

## Agricultural Research Station, Sriganganagar



The Irrigated North-Western Plain Zone (1b) comprises two districts of Rajasthan, Sriganganagar and Hanumangarh, which are located between 28.40 to 30.60 North latitude and 72.30 to 75.30 East longitudes. The zone has geographical area of 20.6 lac hectares out of which about 74 per cent area is under cultivation. The Ferozpur district of Punjab and Hissar district of Haryana form North-Western boundary, Churu and Bikaner districts of Rajasthan form South boundary and International border of Pakistan forms the North and North-Western boundary of the zone. Fifty percent of the cultivated area in the zone is irrigated. The Gang canal, Bhakhra canal and Indira Gandhi Canal are the major sources of irrigation in the zone. The zone has extreme climatic conditions with the scorching summer, cold winter and mild rainy season. Dust storms during summer, frosty winter nights and ground fog are some of the typical features of weather hazards. The mean annual rainfall of the zone is 322 mm.

### Zone 1b Area



### Lead Functions of ARS, Sriganganagar

- ❖ Cotton, Chickpea (irrigated)
- ❖ Water & Soil Management
- ❖ Crop Physiology
- ❖ Fruit Research (Kinnow, Malta, Peach, Grape) including Horticulture
- ❖ Biological control of Insect-Pest and Disease
- ❖ Integrated nutrient management
- ❖ Groundnut, Cluster bean (ARSS, Hanumangarh)

## Verification function

- ❖ Mustard, Wheat, Paddy, Clusterbean, Groundnut, Sugarcane
- ❖ Drip irrigation in Horticulture
- ❖ Testing & modification of farm tools and implements for increasing farm efficiency.
- ❖ Sesame (ARSS, Hanumangarh)

## Latest Projects

### 1. AICRP on Chickpea



**Objectives:** Development of high yielding disease and insect – pest resistant varieties of chickpea and refinement of crop production and plant protection technologies for increased chickpea production under irrigated conditions

### 2. AICRP on Mustard



**Objectives:**

- a. Development for high seed & oil yielding mustard varieties resistant to biotic and abiotic stresses.
- b. To evolve the production and protection technology for maximizing the mustard production.
- c. Popularization of improved varieties, production and protection technology among farmers.

### 3. ACIRP on Cotton



#### Objectives:

To develop cultivars and hybrