monitoring of white fly.
8. Installation of pheromone traps @ 5 traps/ha for monitoring of all bollworms.
9. Need based application of copper oxychloride 50 % WP 0.2 % (40 g/10 lit. water) and carbendazim 50 % WP (0.05 %) (10 g /10 lit. water) for disease control.

(Cotton Research Station, JAU, Junagadh)

B. Plant Pathology

Year: 2004-05

Pearl millet

For the control of blast disease of pearl millet, two sprays of carbendazim 0.05 per cent (ICBR 1:3.85) at 15 days intervals starting from the initiation of the disease are recommended.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Groundnut

The farmers of South Saurashtra Agro-climatic Zone are advised to use tebuconazole @ 1.25 g/kg as seed treatment (ICBR 1:51.12) to reduce the collar rot disease of groundnut.

(Main Oilseed Research Station, JAU, Junagadh)

Tomato

For the management of early blight of tomato in South Saurashtra Agro-climatic Zone, seed treatment with captan @ 3 g/kg seeds, application of carbofuran @ 1kg a.i./ha in seed bed and covering of nursery with nylon net (400 mesh) after sowing and after transplanting four sprays of mancozeb @ 0.3 per cent (ICBR 1:7.09) during *rabi* season at 15 days interval starting from initiation of early blight disease are recommended.

(Vegetable Research Station, JAU, Junagadh)

Year: 2006-07

Chickpea

The farmers of South Saurashtra Agro-climatic Zone are advised to apply phosphate solubilizing microorganism cultures either PBA-13 (*Bacillus coagulans*) (CBR 1:28.79) or PBA-20 *(Aspergillus* spp.*)* (CBR 1:22.95) or PBA-10 (*B. coagulans*) (CBR 1:21.60) (10^8 viable cells/g) as seed treatment @ 30 g/kg seed in gram crop in place of phosphatic fertilizer.

(Department of Plant Pathology, JAU, Junagadh)

Groundnut-Castor relay crop

The farmers of South Saurashtra Agro-climatic Zone are advised to sow groundnut with castor as relay crop (Row ratio of 2:1) along with soil application of carbofuran 3 G @ 1 kg a.i./ha (Furadan 3G @ 33 kg/ha) to reduce the root knot nematode disease (*Meloidogyne arenaria*)and to get higher yield (CBR 1: 2.35).

(Main Oilseed Research Station, JAU, Junagadh)

Garlic

The farmers of South Saurashtra Agro-climatic Zone growing garlic are advised to apply three sprays of thiophanate methyl 70 % WP @ 0.05 % (CBR 1: 7.85) or hexaconazole 5 % EC @ 0.008 % (CBR 1:6.48) at 10 days interval starting from initiation of powdery mildew (*Leveillula taurica*) disease during *rabi* season for it's economic and effective management. However, those who are interested in organic farming can use wettable sulphur 80 WP @ 0.30 % (ICBR 1 : 8.67).

(Vegetable Research Station, JAU, Junagadh)

Year: 2007-08

Fenugreek

The farmers of South Saurashtra Agro-climatic Zone are advised to sow fenugreek in third or fourth week of October for maximum yield and minimum powdery mildew disease incidence.

(Department of Plant Pathology, JAU, Junagadh)

Green gram

The farmers of North Saurashtra Agro-climatic Zone are advised to apply three sprays of carbendazim 0.025 % (CBR 1:7.37) or hexaconazole 0.005 % (CBR 9.16) or wettable sulphur 0.2 % (CBR 1:15.99) or for organic farming, neem seed kernel extract 5 % (CBR 1:2.89) starting from the initiation of the disease and subsequent at 15 days interval for effective and economical management of powdery mildew of *kharif* green gram.

(Main Dry Farming Research Station, JAU, Targhadia)

Black gram

The farmers of North Saurashtra Agro-climatic Zone are advised to apply two sprays of hexaconazole 0.005 % (CBR 1:24.42) or carbendazim 0.05 % (CBR 1:22.84); first spray at initiation of disease and second spray at 20 days after first spray for effective and economical management of powdery mildew of black gram.

(Main Dry Farming Research Station, JAU, Targhadia)

Onion (*kharif*)

The farmers of South Saurashtra Agro-climatic Zone, growing *kharif* onion nursery are advised to adopt any one of the following treatments in the raised bed nursery after 15 days of soil solarization to get maximum transplantable seedlings at economical cost.

Seed treatment with thiram 75 % SD (3 g/kg seed) and drenching with thiram 75 % WP (0.2 %) @ 3 litre/m^2 after 10 days of seed sowing (CBR 1:3.94).

OR

Seed treatment with thiram 75 % SD (3 g/kg seed) and drenching with copper oxychloride (0.2 %) @ 3 litre/m^2 after 10 days of seed sowing (CBR 1:3.10).

OR

Seed treatment with *Trichoderma harzianum* (2 x 10^6 cfu) @ 5 g/kg seed and drenching of *T. harzianum* (0.5 %) @ 3 litre/m^2 after 10 days of seed sowing (CBR 1:3.70).

OR

Seed treatment with carbendazim 50 % WP (3 g/kg seed) and drenching of carbendazim 0.1 % @ 3 litre/m^2 after 10 days of seed sowing (CBR 1:3.12).

(Vegetable Research Station, JAU, Junagadh)

Year: 2008-09

Chemical control of powdery mildew of coriander

The farmers of South Saurashtra Agro-climatic Zone are advised to apply three sprays of hexaconazole 5 EC 0.005 per cent (10 ml/10 lit) or propiconazole 25 EC 0.025 per cent (10 ml/10 lit) or difenoconazole 25 EC 0.025 per cent (10 ml/10 lit) at 15 days interval starting from initiation of disease for effective and economical control of powdery mildew of coriander.

(Department of Plant Pathology, JAU, Junagadh)

Efficacy of fungicides for the control of powdery mildew of cumin

The farmers of South Saurashtra Agro-climatic Zone are advised to apply three sprays of hexaconazole 5 EC 0.005 per cent (10 ml/10 lit) or propiconazole 25 EC 0.025 per cent (10 ml/10 lit) or difenoconazole 25 EC 0.025 per cent (10 ml/10 lit) at 15 days interval starting from initiation of disease for effective and economical control of powdery mildew of cumin.

(Department of Plant Pathology, JAU, Junagadh)

Effect of sowing period on the occurrence of powdery mildew of cumin

The farmers of South Saurashtra Agro-climatic Zone are advised to sow cumin in third or fourth week of October for keeping low incidence of powdery mildew disease and better seed yield.

(Department of Plant Pathology, JAU, Junagadh)

Management of stem rot of groundnut through oil cakes

The farmers of North Saurashtra Agro-climatic Zone are advised to apply castor cake @ 750 kg/ha in furrow before sowing for effective and economical management of stem rot of groundnut.

(Dry Farming Research Station, JAU, Targhadia)

Management of powdery mildew of sesamum through triazole fungicides

The farmers of North Saurashtra Agro-climatic Zone are advised to apply two sprays of hexaconazole 5 EC 0.005 per cent (10 ml/10 lit) or carbendazim 50 WP 0.05 per cent (5g/10 lit) first spray at initiation of the disease and second spray at 15 days after first spray for effective and economical management of powdery mildew of sesamum.

(Dry Farming Research Station, JAU, Targhadia)

Year: 2009-10

Chemical control of powdery mildew of mango

The farmers of South Saurashtra Agro-climatic Zone cultivating mango are advised to apply three sprays of hexaconazole 5 EC 0.005% (10 ml/10 l) **or** propiconazole 25 EC 0.025% (10 ml/10 l) at 20 days intervals from initiation of flowering for effective and economical management of powdery mildew. (Department of Plant Pathology, JAU, Junagadh)

Chemical control of colletotrichum and cercospora leaf spots of urdbean

The farmers of South Saurashtra Agro-climatic Zone growing urdbean are advised to apply three sprays of propiconazole 25 EC 0.025% (10 ml/10 l) **or** hexaconazole 5 EC 0.005% (10 ml/10 l) at 15 days intervals from the disease initiation for effective and economical management of Colletotrichum and Cercospora leaf spot. (Department of Plant Pathology, JAU, Junagadh)

Evaluation of fungicides for the control of downy mildew disease of bitter gourd

The farmers of South Saurashtra Agro-climatic Zone growing bitter gourd are advised to apply three sprays of metalaxyl MZ 72 WP, 0.1% (14 g/10 l) **or** chlorothalonil 75 WP, 0.1 % (13.3 g/10 l) **or** fosetyl-Al 80 WP, 0.1% (12.5 g/10 l) at 15 days intervals from the disease initiation for effective and economical management of downy mildew.

(Department of Plant Pathology, JAU, Junagadh)

Management of stem rot of groundnut (*Sclerotium rolfsii*) by different methods of application of *Trichoderma sp*.

The farmers of South Saurashtra Agro-climatic Zone cultivating groundnut are advised to treat the seed with talc based *Trichoderma viride* @ 10 g/kg seeds **or** apply T. *viride* @ 2.5

kg/ha as soil drenching at 30 days after sowing **or** *T. viride* @ 2.5 kg along with either castor cake **or** FYM @100 kg /ha in furrow at the time of sowing to reduce stem rot incidence.

(Main Oilseeds Research Station, JAU, Junagadh)

Management of *Meloidogyne arenaria* and *Sclerotium rolfsii* complex in groundnut

The farmers of South Saurashtra Agro-climatic Zone cultivating groundnut are advised to treat the seed with talc based *Pseudomonas fluorescens* @ 20 g/kg seeds followed by the application of *Pseudomonas fluorescens* in furrow @ 2.5 kg/ha for effective management of root knot nematode and stem rot diseases.

(Main Oilseeds Research Station, JAU, Junagadh)

Biological control of angular leaf spot disease of cotton

The farmers of South Saurashtra Agro-climatic Zone growing cotton are advised to treat the seeds with talc based *Pseudomonas fluorescens* (Pf-1) @ 10 g/kg seed along with foliar sprays of *P. fluorescens* (Pf-1) @ 0.2 % (20 g/10 l) at 30, 50, 70 and 90 days after sowing for effective and economical management of angular leaf spot disease.

(Cotton Research Station, JAU, Junagadh)

Chemical control of Alternaria leaf spot of sesame

The farmers of North Saurashtra Agro-climatic Zone cultivating sesame are advised to apply three sprays of propiconazole 25 EC 0.025% (10 ml/10 l) **or** cymoxanil 8 WP + mancozeb 64 WP 0.1% (20 g / 10 l) **or** mancozeb 75 WP 0.2% (25 g/10 l), first at 40 days after sowing and subsequent sprays at 12 days intervals for effective and economical management of alternaria leaf spot disease.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2010-11

Integrated Management of downy mildew of cucurbit (Ridge gourd)

For economical and effective management of downy mildew disease and to get higher ridge gourd fruit yield, the farmers of South Saurashtra Agro-climatic Zone are advised to adopt bower system with seed treatment of combi product of metalaxyl 8 % + mancozeb 64 % WP @ 4 g/kg seeds followed by three times removing of old leaves in the morning and three sprays of mancozeb 75 % WP 0.2 % (27 g/10 l of water) in the afternoon at 50, 60 and 70 days after sowing or bower system with seed treatment of metalaxyl 8 % + mancozeb 64 % WP @ 4 g/kg seeds followed by two sprays of fosetyl-Al 80 % WP 0.1 % (12.5 g/10 l of water) at 50 and 65 days after sowing.

(Vegetable Research Station, JAU, Junagadh)

Chemical control of leaf/stem/capsule spots (*Alternaria alternata*) of sesame

The farmers of North Saurashtra Agro-climatic Zone growing *kharif* sesame are advised to apply three sprays of propiconazole 0.025 % (10 ml/10 l water) or hexaconazole 0.005 % (10 ml/10 l water) or carbendazim 12 % WP + mancozeb 63 % WP 0.15 % (20 g/10 l water) at 12 days interval starting from 40 days after sowing for effective and economical management of leaf/stem/ capsule spots. (Agricultural Research Station, JAU, Amreli)

Year: 2011-12

Integrated management of major diseases of groundnut

The farmers of South Saurashtra Agro-climatic Zone growing groundnut are advised to treat the seeds with tebuconazole 2% DS @1.5 g/kg and spray tebuconazole 250 EC @ 10 ml/ 10 l water at 45 and 60 days after sowing.

OR

Apply talc based *Trichoderma* @ 10 g/kg seed and @ 4 kg/ha with 250 kg castor cake in furrow at the time of sowing and spray hexaconazole 5 EC @ 10 ml/10 l water twice at 45 and 60 days after sowing for economic and effective control of soil borne (collar rot & stem rot) and foliar (tikka & rust) diseases. The waiting period of tebuconazole 250 EC (125 g a.i./ha) and hexaconazole 5 EC (100 g a.i./ha) should be maintained 49 and 30 days, respectively between last spray and harvesting of the crop.

(Main Oilseed Research Station, JAU, Junagadh)

Wilt management in chickpea

The farmers of the South Saurashtra Agro-climatic Zone growing irrigated chickpea during *rabi* season are advised to adopt seed treatment of carbendazim 1g+thiram 2 g/kg seed along with soil application of *Trichoderma viride* (10^6 cfu/g) @ 2.5 kg mixed in 250 kg either castor cake or FYM/ha at the time of sowing in furrow for management of wilt and to get higher seed yield.

(Pulse Research Station, JAU, Junagadh)

Year: 2012-13

Management of root knot nematode, *Meloidogyne arenaria* in groundnut

The groundnut growing farmers of South Saurashtra Agro-climatic Zone are advised to apply talc based *Paecilomyces lilacinus* (cfu $1x10^6$/g) as seed treatment @ 10 g/kg seed or soil application of *Paecilomyces lilacinus* (cfu 1 x 10^6/g) @ 2.5 kg/ha for effective and economical management of root knot nematode.

(Main Oilseed Research Station, JAU, Junagadh)

Management of leaf blight disease in tomato

For economical and effective management of leaf blight disease *Alternaria solani* and to get higher tomato fruit yield, farmers of South Saurashtra Agro-climatic Zone, growing tomato in late *kharif* season are advised to apply three sprays of copper hydroxide 77 WP @ 0.2% (25 g/10 lit water) at 10 days interval starting from the initiation of the disease.

(Vegetable Research Station, JAU, Junagadh)

Year: 2014-15

Assessment of *Trichoderma* population in the field under groundnut cultivation

Farmers of North and South Saurashtra Agro-climatic Zone are advised to apply *Trichoderma* every year for the management of stem/pod rot disease in groundnut.

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Standardization of method and time of application of bio-control agents for management of stem and pod rot of groundnut caused by *Sclerotium rolfsii*

Farmers of South Saurashtra Agro-climatic Zone are advised furrow application of *Trichoderma harzianum* 2 x 10^6 $cfug^{-1}$ @1.25 kg in 125 kg of castor cake/ha at the time of sowing as well as its broadcasting at plant base with same dose at one month after sowing for effective and economic control of stem and pod rot (*Sclerotium rolfsii*) of groundnut.

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Compatibility of *Trichoderma* with different seed dressing agrochemicals used for the management of diseases and pest in groundnut

Farmers of South Saurashtra Agro-climatic Zone are advised that the agrochemicals used for seed treatment in groundnut *viz.*, carbendazim 12 % + mancozeb 63 % - 75 WP @ 3.0 g/kg seed or mancozeb 75 WP @ 4.0 g/kg seed or carboxin 37.5 % + thirum 37.5 % - 75 WP @ 3.0 g/kg seed or tebuconazole 2 DS @ 2.0 g/kg seed or imidacloprid 600 FS @ 3.0 ml/kg

seed against seed and soil borne diseases/sucking pests do not reduce the soil population of *Trichoderma*, hence they are compatible with *Trichoderma harzianum*.

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Effect of spawn rates on sporophore production of Oyster mushroom (*Pleurotus sajor-caju*)

Mushroom growers are advised to use 3.0 per cent spawn rate in polyethylene bags (18 × 24 inch) of oyster mushroom (*Pleurotus sajor-caju*) to get the optimum sporophore production with higher biological efficiency.

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Effect of substrate rates on sporophore production of Oyster mushroom (*Pleurotus sajor-caju*)

Mushroom growers are advised to use 3 kg wheat straw substrate with 3 per cent spawn rate in polyethylene bags (18 × 24 inch) for the optimum sporophore production with higher biological efficiency of oyster mushroom (*Pleurotus sajor-caju*).

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Management of cumin wilt (*Fusarium oxysporum f. sp. cumini*)

Farmers of South Saurashtra Agro-climatic Zone are advised to broadcast *Trichoderma harzianum* 2 x 10^6 $cfug^{-1}$ @ 5.0 kg mixed in 1000 kg of FYM/ha at the time of sowing for effective and economical control of cumin wilt.

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Efficacy of different bio-control agents against cumin wilt caused by *Fusarium oxysporum f. sp. cumini*

Farmers of South Saurashtra Agro-climatic Zone are advised to broadcast mixture of *Trichoderma viride* @ 1.70 kg + *T. harzianum* @ 1.70 kg + *Pseudomonas fluorescens* @ 1.70 kg (2 x 10^7 $cfug^{-1}$) or *T. viride* @ 2.50 kg + *P. fluorescens* @ 2.50 kg (2 x 10^7 $cfug^{-1}$) mixed in 500 kg of castor cake/ha at the time of sowing for effective and economical control of cumin wilt.

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Effect of foliar application of insecticides in cumin on *Trichoderma* applied in soil

Farmers of South Saurashtra Agro-climatic Zone are advised to apply *Trichoderma harzianum* (2 x 10^7 $cfug^{-1}$) @ 5 kg in 500 kg of castor cake/ha at the time of sowing as well as its broad-casting @ 5 kg/ha Trichoderma in 100 kg sand at one month after germination of crop for effective and economical control of cumin wilt.

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Effect of foliar application of herbicides in cumin on *Trichoderma* applied in soil

Farmers of South Saurashtra Agro-climatic Zone are advised that the application of herbicides oxadiargyl 6 EC, 0.075 kg a.i./ha, 25 ml/10 litre at 7 days after sowing in cumin do not reduce the soil population of *Trichoderma harzianum*.

(Dept. of Plant Pathology, CoA, JAU, Junagadh)

Year: 2015-16

Management of alternaria leaf blight of groundnut

The farmers of south Saurashtra growing summer groundnut are advised to apply three sprays of mancozeb 75 WP 0.2% (27 g/10 litre of water) at 35, 50 and 65 days after sowing for effective and economical management of alternaria leaf blight of groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)

Refining integrated disease management in groundnut

The farmers of south Saurashtra growing *kharif* groundnut are advised to apply seed treatment with tebuconazole 25 WG @1.5 g/kg seed or seed treatment with *Trichoderma*

viride 1% WP 10 g/kg seed, furrow application of *T. viride* at the time of sowing and broadcasting at 40 DAS @ 4 kg enriched in 50 kg FYM and two sprays of tebuconazole 25.9 SC @10 ml/ 10 lit at 15 days interval from initiation of foliar disease for effective and economical management of collor rot, stem rot, tikka and rust disease.

(Main Oilseeds Research Station, JAU, Junagadh)

Efficacy of seed dressing chemicals against wilt and root rot complex of cotton

The farmers of south Saurashtra are advised to treat the cotton seeds with a ready mixture of carboxin 37.5% + thiram 37.5% DS @ 3.5 g/kg seeds before sowing for economical and effective control of wilt and root rot complex and to improve seed cotton yield.

(Cotton Research Station, JAU, Junagadh)

Year: 2016-17

Biological control of soil borne diseases of sesame

The farmers of North Saurashta Agro-climatic Zone growing sesame are advised to treat seed with *Trichoderma harzianum* 1 % WP 5 g/kg seed or *Pseudomonas fluorescens* 1 % WP 5 g/kg along with soil application of *Trichoderma harzianum* 1 % WP 2.5 kg/ha with 300 kg FYM or castor cake at the time of sowing were found effective and economical for management of soil borne diseases (*Macrophomina* stem rot and *Phytophthora* blight) of sesame.

(Agril. Research Station, JAU, Amreli)

III. HORTICULTURE AND AGRO FORESTRY

Year: 2004-05

Custard apple and Guava

The farmers of Saurashtra region are advised that the fresh fruits of custard apple and guava should be dipped in the solution of 0.5 per cent carbendazim for 10 minutes and then packing in polyethylene bag of 30 x 20 cm size having six vents with $KMnO_4$ coated silica gel for enhancing post harvest life, marketability and quality of fruits up to six days.

(Department of Horticulture,JAU, Junagadh)

Year: 2005-06

Coconut hybrid (Cv. D x T)

The farmers of South Saurashtra Agro-climatic Zone growing coconut hybrid (D x T) are advised to apply 270 g urea/plant at monthly interval through drip irrigation. The drip system should be operated for one & half hour daily during October to February and two & half hour from March onwards with four drippers, each having 8 liters discharge/hour (1.1 kg / cm^2 pressure), keeping drippers one meter away from palm trunk to save 47 per cent irrigation water without affecting yield.

(Department of Horticulture, JAU, Junagadh)

Coconut hybrid (Cv. D x T)

The coconut hybrid (D x T) growers of coastal area of South Saurashtra Agro-climatic Zone are advised to apply 2 kg nitrogen, 1 kg phosphorus, 2 kg potash per plant/year in two equal split i.e., June and October for getting higher nut yield and higher net return in saline (14 EC) irrigation water.

(Fruit Research Station, JAU, Mangarol)

Year: 2006-07

Banana

The farmers of South Saurashtra Agro-climatic Zone growing banana are advised to grow variety "Gandevi Selection" for higher yield and income per hectare.

(Department of Horticulture, JAU, Junagadh)

Papaya

Papaya growers of Saurashtra region are advised to grow Madhubindu variety for maximum papain production. Further, they are advised to extract papain from papaya at 80 days old fruits for getting maximum fresh and dry weight of latex (crude papain).

(Department of Horticulture, JAU, Junagadh)

Papaya

Papaya growers of Saurashtra region are advised that the fresh harvested fruits of papaya cv. Madhubindu should be dip for five minutes in the solution of GA_3 100 ppm (100 mg/lit.) followed by packing in perforated polyethylene bag which enhanced shelf life, marketability and quality of fruits up to six days of storage.

(Department of Horticulture,JAU, Junagadh)

Kagzi lime

The farmers of Saurashtra region growing acid lime cv. Kagzi lime are advised to apply 80 per cent recommended dose of fertilizers for more production and higher income from adult tree. Out of which nitrogen in form of urea 2.6 kg per plant in 12 equal splits should be applied at monthly intervals thorough drip irrigation, while phosphorus and potash should be applied as soil application in two splits (SSP-3.75 kg & MOP-2.00 kg/ tree) in June and October. The drip system should be operated at 0.8 PEF for 3.00 hours daily during October to February and 5.00 hours from March to onward with 4 drippers, each having 4 lit. discharge per hour (1 kg/cm^2 pressure) keeping dripper 1.0 meter away from trunk of lime plant to save 33.19 per cent irrigation water.

(Department of Horticulture, JAU, Junagadh)

Sapota

Sapota (cv. *Kalipatti*) growers of South Saurashtra region are advised to apply 72 litres water / tree / day (0.6 PEF) in summer (March to May) and 52 litres water/tree/day in winter (October to February) to adult tree (15 to 20 years old) through drip irrigation system which can save up to 32.6 per cent of water without reduction in yield. The drip system should be operated 4 hours and 30 minutes in summer and the 3 hours 15 minutes in winter, with 1 kg / sq.cm^2 pressure keeping four drippers / tree having capacity of 4 LPH. The drippers should be kept one meter away from the trunk of the tree.

(Agricultural Research Station (Fruit Crop), JAU, Mahuva)

Year: 2007-08

Nutrient management in guava cv. Sardar

The farmers of South Saurashtra Agro-climatic Zone growing guava cv. Sardar are advised to apply 10 kg FYM along with 120 g N, 60 g P_2O_5 and 60 g K_2O per tree at the age of one year which should be increased in equal quantity every year upto fifth year (50 kg FYM, 600 g N, 300 g P_2O_5 and 300 g K_2O per tree) for obtaining economical production. One half dose of nitrogen and full dose of FYM, P_2O_5 and K_2O should be applied in June and remaining half dose of nitrogen in September. (Department of Horticulture, JAU, Junagadh)

Effect of manures and fertilizers on bearing trees of chiku cv. Kalipatti

The farmers of South Saurashtra Agro-climatic Zone growing sapota cv. Kalipatti are advised to apply 900 g N or 450 g N plus 8.00 kg castor cake per adult tree along with recommended dose of 50 kg FYM, 450 g each of P_2O_5 and K_2O to obtain higher yield and better quality of fruit. One half dose of nitrogen and full dose of castor cake, FYM, P_2O_5 and K_2O should be applied in June and remaining half dose of nitrogen in September.

(Department of Horticulture, JAU, Junagadh)

Effect of bio-fertilizers on custard apple cv. Sindhan

The farmers of South Saurashtra Agro-climatic Zone are advised to apply 200 g N + 100 g P_2O_5 + 50 g K_2O and *Azotobacter* and *Phosphobacter* bio-fertilizers each @ 30 g by mixing with 15 kg FYM per plant at onset of monsoon to get maximum fruit yield and net profit in six year old custard apple cv. Sindhan orchard.

(Department of Horticulture, JAU, Junagadh)

Year: 2008-09

Standardization of root stock in mango against salt stress

Nurseryman of Gujarat state interested to prepare mango grafts are advised to use the stone of variety Kesar as a root stock for vigorous growth and better survival against salt stress up to EC 2.0 dSm^{-1} of water. (Department of Horticulture, JAU, Junagadh)

Effect of organic manure and chemical fertilizers on growth and yield of acid lime cv. Kagzi lime

Kagzi lime growers of South Saurashtra Agro-climatic Zone are recommended that 20 years old rejuvenated tree through medium pruning (2.00 m height at ground level) should apply the half recommended dose of fertilizer (25 kg FYM, 450g N, 375g P_2O_5 & 250g K_2O) in which 25 kg FYM with half dose of nitrogen i.e. 225 g N, 375 g phosphorus and 250g potassium per tree should be at the onset of monsoon and remaining half dose of nitrogen i.e. 225g N in the month of March for getting higher net return along with higher yield and quality of fruits.

(Department of Horticulture, JAU, Junagadh)

Year: 2009-10

Pruning trail on gunda (*Cordia dichotoma*)

The farmers of South Saurashtra Agro-climatic Zone are advised to prune 75% length of one year old branches of gunda from all sides of the tree in 1st week of June to get higher yield and economic return.

(Department of Horticulture, JAU, Junagadh)

Integrated nutrient management in custard apple cv. Sindhan

The farmers of South Saurashtra Agro-climatic Zone are advised to apply 100g N + 50g P_2O_5 + 25g K_2O + 2.5 kg castor cake per adult custard apple tree cv. Sindhan at first rainfall in monsoon to get higher fruit yield and net profit.

(Department of Horticulture, JAU, Junagadh)

Post harvest treatment for enhancement of ripening of Kesar mango

It is recommended that the freshly harvested mature mango fruits of cv. Kesar should be treated with ethrel @ 750 mg /l of water for 5 minutes and kept at room temperature to enhance the ripening and get maximum ripened and marketable fruits at 9th day.

(Department of Horticulture, JAU, Junagadh)

Nutrient management in coconut through organic manures

The coconut growing farmers of South Saurashtra Agro-climatic Zone are advised to apply half dose of recommended chemical fertilizers i.e. NPK 200:160:750 g per palm per year along with 5 kg castor cake in two equal splits (June & October) to coconut cv. West Coast Tall to obtain higher nut yield with improvement in nut quality and soil fertility.

(Agricultural Research Station (Fruit Crop), JAU, Mahuva)

Evaluation of Chrysanthemum (*Chrysanthemum morifolium* R.)

The farmers of South Saurashtra Agro-climatic Zone interested to grow flower crop of chrysanthemum are advised to grow variety IIHR-6 for getting higher yield and maximum monetary return.

(Department of Horticulture, JAU, Junagadh)

Year: 2010-11

Comparison of open and low cost net house nursery for seed germination and dynamic growth of coconut seedling cv. D X T (Mahuva)

The nursery growers of South Saurashtra Agro-climatic Zone producing coconut seedlings are advised to grow coconut seed nut in the month of June under low cost net house (50 % shed net) to get higher quality seedling and net return as compared to open field.

(Agricultural Research Station (Fruit Crop), JAU, Mahuva)

Effect of soil amendments with organic materials on yield and quality of onion cv. Talaja red under sodic soil and brackish water condition

Onion growers of South Saurashtra Agro-climatic Zone having sodic soil and brackish irrigation water condition are advised to apply gypsum 5 t/ha with 50 per cent recommended dose of chemical fertilizer (N:P:K 37.5:30:25 kg/ha) and neem cake 900 kg /ha to get maximum yield and net return of onion cv. Talaja red.

(Agricultural Research Station (Fruit Crop), JAU, Mahuva)

Effect of plant growth regulators on gladiolus cv. American Beauty in protected condition for spikes

The farmers of South Saurashtra Agro-climatic Zone who are interested to grow gladiolus cv. American Beauty under poly house are advised to treat the corms of gladiolus with thiourea 1g/liter for 10 hrs before planting for getting maximum number of spikes with good quality, vase life and to get the highest net return.

(Department of Horticulture, JAU, Junagadh)

Effect of plant growth regulators on gladiolus cv. American Beauty in protected condition for corms

The farmers of South Saurashtra Agro-climatic Zone who are interested to grow gladiolus cv. American Beauty under poly house are advised to treat the corms of gladiolus with GA_3 0.05g/liter for 10 hrs before planting for getting maximum number of corms and to get the highest net return. (Department of Horticulture, JAU, Junagadh)

Year: 2011-12

Fertigation system in guava cv. Bhavnagar Red

The farmers of Saurashtra region growing guava cv. Bhavnagar Red (6 years and above old tree) for *Mrig Bahar* crop are advised, to apply 1.0 kg urea per plant through drip irrigation and 0.4 Kg MOP per plant in soil in four equal splits during June, August, October and December; while phosphorus (SSP 1.5 Kg) as a basal dose with drip system operating for 3.00 hours daily during October to December and 4.00 hours during January to March with 4 drippers per tree, each having discharge 4 lit. per hour keeping dripper 1.0 meter away from trunk of tree, which will save 40.69% irrigation water for higher production and income.

(Department of Horticulture, JAU, Junagadh)

Varietal evaluation of gerbera (*Gerbera jamesonii*) under green house

The farmers of South Saurashtra agro climatic zone, interested to cultivate gerbera flower crop under green house are advised to grow varieties Pink Elegance (pink), Savannah (red) and Dana Allen (yellow) for obtaining higher yield and income with good quality of cut flowers.

(Department of Horticulture, JAU, Junagadh)

Integrated Nutrient Management in Sapota cv. Kalipatti

The farmers of South Saurashtra region growing sapota cv. Kalipatti are advised to apply full recommended dose of phosphorus and potash (450 g/plant P & K each) along with half dose of nitrogen (11.25 kg castor cake) and 100 g *Azatobacter* per plant during onset of monsoon and half recommended dose of nitrogen i.e. 450 g/plant during October to get higher fruit yield and net return.

(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

Application of nutrients through root feeding of coconut cv. D x T (Mahuva)

The coconut growers of South Saurashtra Agro-climatic region are advised to apply full recommended dose of chemical fertilizer (1500, 750, 1500 NPK g/palm) and two dose each of 400 ml of nutrient solution in June and October [10 g each urea and muriate of potash, 5 g zinc sulphate, 2 g ferrous sulphate, magnesium sulphate, manganese sulphate and borax each, 1 g copper sulphate, 10 mg sodium molybdate, 10 mg citric acid and 460 mg NAA (10 ml Planofix) dissolved in one liter of water] through root feeding to get higher nut yield and net return in coconut cv. D x T (Mahuva).

(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

Effect of soil amendment with organic materials on yield and quality of bottle gourd cv. Pusa Naveen under sodic soil and brakish water condition

Vegetable growers of South Saurashtra Agro-climatic Zone growing bottle gourd cv. Pusa Naveen under sodic soil and brakish irrigation water condition are advised to apply FYM 5 t/ha along with half recommended dose of chemical fertilizer i.e. 50:25:25, N:P:K kg/ha and poultry manure 3.3 t/ha to get maximum yield and net return.

(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

Year: 2012-13

Evaluation of guava fruit varieties for processing into nectar beverage

Fruit Processors are advised to use 20 % pulp of cv. Allahabad Safeda with 0.3 % of acidity and 17 % TSS to prepare a good quality of guava nectar (RTS) which can be stored up to 150 days.

(Department of Horticulture, JAU, Junagadh)

Integrated nutrient management in guava cv. 'Lucknow-49' under Saurashtra region

The farmers of South Saurashtra Agro-climatic Zone who are growing guava cultivar Lucknow-49 are advised to apply either vermicompost @ 10 kg along with 75% recommended dose of fertilizers (450 g nitrogen, 225 g phosphorus and 225 g potash) per tree or FYM 75 kg + 25% RDF (150 g nitrogen, 75 g phosphorus and 75 g potash) + PSB (20 g per tree) + *Azospirilium* (20 g per tree), in which half dose of nitrogen, full dose of phosphorus, potash and vermicompost should apply at the onset of monsoon and remaining half dose of nitrogen in first week of October to get higher yield and net return.

(Department of Horticulture, JAU, Junagadh)

Preparation and preservation of lasora in different brine preservatives

Fruit processors are advised that the freshly harvested fruits of lasora should be dipped either in Brine 30% + $CaCl_2$ 2% (LR grade) or sea water @ 35 ppt (part per thousand, collected

from 1 km inside the sea shore) for enhancing storage life up to 180 days with good quality fruit.

(Department of Horticulture, JAU, Junagadh)

Testing of seasonal forage/fodder crops as a inter cropping in coconut orchard cv. T x D

Coconut growers of South Saurashtra Agro-climatic Zone are advised to grow sorghum cv. *Gundari*for green and dry fodder or maize cv. African Tall for dry fodder purpose as an intercrop in adult plantation of coconut hybrid T x D to get additional net return without decreasing coconut yield.

(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

Testing of forage/fodder crops as a inter cropping for coconut orchard cv. T x D

Coconut growers of South Saurashtra Agro-climatic Zone are advised to grow either multi cut sorghum cv. SSG-59-3 or multi cut Napier grass cv. APBN-1 (hybrid Napier) for green fodder purpose as an intercrop in adult plantation of coconut hybrid T x D to get additional net return without decrease in coconut yield.

(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

Year: 2013-14

Effect of green manuring on yield of coconut cv. T x D and soil properties

Coconut growers of South Saurashtra Agro Climatic Zone are advised to grow Sunnhemp or Dhanchia as green manuring crop in adult coconut plantation (T x D hybrid) for improving soil fertility and to get more yield and net return.

(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

Effect of different concentration of ethephon application on gum production from *Acacia senegal* (L.) Willd (Gorad)

The farmers of North Saurashtra Agro Climatic Zone are recommended to apply 5 ml of 900 ppm ethephon [2.25 ml Ethrel (40%) in 1 liter of water] by drilling 5 cm hole of 1 cm diameter on stem at 1 m height above the ground of about five year age of *Acacia senegal* (Gorad) during first week of March for getting higher gum production and maximum net return.

(Grassland Research Station, JAU, Dhari)

Year: 2014-15

Effect of different sources of nitrogen with graded levels of inorganic fertilizer on papaya cv. Madhubindu

Farmers of South Saurashtra Agro-climatic Zone growing papaya (Madhubindu) crop are advised to apply 25 per cent N from FYM (6 kg FYM), and remaining 75 per cent N (150 g), 200g P and 250g K per plant from chemical fertilizers during 2nd, 3rd and 4th month after transplanting in equal splits for getting higher yield and net return.

(Dept. of Horticulture, CoA, JAU, Junagadh)

Effect of micro nutrients on growth, yield and quality of papaya cv. Madhubindu

Farmers of South Saurashtra Agro-climatic Zone are advised to spray micronutrients *viz.*, zinc sulfate 24.0 g (Zn 0.5 %) and Borax 10.0 g (B 0.1 %) per liter of water during 2nd and 4th month after transplanting for getting higher yield and net return in papaya cv. Madhubindu.

(Dept. of Horticulture, CoA, JAU, Junagadh)

Dehydration of sapota slices

Fruit processors are advised to dry the sapota slices of 0.5 cm thickness in solar dryer up to 33 per cent recovery to maintain quality in storage up to six months at room temperature.

(Dept. of Horticulture, CoA, JAU, Junagadh)

Effect of soil amendment with organic materials on yield and quality of tomato (cv. Junagadh Tomato-3) under sodic soil & brackish water condition

The farmers of South Saurashtra Agro-climatic Zone growing *Rabi* Tomato (JT-3) under sodic soil (EC 1.48 dS/m, pH 7.81, ESP 21.84 %) and brackish water (EC 4.34 to 4.88 dS/m) condition are advised to apply FYM 5 t/ha + 50 per cent R.D.F. (37.5+18.75+ 31.25NPK kg/ha) + poultry manure (3700 kg/ha) for securing higher yield and net return.

(Agriculture Research Station (Fruit Crop), JAU, Mahuva)

Year: 2015-16

Effects of chemical fertilizers and vermicompost on yield and quality of banana (*Musa paradisiaca* L.) cv. Grand Naine

Farmers of South Saurashtra Agro-climate Zone cultivating banana cv. Grand Naine are advised to apply total 300 g nitrogen and 4 kg vermicompost per plant in four equal split at 2^{nd}, 3^{rd}, 4^{th} and 5^{th} month after planting; along with recommended dose of phosphorus 90 g and 200 g potash per plant at 3^{rd} month after transplanting, while 5 kg FYM as basal dose at transplanting for getting good quality, higher yield and higher return.

(Department of Horticulture, JAU, Junagadh)

Feasibility of organic farming in coconut (*Cocos nucifera*) under saline water irrigation condition

The farmers of South Saurashtra Agro-climatic Zone interested organic cultivation of coconut cv. West Coast Tall (WCT) are advised to apply FYM @ 60 kg per tree under saline irrigation (EC 10-14 dSm^{-1}) condition for obtaining higher return and improving soil fertility.

(Fruit Research Station, JAU, Mangrol)

Year: 2016-17

Varietal evaluation of strawberry under polyhouse

Farmers of South Saurashtra Agro-climate Zone, interested in strawberry cultivation, are advised to grow cv. Winter Queen under protected structure (Fan-pad Cooling Poly House) for getting higher yield and net return.

(Department of Horticulture, JAU, Junagadh)

Evaluation of small to medium sized varieties of Mango

Farmers of Saurashtra region growing small to medium size mango (150 to 250 g) are advised to grow variety Kesar and as alternate of Kesar variety, hybrid variety Amrapali for better yield from thirteen years old tree. Both varieties possess medium sized fruits with attractive colour, flavor, aroma and good taste.

(Department of Horticulture, JAU, Junagadh)

Evaluation of medium to large sized varieties of Mango

Farmers of Saurashtra region growing medium to large sized mango (250 to 500 g) varieties for getting higher yield are advised to grow mango hybrid Sonpari or Rajapuri. The variety possesses good quality with attractive and large sized fruits.

(Department of Horticulture, JAU, Junagadh)

Performance of leafy vegetables purpose coriander under different shed net in summer season

The farmers of Saurashtra region interested to grow coriander for green coriander purpose in summer season are advised to use 75 % white shed net in low cost shed net house for securing higher yield and net return.

(Agricultural Research Station, JAU, Mahuva and Department of Horticulture, JAU, Junagadh)

Performance of leafy vegetables purpose fenugreek under different shed net in summer season

The farmers of Saurashtra region interested in green vegetable purpose fenugreek in summer season are advised to use 75 % white shed net in low cost shed net house for securing higher yield and net return.

(Agricultural Research Station, JAU, Mahuva and Department of Horticulture, JAU, Junagadh)

Integrated nutrient management in mango cv. Jamadar

The farmers of South Saurashtra Agro-climatic Zone interested to grow mango cv. Jamadar are recommended to apply fertilizers as per following schedule for securing higher yield and net return.

Age of tree (Year)	Poultry manure (kg/plant)	N (g/plant)	P (g/plant)	K (g/plant)
4th year	20	160	64	232
5th year	25	200	80	290
6th year	30	240	96	348
7th year	35	280	112	406

(Agricultural Research Station, JAU, Mahuva and Dept. of Horticulture, JAU, Junagadh)

IV. AGRICULTURAL ENGINEERING

Year: 2004-05

Sweep blade for inter-culturing

The farmers of South Saurashtra Agro-climatic Zone growing row crops are advised to use sweep blade (angle 70^0 and working length 42 cms) for inter-culturing to reduce number of clogging and to improve weeding and field efficiency as compared to straight and curved blades. Use of sweep blade for inter-culturing also reduces drudgery to operator.

(Research Testing & Training Center, JAU, Junagadh)

Year: 2005-06

Mango Positioner

Mango growers are advised to use positioner for mango harvesting with uniform stalk length (1-2 cm), for maintaining white layer on the fruit and with choice of matured fruit as the harvesting is done at a close distance. Using this machine, one can get economical advantage over local picker.

(Research Testing & Training Center, JAU, Junagadh)

Post hole digger

The engine operated portable post hole digger is useful for making the pits for erecting fencing poles, plantation of fruits and forest saplings etc. This machine makes about 25 to 35 pits of 15 cm (6 inch) diameter and 45 cm (18 inch) depth in one hour. By this machine, the cost of making one pit (Rs. 2.16) is low as compared to manual digging (Rs. 5.60) and tractor operated digger (Rs. 4.10). Looking to the performance and application, this machine is recommended for farmers, manufacturer and other users.

(Department of FMP, CAET, JAU, Junagadh)

Year: 2006-07

Cleaner-cum-Grader for Cumin

The cumin cleaner-cum-grader machine developed by Junagadh Agricultural University has cleaning efficiency of 75 per cent at the capacity of 50 kg/h and a low cost of cleaning (Rs. 0.31 per kg). It is recommended for the use of farmers, processors and other users.

(Dept. of Agril. Process Engg., CAET, JAU, Junagadh)

Residue Shredder

Agricultural residue shredder developed by Junagadh Agricultural University is recommended for the use of farmers and industries for shredding the plant stalks of castor, cotton and pigeon pea. The machine is operated with 6 hp diesel engine and having capacity of about 170 to 190 kg/h, producing pieces of stalks in size 10 to 75 mm length. The volume of plant stalks reduces to about 80 per cent due to shredding with the value addition of about 170 to 230 per cent.

(Department of FMP, CAET, JAU, Junagadh)

Peanut butter

The entrepreneurs/farmers interested in value addition in peanut are recommended to select the GG-20 cultivar (in comparison to GG-2, GG-7, GG-11, GG-13) of peanut for the production of good quality peanut butter.

(Dept. of Agril. Process Engg., CAET, JAU, Junagadh)

Rainfall-Runoff Relationships for Mahi Basin

The mathematical model and nomograph of rainfall intensity-duration-frequency relationships for Mahi basin developed by Junagadh Agricultural University are recommended to the designers, planners, NGOs and Govt. agencies involved in watershed development projects for the design of structures.

Mathematical Model: I = 113.3211(T) 0.2156(t+1.4275)1.0132.

Where, I = rainfall intensity (mm/h); T = return period (years); t = duration (hours).

(Dept. of Soil & Water Engineering, CAET, JAU, Junagadh)

Rainfall Intensity-Duration-Frequency relationships

The mathematical model and nomograph of rainfall intensity-duration-frequency relationship for Junagadh region developed by Junagadh Agricultural University are recommended to the designers, planners, NGOs and Govt. agencies involved in watershed development projects for the structures.

Mathematical Model: $I = 68.86\ T^{0.265}/(t+0.86)^{1.022}$

Where, I = rainfall intensity (mm/h); T = return period (years); t = duration (hours).

(Dept. of Soil & Water Engineering, CAET, JAU, Junagadh)

Year: 2007-08

Grader for Sapota

Hand-operated grader developed by Junagadh Agricultural University for grading sapota on the basis of size is released for the use of farmers, manufacturers and processors. The same machine can also be used for grading of similar types of fruits and vegetables.

(Dept. of Agril. Process Engg., CAET, JAU, Junagadh)

Hay rake-cum-loader

Tractor operated hay rake cum loader, developed by Junagadh Agricultural University is released for the use of farmers and manufacturers. The machine is easy to operate and reduces time & cost of collecting hay.

(Dept. of Farm Machinery & Power, CAET, JAU, Junagadh)

Time table for green house cooling

The farmers of the Saurashtra region growing flower crops in medium cost green houses are advised to adopt the following time table for operating different cooling systems by using 50 per cent shade net along with natural ventilation (20 to 30 % of the ground floor area) during summer months (March-June) for maintaining productive temperature (20-30 ^{0}C) inside the greenhouse and for saving energy.

Month	Treatment	Time of operation
March	Natural Ventilation	8.00-10.00 /19.00-21.00
	Fogging & Natural Ventilation	10.00-11.00/17.00-19.00
	Fogging & Fan Ventilation/Fan & Pad Ventilation	11.00-17.00
	Without ventilation	21.00-8.00
	Shading	Required
April	Natural Ventilation	7.00-8.00 /22.00-23.00
	Fogging & Fan Ventilation	8.00-10.00/19.00-22.00
	Fan & Pad Ventilation	10.00-19.00
	Without ventilation	23.00-7.00
	Shading	Required
May	Natural Ventilation	22.00-24.00
	Fogging & Fan Ventilation	8.00-11.00/19.00-22.00
	Fan & Pad Ventilation	11.00-19.00
	Without ventilation	0.00-8.00
	Shading	Required
June	Natural Ventilation	22.00-24.00
	Fogging & Fan Ventilation/Fan & Pad Ventilation	8.00-22.00
	Without ventilation	0.00-8.00
	Shading	Required

(Department of RE & RE, CAET, JAU, Junagadh)

Least-cost design for drip irrigation system

The farmers, entrepreneurs and design engineers are advised to install the drip irrigation system as per layout given below for different crops grown in Saurashtra region to minimize installation cost (Table 1 and 2)

Table 1: Drip Irrigation in Horticultural Crops**

Sr. No	Name of Crop	Spacing (mx m)	Expenditure (Rs/ha)	Size of Different components				
				Screen Filter	Main Line	Sub main line	Lateral	Dripper Discharge
				M^3/h	mm	mm	mm	Lph
1	Mango	10 x 10	25,376	10	-	50	16	8
2	Sapota	10 x 10	25,493	10	-	50	16	8
3	Coconut	6 x 6	33,855	10	-	50	16	8
4	Custard apple	6 x 6	34,123	10	-	50	16	4
5	Guava	6 x 6	33,372	10	50	40	12	8
6	Lemon	6 x 6	33,855	10	-	50	16	8
7	Pomegranate	6 x 6	35,131	10	-	50	16	4
8	Datepalm	8 x 8	30,255	10	-	50	16	8
9	Ber	6 x 6	32,209	10	50	40	12	8
10	Amla	8 x 8	29,476	10	40	32	12	8
11	Papaya	2 x 2	58,789	10	-	75	16	4
12	Cashew nut	5.4 x 5.4	36,124	10	-	50	16	8

13	Banana	1.5 x 1.5	62,290	10	63	50	12	4
14	Banana	3.2 x 1.2	45,101	10	-	50	16	2

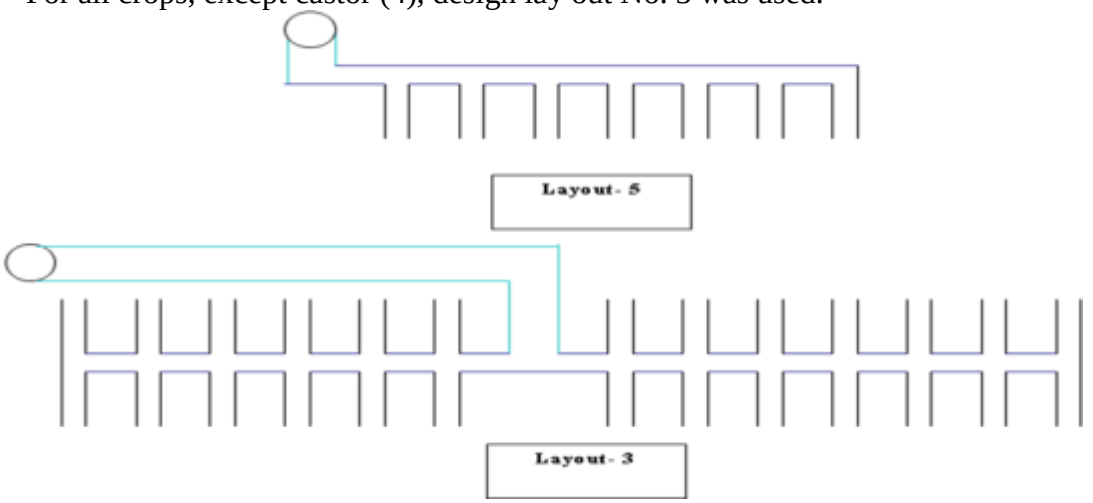
***As per the GGRC rates of 2007.**

**** For all crops, design lay out No. 5 was used, except, Amla (4) and Banana (3).**

Table 2: Drip Irrigation in Field Crops*

Name of Crop	Crop geometry (m x m) (R x P)	Lateral x Dripper Spacing (m x m)	Expen-diture (Rs/ha)	Size of Different Components				
				Screen Filter	Main Line	Sub main line	Late-ral	Dripper Discharge
				M^3/h	mm	mm	mm	Lph
Groundnut	0.45 x 0.1	0.9 x 0.6	1,23,986	20	90	75	12	2
Groundnut	0.9 x 0.1	0.9 x 0.6	1,19,971	20	75	63	12	2
Groundnut	0.6 x 0.1	1.2 x 0.6	94,586	20	75	63	12	2
Groundnut	0.75 x 0.1	0.75x 0.6	1,42,174	25	90	75	12	2
Cotton	1.5 x 0.6	1.5 x 1.2	86,723	25	90	75	16	8
Cotton	1.2 x 0.6	1.2 x 1.2	78,612	20	75	63	12	4
Cotton	0.9 x 0.6	0.9 x 1.2	98,673	20	75	63	12	4
Castor	0.6 x 0.6 x 1.2	1.8 x 0.6	68,619	10	63	50	12	2
Castor	0.9 x 0.6	0.9 x 1.2	98,673	20	75	63	12	4
Castor	0.9 x 0.6	0.9 x 0.6	1,48,711	40	75	63	16	4
Tomato/ Brinjal	0.6 x 0.6 x 0.9	1.5 x 1.2	68,301	20	75	63	12	4
Tomato/ Brinjal	0.75 x 0.6	0.75x 1.2	1,16,618	25	90	75	12	4
Chilles	0.6 x 0.6	1.2 x 1.2	78,612	20	75	63	12	4
Lady's finger	0.6 x 0.3	1.2 x 0.6	94,586	20	75	63	12	2
Lady's finger	0.3 x 0.3 x 0.9	1.2 x 0.6	94,586	20	75	63	12	2
Cabbage/ Cauliflower	0.45 x 0.45	0.9 x 0.9	1,02,902	20	75	63	12	2
Cabbage/ Cauliflower	0.3 x 0.3 x 0.9	1.2 x 0.6	94,586	20	75	63	12	2
Bittergourd	1 x 1	1 x 1	99,647	20	90	75	12	4
Sugarcane	0.1 x 0.6 x 1.2	1.8 x 0.6	68,619	10	63	50	12	2

* For all crops, except castor (4), design lay out No. 3 was used.



(Research Testing & Training Center, JAU, Junagadh)

Year: 2008-09

JAU Tractor drawn groundnut digger cum shaker

The farmers and manufacturers are recommended to use "JAU" Tractor Drawn Groundnut Digger cum shaker for groundnut harvesting, as it saves 30 per cent of operational cost and 15 per cent time as compared to traditional blade harrow.

(Department of Farm Engineering, College of Agriculture, JAU, Junagadh)

JAU Tractor drawn groundnut pod exposer

The farmers and manufacturers are recommended to use Tractor Drawn "JAU" Groundnut Pod Exposer for exposing left out groundnut pods after harvesting, as it exposes about 93 per cent pods on surface in one pass and saves 12 per cent time as compared to 2 to 3 harrowing with traditional equipment.

(Department of Farm Engineering, College of Agriculture, JAU, Junagadh)

JAU vertical conveyor harvesting unit

The farmers and manufacturers are recommended to use mini tractor front mounted "JAU" Vertical Conveyor Harvesting Unit for harvesting of cereals as well as fodder crops as it saves about 30 per cent cost of harvesting, compared to manual harvesting.

(Department of Farm Engineering, College of Agriculture, JAU, Junagadh)

Drying and storage study on seed quality of groundnut

The farmers of South Saurashtra Agro-climatic Zone are advised that after shade drying of summer groundnut having about 8.00 to 8.50 per cent moisture content (WB), considering the minimum weight loss in pods (4.86 %) and kernels (4.92 %), higher germination (81.04 %), minimum pod damage (10.66%) and higher vigour index. The groundnut variety GG-7 followed by GG-2 was found better for four months storage period.

Also, in *kharif* groundnut having about 8.00 to 8.50 per cent moisture content (WB), considering the minimum weight loss in pods (2.06 %) and kernels (4.28 %), higher germination (81.66 %), minimum pod damage (9.22%) and higher vigour index, the groundnut variety GG-7 followed by GG-2 were found better for six months storage period.

(Dept. of APE, CAET, JAU, Junagadh)

Rainfall analysis for planning soil and water conservation structures and for draught occurrence in Rajkot district

In the North Saurashtra Agro-climatic Zone minimum drought observed in 26^{th} to 31^{st} (25^{th} June to 5^{th} August), 34^{th} (20^{th} to 26^{th} August) and 39^{th} (24^{th} to 30^{th} September) meteorological standard week. Hence, these meteorological standard weeks are better for storing the excess runoff water during monsoon period, which can be used as supplementary irrigation to save the crops during moisture deficit period.

(Main Dry Farming Research Station, JAU, Targhadia)

Ground water recharge estimation in and around Junagadh and Ghed area

It is recommended to Govt. agencies, NGOs & planners that in Junagadh and Ghed area, the empirical methods are giving annual groundwater recharge in the range of 15 to 18 per cent of the annual rainfall. In these areas by measuring rainfall, pre-monsoon water table and using artificial neural network (architecture 2-5-1), the post groundwater table could be predicted well.

(Department of Soil & Water Engineering, CAET, JAU, Junagadh)

Impact analysis of a watershed management project

The farmers of the watershed area (North Saurashtra Agro-climatic Zone) shifted the cropping pattern in favour of high yielding varieties and cash crops due to implementation of Watershed Development Programme, which has increased annual income from agriculture

and livestock. Also the Gini concentration ratio, coefficient of variation and standard deviation of agricultural income were reduced. This implies that the Watershed Development Programme played a major role in increasing income, irrigation facilities and income disparity among farmers.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2009-10

Design and development of SPV operated greenhouse ventilation system

The farmers/greenhouse growers and greenhouse manufacturers are recommended to use JAU SPV operated Greenhouse Ventilation System for natural ventilation of greenhouses built in farms, where frequent power cut may cause greenhouse environment unfavorable for crop cultivation.

(Department of RE & RE, CAET, JAU, Junagadh)

Performance of bio-degradable plastic mulch on onion production in comparison of normal plastic mulch

The farmers of Saurashtra region are advised to use bio-degradable plastic mulch (20 µ, black colour) for the cultivation of onion for the higher yield of the crop (15%) and to reduce weed growth (50-62%) as compared to no mulch. After harvesting of the crop, the field should be ploughed for mixing mulch in to the soil.

(Department of RE & RE, CAET, JAU, Junagadh)

Storage study of wheat obtained by combine harvester and thresher

The farmers growing wheat for seed purpose are advised to use thresher for better germination and vigour as compared with self propelled combine harvester.

(Department of APE, CAET, JAU, Junagadh)

Studies on drying characteristics of vegetables using crop residue dryer

The agro processor interested in using the crop residue based dryer developed by Junagadh Agricultural University for drying serrated carrot, carrot slices, cabbage leaves, cauliflower pieces, tomato slices and whole green chillies are recommended to use following operating parameters :

1. Air temperature : 51 to 55 ^{0}C
2. Air velocity : 1.5 m/s
3 Bed thickness : 8.0 cm
4. Average fuel required : 5.5 kg/h

(Department of APE, CAET, JAU, Junagadh)

Evaluation of the size of the bed at a given grade for effective soil and water management

The farmers of North Saurashtra Agro-climatic Zone growing bunch groundnut (GG-5) are advised to sow groundnut at 30 cm distance between rows having three rows on broad bed of 90 cm and furrow of 45 cm for getting higher yield and net return per hectare as well as to check runoff and soil loss under dry farming condition.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2010-11

Modified atmosphere packaging technique for sapota

The farmers, processors and exporters are recommended to adopt modified atmosphere packaging technique developed by JAU for increasing the shelf life of *sapota* fruit by packing in 25 µ LDPE bag with a combination of 5 % O_2 +10 % CO_2 gas concentration and stored at 6 ^{0}C temperature. The shelf life of *sapota* fruits can be increased up to 49 days by using this technique.

(Department of RE & RE, CAET, JAU, Junagadh)

Modified atmosphere packaging technique for mango

The farmers, processors and exporters are recommended to adopt modified atmosphere packaging technique developed by JAU for increasing the shelf life of mango fruit by packing in 25 µ LDPE bag with a combination of 6 % O_2 + 5 % CO_2 gas concentration and stored at 10 ^{0}C temperature. The shelf life of mango fruits can be increased up to 35 days by using this technique.

(Department of RE & RE, CAET, JAU, Junagadh)

Lime harvester

The farmers having *Kagzi* lime orchards are advised to use the JAU-Lime harvester to reduce losses like impact damage and immature lemon fall-up.

(Research Testing & Training Center, CAET, JAU, Junagadh)

Application of murrum in groundnut

The farmers of North Saurashtra Agro-climatic Zone growing bunch groundnut (GG-5) are advised to apply murrum @ 40 t/ha or FYM @ 10 t/ha along with recommended dose of fertilizer for obtaining higher yield of groundnut and net return under dry farming condition.

(Main Dry Farming Research Station, JAU, Targhadia)

Mulching on dripped guava orchard

The farmers of North Saurashtra Agro-climatic Zone growing guava under drip irrigation system are advised to apply black plastic (50 micron) or groundnut shell or wheat straw mulch @ 7.5 kg/plant (0.5 m around the plant) for obtaining maximum plant growth, fruit yield and net return.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2011-12

Modified atmosphere packaging of spine gourd cv. local

The farmers, processors and exporters are recommended to adopt modified atmosphere packaging technique developed by JAU for increasing the shelf life of spine gourd by packing in 50 µ LDPE bag with a combination of 2% O_2 + 4% CO_2 gas concentration and stored at 8ºC temperature. The spine gourd can be stored up to 20 days by using this technique.

(Department of Renewable Energy & Rural Engg., CAET, JAU, Junagadh)

Transportation losses for sapota

The farmers, processors and exporters are recommended to adopt foldable plastic box with cells developed by JAU for local transportation of sapota fruit. This box was found cheaper compared to other containers considering cost of container, transportation, returning empty container/bag and total losses after transportation including decay after storage and also quality of the fruits retained during transportation**.**

(Department of Renewable Energy & Rural Engg., CAET, JAU, Junagadh)

Dehydration and storage of vegetables

The processors, exporters are advised to store dehydrated onion, garlic and unripe mango powder in polyethylene (HDPE) bags of 50 micron in vacuum packaging (740 mm Hg) to retain the quality up to 120 days of storage period.

(Department of Processing & Food Engg., CAET, JAU, Junagadh)

Storage of onion

The farmers and traders who are interested to store the onion for more than four months are recommended to use forced air ventilated storage structure to get 36 per cent of more marketable red onion.

(Department of Processing & Food Engg., CAET, JAU, Junagadh)

Method of sowing of groundnut under poor drainage condition

The farmers of South Saurashtra Agro-climatic Zone growing bunch type groundnut under poor drainage field condition are advised to sow by broad bed furrow method (55 cm width and 15 cm depth of furrow and 100 cm bed width between two furrows) for getting higher yield and net return.

(Research Testing & Training Center, JAU, Junagadh)

New horticultural crops in coastal belt area of Saurashtra region using saline water with drip and mulching technology

The farmers of South Saurashtra Agro-climatic Zone having saline ground water (EC-3.15 ds/m) and medium black calcareous soil (EC-0.88 ds/m) conditions are advised to introduce trees like; seemaruba, tamarind, aonla, pomegranate, sapota, date palm, ber, carambola and guava with drip irrigation.

(Research Testing & Training Centre, JAU, Junagadh and Cotton Research Station, JAU, Khapat)

Year: 2012-13

Determination of groundwater potential of the South West Saurashtra region

Groundwater utilization and management policy guidelines are recommended for the South West Saurashtra region to Farmers as well as concerned Planners, NGOs and line departments.

- In normal years, the groundwater potential of South West Saurashtra region is estimated at 4060.66 MCM which is just sufficient to meet requirement of exiting cropping pattern. The water table in the North East area (Talukas: Bhesan, Dhari, Part of Visavadar, part of Junagadh) usually goes down up to 20m during pre monsoon. Therefore, water harvesting activities and low water requirements, crops should be encouraged to improve the groundwater conditions.
- Around Veraval and Talala, the transmissibility of aquifer is observed around 32 sq.m /hr. Veraval is near sea cost having low altitude, where as Talala having higher altitude. Talala, Mendarada and Visavadar and Malia talukas should be encouraged for surface water harvesting and well recharging (aquifer recharging) as this part has higher transmissibility and upland which creates groundwater flow seaward after recharge which helps to improve ground water quality at coastal belt as well enhance groundwater potential.
- Conjunctive use planning is recommended in good quality groundwater area also to reduce groundwater draft and save power costs.
- Around 2130 sq.km (23%) area of region is under degraded groundwater class during pre monsoon mostly found along coastal line. The area must be improved by bandharas

construction along costal areas, water harvesting structures and conjunctive water use planning. Also salt tolerance and low water requirement crops should be introduced.

- The absolute head continuously falling from North-East upland to sea cost. Just near coastal line 20 m of head remains in pre monsoon. Under such head condition, water harvesting and conjunctive water use planning should be encouraged. The streams must be checked before 2 km from sea coast by Bandhara system which will reduce sea water intrusion as well as not affects the river livelihood up to the end of river.

In the area of good class of groundwater, high value crops which can grow under local climatic conditions may be encouraged beside existing cropping pattern as good groundwater quality supply is possible to meet.

(Department of SWE., CAET, JAU, Junagadh)

Conjunctive use of surface water with groundwater for irrigating wheat crop

It is recommended to farmers, Planners and NGOs that conjunctive use of surface water from nearby water harvesting structures with groundwater for irrigating wheat crop in Junagadh region is benefited. Further it is recommended to Irrigation Department of Government of Gujarat to allow to use check dam water to nearby farmers freely instead of keeping it for recharge only after monsoon. As under conjunctive use 533.94 cum (7.72%) of groundwater draft per ha. can be reduced and 123.8 units power per ha. (4.9%) can be saved per irrigation given from check dam. It is economical when at least two irrigations given from surface sources and from second irrigation B/C can rise by 0.038 per irrigation given from check dam as compare to without Conjunctive water use. The conjunctive use can control up to 101 mm of evaporation loss from surface water sources. Good scopes are lying to avoid deep pumping, reduce groundwater draft and achieve higher economy by utilizing spill over water before it escapes from water harvesting structures.

(Department of SWE., CAET, JAU, Junagadh)

Summer sesame response to irrigation under drip and mulching technology

The farmers of the South Saurashtra region sowing summer sesame (Guj. Til - 3) crop are advised to adopt any one of the following two irrigation scheduling options through high discharge drip irrigation system (20lph drippers 1 m dripper spacing and 2m lateral spacing) with mulch application (5 tone/ha wheat straw) for getting the maximum return.

Option - I: When water availability is not limiting factor

The irrigation should be scheduled at IW/ET_c of 1.0. For that, the above said high discharge drip system should be run for 4 hr & 25 min(40 mm irrigation) immediately after sowing and 3 hr & 15 min (29.5 mm irrigation) at 8, 18, 28, 36, 43, 49, 54, 59, 64, 69 and 74 days after sowing.

Option - II: When Water availability is limiting factor

The deficit irrigation should be scheduled at IW/ET_c of 0.6. The saved water should be used to bring additional area under sesame crop cultivation at same deficit irrigation scheduling level. For that the above said high discharge drip system should be run for 4 hr & 25 min (40 mm irrigation) immediately after sowing , 3 hr & 15 min (29.5 mm irrigation) at 10 days after sowing and 3 hr & 40 min (33.3 mm irrigation) at 23, 36, 47, 58 and 70 days after sowing.

(Department of SWE., CAET, JAU, Junagadh)

Drought investigation using Standardized Precipitation Index (SPI) for Junagadh

The farmers of South Saurashtra Agro-climatic zone are advised to use the excess rainfall prevailing during 27-32nd standard weeks (2nd July to 12th August) judiciously and frugally towards supplemental irrigation to sustain crop productivity under rainfed agriculture.

(Research Testing & Training Center, JAU, Junagadh)

Effect of land configuration on groundnut yield

Farmers of South Saurashtra Agro-Climatic Zone growing bunch type Groundnut are advised to prefer Broad Bed Furrow (55cm width and 15cm depth of furrow and 100cm bed width between two furrows) land configuration for getting more moisture retention and higher return under rain fed agriculture.

(Research Testing & Training Center, JAU, Junagadh)

Performance of screen house for cultivation of capsicum

The farmers of South Saurashtra Agro-climatic Zone who are interested to cultivate the capsicum in protected structures are advised to use JAU developed screen house (poly-cum-shadenet house) covered with 50% green shadenet on periphery for natural ventilation and roof covered with 200 UVS PE sheet to get sufficient light. Under such type of structure, drip irrigation system with IW: CPE=0.8 should be used.

(Research Testing & Training Centre, JAU, Junagadh)

Year: 2013-14

Standardization of packaging technology of fresh guava fruits

The farmers, processors and exporters are recommended to adopt packaging technique developed by Junagadh Agricultural University for increasing the shelf life of guava fruit up to 18 days at room temperature by packing in 50 µ polyethylene bag at a vacuum level of 700 mm Hg.

(Department of Processing & Food Engineering, CAET, JAU, Junagadh)

Standardization of packaging technology of processed guava fruits

The farmers, processors and exporters are recommended to adopt hot air drying technique developed by Junagadh Agricultural University for preparing of guava powder by drying of fresh guava slices (3 mm thick) pretreated with 1 % $CaCl_2$ + 2 % Potassium Meta bi Sulphate (KMS) solution for 10 minutes at 60 ^{0}C drying air temperature and 1.25 m/s air velocity in drying period of 17 hours. The powder prepared by this method can be stored up to 80 days at room temperature by packing in 50µ polyethylene bag at a vacuum level of 700 mm Hg.

(Department of Processing & Food Engineering, CAET, JAU, Junagadh)

Preparation of custard apple powder by freeze drying methods

The processors and exporters are recommended to adopt freeze drying technique developed by Junagadh Agricultural University for preparing custard apple powder by freeze drying of fresh custard apple pulp (1.5 kg) pretreated with 5 % maltodextrine at -40 ^{0}C temperature with a drying period of 41 hours. The custard apple powder obtained by this method has better product quality and could be stored up to 90 days at room temperature when packed in 50 µ polyethylene bag at a vacuum level of 700 mm Hg.

(Department of Processing & Food Engineering, CAET, JAU, Junagadh)

Extraction of enzymes from potato peels substrate using *bacillus* group of bacteria

Potato processors and entrepreneurs are recommended to adopt a process technology developed by Junagadh agricultural university for the production of Alpha-amylase and protease enzymes through microbial and biochemical methods from bio waste (potato peel) using Bacillus Subtilis bacteria. This process is beneficial (BCR 7.54:1) as compared to readymade available enzymes in market.

(Department of Processing & Food Engineering, CAET, JAU, Junagadh)

Development of manually operated sapota cleaner

The farmers growing sapota are recommended to use hand operated Junagadh Agricultural University developed sapota cleaner (capacity: 120 kg/h) having perforated metal sheet drum (45 cm diameter and 90.5cm length) lined with jute cloth on inner surface and be operated at 65 rpm for 90 seconds with 66% free space (in batch) for cleaning and shining the sapota surface after harvesting to reduce human drudgery.

(Department of Processing & Food Engineering, CAET, JAU, Junagadh)

Development of tractor drawn plant thinning device for row crops

The farmers and manufacturers are recommended to use JAU developed mini tractor drawn two row plant thinning device for maintaining plant spacing of 10 to 12 cm for small seed crops like Pearl millet and Sesamum. High thinning efficiency can be achieved using this device. As compared to manual thinning, approximatly 70 % man-hours/ha can be saved.

(Department of Farm Machinery and Power, CAET, JAU, Junagadh)

Study on watershed development activities conducted in dark zone area of Junagadh district

The Planners, Designers, NGOs, Field Officers, and Government Departments of Junagadh district are recommended to use below given daily rainfall-runoff prediction equations for estimating daily runoff which are derived by JAU Junagadh using practically derived SCS Curve number (73.03) and adopting Remote Sensing approach. The groundwater contribution for the district can be taken as 12.67% of the above estimated runoff for efficient watershed planning. Additionally the updated Land Capability Classification for Ozat catchment in Junagadh can be taken as provided in the below table.

A) Rainfall – Runoff Relationships for Ozat Catchments (Daily basis)

S.N	Catchment Name	Rainfall (x) – Runoff (y) Equation*	R^2
1	Ambajal Catchment	y = 0.6403x - 11.459	0.9237
2	Motagujariya Catchment	y = 0.4599x - 5.9043	0.8317
3	Zanjeshri Catchment	y = 0.5525x - 7.7979	0.8971
4	Dhrafad Catchment	y = 0.5748x - 8.2758	0.8706
5	Ozat Weir-2 Catchment	y = 0.366x - 3.4271	0.7299
6	Ozat Weir-Shapur Catchment	y = 0.4994x - 5.9403	0.8571
7	Ozat Weir-Vanthli Catchment	y = 0.459x - 5.1273	0.8493
8	Ozat River Catchment	y = 0.5366x - 7.3009	0.8591

* Rainfall and Runoff are in mm

B) Updated Land Capability Classification for Ozat Catchment

Sr. No	Particular	Area, km^2	Percent (%)	Remark
1	CLASS - I	975.34	69.22	Cultivable land
2	CLASS - Il	7.67	0.54	
3	CLASS - IV	131.16	9.31	
4	CLASS - V	14.42	1.02	Uncultivable land
5	CLASS - VI	233.12	16.54	
6	Village	20.52	1.46	

7	River, Reservoir	26.93	1.91	
	Total	1409.16	100.00	

(Department of Soil & Water Engineering, CAET, JAU, Junagadh)

Geometry of wetting pattern under trickle irrigation

The following three models developed by JAU can be used to decide the lateral and emitter spacing in drip irrigation design for a particular emitter discharge in loamy soil.

Case: a) If moisture data before irrigation is not monitored

Planners Designers, NGO's, Field officers and Govt. Departments are recommended to use the following expression for determining the wetting dimensions if moisture information is not available

$$W = 0.516\ V^{0.393}\ (K_s / q)^{0.062} \qquad (R^2 = 0.983)$$

$$Z = 0.069\ V^{0.303}\ (K_s / q)^{-0.060} \qquad (R^2 = 0.965)$$

Where W = Diameter of wetted spread on the ground surface, *m*; q= emitter discharge in lph; V = volume of water application, *l*, and K_s = saturated hydraulic conductivity, *m/sec*; and Z= depth of wetting front below the emitter, *m*.

Case: b) If moisture data before irrigation is monitored then

The Planners Designers, NGO's, Field officers and Govt. Departments are recommended to use the following expression for determining the wetting dimensions if moisture information is available

$$R = \Delta\theta^{-452.978}\ v^{0.393}\ q^{-0.062}\ K_s^{-17352.497} \qquad (R^2 = 0.983)$$

$$Z = \Delta\theta^{-439.643}\ v^{0.303}\ q^{0.060}\ K_s^{-16840.965} \qquad (R^2 = 0.965)$$

Where R = Radius of wetted spread on the ground surface, *cm*; q= emitter discharge in *ml/h*; V = volume of water application *ml*; and K_s = saturated hydraulic conductivity, *cm/h*; and Z= depth of wetting front below the emitter, *cm*.

Case: c) If time of application is mentioned

The Planners Designers, NGO's, Field officers and Govt. Departments are recommended to use revised Debral (2012) model for greater accuracy for determining the wetting dimensions if time of irrigation is known:

$$W = 15.081\ t^{0.418}\ q^{0.448}\ K_s^{0.091} \qquad (R^2 = 0.960)$$

$$Z = 27.185\ t^{0.303}\ q^{0.363}\ K_s^{0.174} \qquad (R^2 = 0.965)$$

Where W= Diameter (*m*); q = emitter discharge cumec; t = time of application sec; Ks = saturated hydraulic conductivity, *m/sec*; Z = depth of wetting front below the emitter (*m*).

(Research Testing & Training Center, JAU, Junagadh)

Year: 2014-15

Impact of irrigation regimes and mulching on the economic productivity of drip irrigated cotton

Farmers of South Saurashtra Agro-climatic Zone growing Bt. Cotton are advised to adopt drip irrigation (with 1.2m lateral spacing, 40 cm dripper spacing and emitter discharge of 2 lph) in raised bed covered with silver black plastic mulch of 20 micron and irrigate every alternate day at 0.8 ET_c level (or to operate system for 2 to 3.5 hrs, 2.25 to 3.25 hrs and 1.25 to 3 hrs during SeptemberOctober-, November-December and January, respectively) for acquiring higher yield (33 %) and water use efficiency (79 %), higher water productivity (91 %)and higher net return over no mulch.

(Research Testing & Training Center, JAU, Junagadh)

Extraction of Pectin from Kesar Mango Peel by Resins

Mango processors are recommended to adopt a process technology developed by Junagadh Agricultural University for the production/extraction of pectin from mango peel using cation exchange resin as an extracting medium with peel to extracting medium ratio of 1:4, extraction pH of 2.56, extraction temperature of 80 °C, extraction time of 60 min and two extractions. This method can give better yield and quality of pectin with benefit cost ratio (BCR) of 1.17.

(Dept. of Processing and Food Engg., CAET, JAU, Junagadh)

Development and performance evaluation of low cost greenhouse fertigation irrigation system

The greenhouse / net house growers are advised to use low cost greenhouse fertigation system developed by Junagadh Agricultural University to apply fertilizer through drip irrigation as well as interested manufacturers are recommended for manufacturing this system.

(Dept. of Renewable Energy & Rural Engg., CAET, JAU, Junagadh)

Studies on microclimate and plant growth of capsicum under different type of Shade net

The farmers of South Saurashtra Agro-climatic Zone are recommended to adopt white coloured 50 per cent shade net house for cultivation of capsicum. This type of net house results in early production approximately 10-12 days, protection from insects/pests, diseases and higher yield of capsicum as compared to use of green, black and blue coloured shade net house.

(Dept. of Renewable Energy & Rural Engg., CAET, JAU, Junagadh)

Effect of mulch and irrigation level by drip on water use efficiency and yield of water melon

The farmers of South Saurashtra Agro-climatic Zone are advised to use silver black plastic mulch (20 µm) with drip irrigation at 0.6 ETc level to achieve higher crop production of water melon in summer season.

Details of mulching technology :		**Details of irrigation system :**	
1	Mulch film: 20 µm silver black plastic	1	Lateral spacing : 180 cm
2	Bed size: (a) Top width : 40 cm (b) Bottom width : 70 cm (c) Height : 30 cm	2 3 4	Dripper spacing : 40 cm Dripper discharge : 2 lph Irrigation scheduling :
3	No. of row per bed : 2		Feb. : 20 to 45 min/day March: 30 to 95 min/day April : 70 to 105 min/day May : 70 to 90 min/day
4	Spacing : (a) Bed spacing : 180 cm (b) Row spacing : 20 cm (c) Plant spacing : 40 cm		

(Dept. of Renewable Energy & Rural Engg., CAET, JAU, Junagadh)

Year: 2015-16

Evaluation of different mulches for sapota crop under drip irrigation

Farmers of South Saurashtra Agro-climatic Zone growing sapota (Kalippati) are advised to adopt drip irrigation (2 drippers per plant up to 2 years and after that 4 dripper per plant, dripper discharge of 4 lph) covered with black plastic mulch of 100 micron and irrigate every alternate day at 0.6I W/ET_c (or apply water 14, 34, 48, 34, 8, 11 and 9 liters per day per plant during January-February, March-April, May, June, July-August, September-October

and November-December, respectively) for acquiring higher yield and net return of sapota over no mulch.

(Research, Training & Testing Centre (RTTC), JAU, Junagadh)

Preparation of extruded products from flour of amaranth grain, sago and defatted groundnut

Food processors are advised to prepare quality cold extruded pasta by blending defatted groundnut flour, amaranth flour and sago flour (as a binder) in the ratio of 20, 70 and 10 % respectively followed by sun drying for 14 hours in summer months or in solar cabinet dryer for 1 hour at 55 ^{0}C. The product can be stored in transparent polyethylene (LDPE) bags of 75 micron to retain the good quality at least up to two months of storage period.

(*Dept. of Processing & Food Engg., College of Agril. Engg. & Tech., JAU, Junagadh*)

Development of power operated sapota cleaner

The farmers are recommended to use power operated sapota cleaner developed by Junagadh Agricultural University for cleaning and shining sapota surface after harvesting. This machines saves 90 per cent cost of cleaning as compared to manual cleaning. Machine capacity is 575 kg/hr.

(*Dept. of Processing & Food Engg., College of Agril. Engg. & Tech., JAU, Junagadh*)

Effect of different structures on protection of cumin crop against adverse climate

The farmers of South Saurashtra Agro-climatic Zone are recommended to adopt plastic (LDPE-50 micron) low tunnel (sing tunel size: 4 x 2 x 1 m) covered with 30% shade net at both the ends for cultivation of cumin. This type of structure protects the crop from adverse climate, insects/pests, diseases and results in better quality and higher yield of cumin. It can be used for seed production also.

(*Dept. of Renewable Energy & Rural Engg., College of Agril. Engg. & Tech., JAU, Junagadh*)

Year: 2016-17

Design and development of a tractor mounted rural transporter

Farmers are recommended to use tractor mounted "JAU Rural Transporter" for carrying up to 500 kg live/dead load for better safety and fatigue reduction as compared to carrying on tractor mudguard or trailer. Rural transporter is also released for commercial exploitation.

(Department of Farm Machinery & Power, CAET, JAU, Junagadh)

Effect of protected environment on off-season seedling raising of Papaya

The farmers of South Saurashtra Agro-climatic Zone interested to raise papaya seedling in protected structure are advised to use poly-cum-shade net house covered with 50 % white shade net on periphery and roof covered with 200 micron UVS polyethylene sheet.

(Department of Renewable Energy & Rural Engg., CAET, JAU, Junagadh)

Evolvement of mulching technology for bunch type groundnut crop

The farmers of South Saurashtra Agro-climatic Zone are advised to use silver black plastic mulch (20 µm) with drip irrigation and raised bed for water saving and to achieve higher yield of bunch type groundnut in summer season.

Details of mulching technology	
1	Mulch film: 20 µm silver black plastic
2	Bed size: (a) Top width: 75 cm (b) Bottom width: 90 cm (c) Height: 20 cm
3	No. of rows per bed : 3
4	Spacing: (a) Bed spacing :120 cm (b) Row spacing: 20 cm (c) Plant spacing: 20 cm

Details of drip system	
1	No. of laterals / bed : 2
2	Lateral spacing: 20 cm
3	Dripper spacing: 40 cm
4	Dripper discharge: 2 lph
5	Irrigation scheduling : a. Feb.: 10 to 15 min/day b. March: 30 to 35 min/day c. April: 40 to 45 min/day d. May: 55 to 60 min/day

(Department of Renewable Energy & Rural Engg., CAET, JAU, Junagadh)

Aquifer mapping of Uben river basin

The farmers, NGOs and line department's people are advised to construct ground water recharge structures and shaft recharging technique for augmenting ground water resources around the area starting from Sakkarbaugh, Vadal, Choki, Makhiyala up to Fareni. Keeping and view the higher horizontal, vertical hydraulic conductivity and transmissibility of unconfined/ confined aquifer. The surface water harvesting structures should be encouraged for augmenting the surface water resources in rest parts of the Uben basin.

(Department of Soil & Water Engg., CAET, JAU, Junagadh)

Conjunctive effect of emitter configuration and irrigation regimes on productivity of Cumin

Farmers of South Saurashtra Agro-climatic Zone growing cumin are advised to adopt drip irrigation with triangular geometry having 0.6 m lateral spacing and 2 lph emitter discharge and to irrigate at 4 days interval with 0.8 IW/ETc (2 hours) for acquiring higher yield (38 %), water use efficiency (60.95 %), water productivity (61 %) and net return (38.87 %) as compared to farmers' practices.

(Research, Training & Testing Center, JAU, Junagadh)

Design and development of tractor operated FYM applicator

Tractor operated Farm Yard Manure applicator developed by Junagadh Agricultural University is recommended for farmers' use and for commercial exploitation to apply FYM at desired row spacing within furrow as per requirement. It saves time and economical as compared to manual FYM application.

(Research, Training & Testing Center, JAU, Junagadh)

Rain water management for sustaining cotton productivity in medium black soils under dry farming conditions

The farmers of North Saurashtra Agro-climatic Zone growing Bt. cotton are advised to apply FYM @ 10 t/ha and kaolin @ 4 % spray (400 gm/10 liter water) at dry spell for obtaining higher productivity and maximum net returns as well as for getting maximum rain and crop water use efficiency under dry farming conditions.

(Dry Farming), Dry Farming Research Station, JAU, Targhadia)

Rainwater management for sustaining groundnut productivity in medium black soils under dry farming conditions

The farmers of North Saurashtra Agro-climatic Zone growing groundnut (GG 20) are advised to apply FYM @ 10 t/ha and kaolin @ 4 % spray (400 gm/10 liter water) at dry spell for obtaining higher productivity and net returns as well as maximum rain and crop water use efficiency under dry farming conditions.

(Dry Farming), Dry Farming Research Station, JAU, Targhadia)

V. FISHERIES SCIENCE

Year: 2004-05

Breeding season of *Mugil seheli*

It is recommended to fisherman and scientific community that gravid female (length : 375 mm & above) and male (length : 341 mm & above) of *Mugil seheli* are available in coastal seawater of Okha-Mandal region during its major breeding season late August to September and minor breeding season February. To maintain the population of *Mugil seheli* in coastal seawater of Okha-Mandal region, fishermen should not catch the fish during these periods.

(Fisheries Research Station, JAU, Okha)

Fish drying

For faster drying and better nutritional values of dried fish (particularly to get lower acid insoluble ash), drying of fish in solar dryer is advisable as compared to sun drying.

(College of Fisheries, JAU, Veraval and Department of APE, CAET, JAU, Junagadh)

Oyster larvae feed

It is advisable to keep 25 ppt water salinity and 3000 lux of light intensity for getting speedy multiplication of cells of *Isochrysis galbana* - the live feed for Oyster larvae.

(Fisheries Research Station, JAU, Okha)

Year: 2006-07

Mullet fish culture

It is recommended to incorporate *Prosopis juliflora* pod powder @ 20 % alongwith fish meal - 10 %, soyabean meal – 40 %, wheat bran – 15 % and cotton seed oil cake - 15 % in pelleted feed for higher production as well as greater survival rate in mullet fish culture.

(Fisheries Research Station, JAU, Okha)

Shrimp

It is recommended to incorporate probiotics (*Lactobacillus acidophilus*) @ 20 per cent in feed during culture of shrimp for higher production.

(Fisheries Research Station, JAU, Okha)

Year: 2007-08

Microbial population in water at fish landing centre of Veraval

The fishermen of Veraval coast are advised not to use sea water of the coast for washing/cleaning of fish catch as the sea water of Market hall, Jetty and Diwadandi areas contains pathogenic bacteria beyond permissible limit (>20 *E. coli* /ml).

(College of Fisheries, JAU, Veraval)

Year: 2009-10

Standardization of transportation method for the fresh water mussel (*Lamellidens corrianus*)

It is recommended to fish farmers that freshwater mussel (*Lamellidens corrianus*) in the Saurashtra-Kutch region can be transported by road using wet gunny bags upto eight hours.

(College of Fisheries, JAU, Veraval)

Artemia (*Artemia fransiscana*) cyst production in varying salinity

It is recommended to salt paners and aquaculturist of coastal Saurashtra to use 160 ppt salinity of sea water as a rearing medium for Artemia (*Artemia fransiscana*) to obtain higher cyst production.

(Fisheries Research Station, JAU, Okha)

Year: 2010-11

Population growth of rotifer *Brachionus rotundiformis* Tschugunoff in varying salinity

Finfish/crustacean hatchery entrepreneurs are recommended to use 15 to 20 ppt salinity water at 25^{o} C to achieve higher production of rotifer, *Brachionus rotundiformis* in 10 days.

(Fisheries Research Station, JAU, Okha)

Study of location specific growth rate in marine alga *kappaphycus alvarezzi*

It is recommended that carrageenan yielding marine alga *Kappaphycus alvarezii* can be grown profitably in Okha mandal region and five fold growths can be achieved in 45 days from January onwards. (Fisheries Research Station, JAU, Okha)

Year: 2011-12

Foulers and borers of pearl Oyster (*Pinctada fucata*) in around Sikka area

The aqua farmers of the Gulf of Kutch are advised to take appropriate control measures as the Pearl Oysters has been found to be infested by the foulers and borers such as sponges like *Cliona vastifica, Cliona carpenteri, Cliona celata,* Coelenterate like Bryozoans and Hydroids, crustaceans like copepod, *Balanus amphrite,* pea crab, bivalves like Crassostrea, animals of minor phyla like isopod, amphipod and tunicates like Ascidians sp. and annelids like Tubiculous and Serpulid worms.

(Fisheries Research Station, JAU, Sikka)

Year: 2012-13

Survey for cultivable brackish water fish seeds along coast of Okha mandal to Harshad creek

The fish farmers of saurashtra are recommended to collect the fry of cultivable mullet species *Mugill cephalus* are available abundantly, during February at Rupen and Harshad creeks;*Mugillseheli* during October-November at Khatumba and *MugillParsia* during August-September at Rupen and Harshad creeks.

(Fisheries Research Station, JAU, Okha)

Year: 2013-14

Evaluation of stocking density of carp fry in rearing pond

Fish farmers of Saurashtra region are recommended to stock rohu fry @1.00 lakh per hectare in rearing ponds for obtaining better growth and survival rate.

(College of Fisheries Science, JAU, Veraval**)**

Effect of different levels of protein diet on the growth and survival of Mugil cephalus (Linnaeus) fry

Fish farmers of Saurashtra are recommended to feed gray mullet *Mugil cephalus* fry reared in seawater with 35% protein incorporated diet in first 45 days for obtaining higher growth and survival

(Fisheries Research Station, JAU, Okha)

Effect of different salinities on density of Chaetoceros calcitrans

Hatchery owners of Saurashtra region are recommended to use 30 PPT saline water to grow *Chaetoceros calcitrans* for higher yield.

(Fisheries Research Station, JAU, Sikka)

Effect of monospecies and mixed species' diet on growth and survival of pearl oyster (*Pinctada fucata*)

Hatchery entrepreneurs of Saurashtra region are recommended to use 50% Isochrysis galbana and 50% *Chaetoceros calcitrans* as a feed for pearl oyster rearing for better growth and profit.

(Fisheries Research Station, JAU, Sikka)

Year: 2014-15

Growth, mortality and stock assessment of Soldier cat fish *Osteogeneiosus militaris* of Veraval coast

The present level of fishing of the Soldier cat fish confirmed that the stock is over exploited in Veraval. Hence, it is recommended to fishermen of Veraval not to increase the fishing efforts.

(FRM Dept., College of Fisheries, JAU, Veraval)

Study the effect of some natural cryoprotectants on quality of Japanese threadfin breams (*Nemipterus japonicus*) surimi during frozen storage

Surimi processors and exporters are recommended to use 1% shrimp chitosan as natural cryoprotectant in Japanese threadfin bream surimi to get better gel strength and good water holding capacity instead of commercially used cryoprotectants (sugar, sorbitol, polyphosphate) upto 240 days under frozen storage at -18^{o}C.

(Dept. of Harvest and Post-harvest Technology, College of Fisheries, J.A.U., Veraval)

Effect of salinity on survival rate of *Penaeus monodon* larvae

It is recommended to hatchery entrepreneurs to use 15 ppt salinity water for larval (zoea and mysis) rearing and 20 ppt salinity water for post-larval (PL1 to PL20) rearing of *Penaeus monodon* for higher survival.

(Research Officer, Fisheries Research Station, JAU, Okha)

Year: 2015-16

Study of density dependent growth and survival of *Macrobrachium rosenbergii* (scampi)

Fish farmers are recommended to stock freshwater prawn *Macrobrachium rosenbergii (*Scampi) seeds @ 20,000 per hectare in grow-out ponds for obtaining better growth, survival rate and economic returns.

(Inland Fisheries Research Station, JAU, Junagadh)

Aspects of biology and fishery of *Scylla serrata* and *Portunus pelagicus* in and around Sikka

Fishermen community engaged in Crab fishing are advised to avoid capture of berried female Crabs having orange, greenish, brownish or blackish eggs for sustainable Crab resource.

(Fisheries Research Station, JAU, Sikka)

Year: 2016-17

Effects of Pro-biotics on survival, growth and biochemical changes in *Labeo- rohita* fry

Fish farmers are recommended to incorporate three Probiotics *Lactobacillus subtilis (*15 x 10^7 cfu/g), *Bacillus subtilis (*10 x 10^7 cfu/g) and *Sacromyces cerevisiae (*10 x 10^7 cfu/g) in the ratio of 4:3:4 @ 3 % in fish feed to obtain higher growth, nutritive value and survival rate of *Labeo rohita* in rearing pond.

(Inland Fisheries Research Station, JAU, Junagadh)

Effect of dressing on quality and shelf life of dried bombay duck (*Harpodon nehereus*) during storage

It is recommended to fish processors that removal of gill and gut in bombay duck (*Harpodon nehereus*) before sun drying may be adopted for better quality and storage period up to six months.

(Department of Fish Processing Tech., College of Fisheries Sci., JAU, Veraval)

Effects of different salinities on growth and survival of juvenile Pacific white shrimp, *Litopenaeus vannamei* (Boone, 1931)

Shrimp farmers are recommended to use 30 ppt salinity water or select areas having such salinity water for higher growth and survival of shrimp *Litopenaeus vannamei*.

(Fisheries Research Station, JAU, Okha)

Effects of gamma irradiation on the quality of sun-dried croaker (*Johnius dussumieri)*

The dry fish processors/exporters are recommended to apply dose of 5 kGy gamma irradiation to dry salted croaker (*Johnius dussumieri*) fish for better quality and nine months shelf-life.

(Fisheries Research Station, JAU, Okha)

Effect of bottom sediments on moulting to *Fenneropenaeus merguiensis* in circular cement tank

Shrimp farmers are recommended to culture *Fenneropenaeus merguiensis* (Banana shrimp) with pond bottom of sea sand + mud (50:50) mixture of 6 inch sediment thickness, for better growth and survival rate.

(Fisheries Research & Training Center, JAU, Mahuva)

VI. ANIMAL HEALTH & ANIMAL PRODUCTION

Year: 2004-05

Animal Feed

Jowar straw and groundnut gotar in 70:30 ratios instead of Jowar straw alone can meet the daily maintenance need of Gir bullocks.

(Cattle Breeding Farm, JAU, Junagadh)

Aforestation

Under rainfed agro-climatic situation of South Saurashtra, tree species *Azadirechta indica*, *Acacia nilotica*, *Ziziphus mauritiana* and *Tectona grandis* have fairly good survival and growth rate on barren, degraded and wasteland. Therefore, these tree species can be planted to conserve afforestate and improve such land.

(Cattle Breeding Farm, JAU, Junagadh)

Year: 2006-07

Milk replacer

Milk replacer containing the following ingredients is useful to replace 50 per cent of whole milk for feeding weaned Gir calves, without any adverse effect on body growth. Ingredient composition for one kg milk replacer is wheat flour -100g, soybean meal, 120g, groundnut cake meal - 400g, skim milk powder-130g, coconut oil-100g, butyric acid- 3g, molasses/jaggary-65 % - 100g, mineral mixture - 32g and citric acid- 15g.

(Cattle Breeding Farm, JAU, Junagadh)

Year: 2009-10

Replacement of groundnut *gotar* (haulm) with urea treated straw in composite feed blocks for Gir heifers

The farmers and livestock owners of Saurashtra are recommended that in the ration of Gir heifers, inclusion of four per cent urea treated wheat *bhusa* in place of groundnut *gotar* (haulm) results in 19 per cent higher live weight gain at 23 per cent lower cost of feeding.

(Cattle Breeding Farm, JAU, Junagadh)

Milk production in Gir cows on no green rations

Feeding of 4 per cent urea treated wheat straw as sole roughage source to lactating Gir cows could sustain milk production up to 3.4 lts/day economically with 139 per cent higher returns compared to feeding *ad. Lib*. wheat straw and five kg green jowar fodder/cow/day.

(Cattle Breeding Farm, JAU, Junagadh)

Year: 2011-12

Impact of herd composition on herd performance traits in Gir cattle

On a large farm of Gir cattle in South Saurashtra region, herd structure of 330-345 heads with 100-110 (30-33%) cows, 65-70 (18-21%) breedable heifers and 245-250 (72-75%) total female proportion in the herd is optimum to achieve higher wet average (7.3-7.7 lit), herd average (4.2-4.7 lit), % milch cows (55-60%) and higher return over feed cost (140 %) in the herd.

(Cattle Breeding Farm, JAU, Junagadh)

Impact of herd composition on herd performance traits in Gir cattle

Dairy farmers/gaushalas of Gir herd in South Saurashtra region desiring to improve herd performance and return should set optimum targets of herd performance traits of 7.6 lit. wet average, 4.3 lit. herd average and more than 64 % milch cows for economical and sustainable dairy farming.

(Cattle Breeding Farm, JAU, Junagadh)

Breeding and lactation efficiencies of Gir cows

Dairy farmers of large herd of Gir cattle in South-Saurashtra region should set the target of age at first calving < 44 months and calving interval of 14 months to improve these traits for maximum return. They can maintain Gir cows up to 8 lactations for economical dairy farming; however, high yielding cows may be maintained for more than 8 lactations also.

(Cattle Breeding Farm, JAU, Junagadh)

Breeding and lactation efficiencies of Jaffrabadi buffaloes

Dairy farmers of large herd of Jaffrabadi buffaloes in South-Saurashtra region should set age at first calving of 47 months and calving interval of 15 months as targets to improve these traits for maximum return. They can maintain Jaffrabadi buffaloes upto 6 lactations for economical dairy farming, however, high yielding buffaloes may be maintained for more than 6 lactations also.

(Cattle Breeding Farm, JAU, Junagadh)

Year: 2012-13

Effect of restricted suckling on lactation and reproductive performance of Gir cows

Dairy farmers keeping Gir cows are advised to practice restricted suckling of calves to reduce the incidences of short lactations and low lactation milk yields due to short lactations. There is increased overall milk production in suckled cows as compared to non-suckled cows. Even though there is delay in service period by 1 cycle, it is off-set by over-all benefits in production performance of suckled cows.

(Cattle Breeding Farm, JAU, Junagadh)

Effect ofrestricted suckling on growth performance of Gir calves

Dairy farmers keeping Gir cows are advised to practice restricted suckling up to 5 months of age (daily 2 to 2.5 lit during birth to 1 mo., 3 to 4 lit during 1 to 3 mo. and 1 to 1.5 lit during 4 to 5 month age) and then stop suckling of the calves. This improves growth performance (412 vs. 312 gm/d) and body weight of calf at 3 months of age (59 vs. 51 kg) with lesser milk consumption (319 vs. 279 lit per calf) over that in weaning.

(Cattle Breeding Farm, JAU, Junagadh)

Effect of age and body weight at calving on lactation performance of primiparous Gir cows

Farmers keeping Gir animals are advised to maintain 300 to 350 kg. body weight at first calving in Gir heifers for obtaining higher lactation milk yield.

Year: 2013-14

Morbidity and mortality in Gir cattle herd

In South Saurashtra region, in an organized dairy farm of Gir cattle:

1. Overall annual mortality averages around 6 per cent in the herd. Higher mortality occurs from birth to 1 month of age especially, during November–December months on account of colibacillosis and pneumonia.
2. Mastitis, colibacillosis, fever and pneumonia are major health disorders in Gir cattle.

Therefore, dairy farmers of Gir cattle are advised to take all possible care and precautions during first month of calfhood especially during November-December months to keep incidence of diseases and mortality at the minimum.

(Cattle Breeding Farm, JAU, Junagadh & Dept. LPM, Vet. Coll., JAU, Junagadh)

Morbidity and mortality in Jaffrabadi buffalo herd

In South Saurashtra region, in large dairy farm of Jaffrabadi buffaloes:

1. Overall annual mortality averages around 11 per cent in the herd. Higher mortality occurs from birth to 1 month of age group especially, during September-October months on account of colibacillosis and pneumonia.
2. Colibacillosis, fever, mastitis and gastroenteritis are major health disorders in Jaffrabadi buffaloes.

Therefore, dairy farmers of Jaffrabadi buffalo are advised to take all possible care and precautions during first month of calfhood especially during September-October to keep incidence of diseases and mortality at the minimum.

(Cattle Breeding Farm, JAU, Junagadh & Dept. LPM, Vet. Coll., JAU, Junagadh)

Year: 2016-17

Hydrocyanic concentration during different stages of growth in Gundri jowar (*Sorgum vulgare*) and Baru (*Sorgum helipensis*)

Sorgum vulgare (jowar) and *Sorgum helipensis (baru)* fed at 25 per cent flowering stage is safe for ruminants as the HCL content is below the toxic level.

(Cattle Breeding Farm, JAU, Junagadh)

VII. BASIC SCIENCE

Year: 2006-07

Jivanti

The nurserymen and medicinal plant growers of Saurashtra region are advised to grow *dodi (Jivanti)* seed immediately after removal from follicle for obtaining maximum germination. The seeds sown up to three weeks after removal from follicle germinate up to 65 per cent.

(Department of Agril. Botany, JAU, Junagadh)

Year: 2007-08

Germination study in Rukhdo Rukhdo (*Adansonia digitata*)

The nurserymen are advised to sow fresh seeds of Rukhdo (*Adansonia digitata*) treated with 40 % sulfuric acid (H_2SO_4) for 48 hrs or the seed cracked with hexoblade to get maximum seed germination.

(Department of Agril. Botany, JAU, Junagadh)

Year: 2012-13

The effect of harvesting dates on fresh seed dormancy in pearl millet hybrids

Farmers of South Saurashtra Agro-climatic Zone taking hybrid seed production of pearl millet are recommended to harvest the crop between 25 to 35 days after flowering. They are also recommended to dry and store the seed for 20 to 30 days after harvesting them, in order to get maximum germination and enhanced seedling vigour.

(Department of Genetics & Plant Breeding, JAU, Junagadh)

Year: 2013-14

Effect of NAA on seed cotton (*Gossypium hirsutum* L.) yield

The farmers of South Saurashtra Agro Climatic Zone growing Bt cotton under irrigated condition are advised to spray growth promoter Naphthalene Acetic Acid (NAA) @ 30 ppm(300 mg /10 lit. water) at 50 DAS & 70 DAS for better growth to obtain higher seed cotton yield and net return. This is due to high chlorophyll content, increase in plant height, thickness of leaves, length of sympodia, number of squares and number of bolls.

(Cotton Research Station, JAU, Junagadh)

Effects of plant growth regulators on buds and bolls shedding in cotton (*Gossypium hirsutum* L.)

The farmers of South Saurashtra Agro Climatic zone growing Bt cotton under irrigated condition are advised to spray growth inhibitor Cycocel / Chlormequat Chloride (CCC) @ 40 ppm at 90 DAS (400 mg / 10 lit. water) for minimizing buds and bolls shedding to obtain higher seed cotton yield and net return. This is due to high chlorophyll content, increase in thickness of leaves, number of squares, number of bolls and minimum boll shedding.

(Cotton Research Station, JAU, Junagadh)

Year: 2014-15

Effect of Brassinolide foliar spray on yield and yield attributing characters of wheat

The farmers of South Saurashtra Agro-climatic Zone growing wheat under irrigated condition are recommended to spray growth promoter Brassinolide (BS) @ 0.01mgL^{-1} (12.5 ml Brassinolide dissolved in 5 litres water, from which 150 ml is taken and diluted to 15 litres solution) at milk dough stage to obtain higher grain yield and net return.

(Dept. of Genetics and Plant Br., CoA, JAU, Junagadh)

Response of sesame (*Sesamum indicum* L.) to growth regulators

The farmers of North Saurashtra Agro-climatic Zone growing sesame in *kharif* season are recommended for foliar spray of Indole Acetic Acid (IAA) 100 ppm (1 gram/10 liter water) at flowering stage for obtaining higher yield and net return.

(Dry Farming Res. Station, JAU, Targhadia)

Effects of foliar application of organic and inorganic substances on the yield of chick pea (GJG-3) under limited water supply

The farmers of North Saurashtra Agro-climatic Zone (AES-VI) growing chickpea (Var.GJG-3) in *rabi* season are recommended to apply two irrigation (one at flowering and second at pod development stage) along with recommended dose of fertilizer (20:40 NP kg/ha) and foliar application of KNO_3 @ 2 per cent twice at flowering and pod development stages for obtaining higher yield and maximum net return.

(Dry Farming Res. Station, JAU, Targhadia)

Effect of foliar spray of plant growth retardants on growth and yield parameters of *kharif* groundnut

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut are recommended for foliar spray of cycocel (50 % SL) @ 1000 ppm (2.0 ml/lit) at 30 Days after sowing (DAS) or foliar application of paclobutrazol (23 % w/w SC) @ 500 ppm (2.5 ml/lit) at 60 DAS to suppress the excess vegetative growth and to get higher pod yield and net return.

(Main Oilseed Research Station, JAU, Junagadh)

Year: 2015-16

Effect of foliar spray of micro-nutrients on growth and yield parameters of summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are advised to apply the foliar spray of zinc sulfate 0.5% (2.5 Kg ha^{-1} in 500 liter water) at 35 and 70 DAS for higher vegetative growth, pod yield and net return.

(Main Oilseeds Research Station, J.A.U., Junagadh)

Effect of plant growth regulators and detopping on yield of Bt cotton (*Gossypium hirsutum* L.) under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone growing Bt cotton in *kharif* season are advised for detopping at 75 DAS + spray of ethrel (Ethylene-39 %) 50 ppm (1.3 ml/10 liter water) at 90 DAS for obtaining higher yield and net return. This is due to higher values of tap root length, number of monopodia and number of sympodia per plant and improved quality of seed i.e. ginning percentage, increase uniformity ratio, elongicity percentage and tenacity.

(Dry Farming Research Station, JAU, Targhadia)

Effect of plant growth regulators and detopping on morpho-physiological components of yield in cotton (*G. hirsutum* L.)

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton under irrigated condition are recommended for detopping the cotton plant at 75 DAS for balance growth to obtain higher seed cotton yield and net return. This is due to high chlorophyll content, increases in thickness of leaves, length and number of sympodia, plant spread and number of bolls.

(Cotton Research Station, J.A.U., Junagadh)

Year: 2016-17

Effect of brassinolide on physiological and yield related traits of chickpea and their relationship with yield

The farmers of South Saurashtra Agro-climatic Zone growing chickpea under irrigated condition are advised to use growth regulator Brassinolide (BS) as a seed treatment

for 2 hrs @ 0.50 mgl^{-1} (0.04 % i.e. 12.5 ml BS and make up 10 liter solution) to obtain higher seed yield and net return**.**

(Department of Genetics and Plant Breeding, JAU, Junagadh)

Efficiency of foliar spray of growth regulating substances for enhancing seed yield under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone growing *kharif* pearl millet are advised to go for foliar application of potassium chloride 1.5 % (7.5 $kgha^{-1}$ in 500 liter water) at 30-35 and 50-55 DAS for higher vegetative growth, seed yield and net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)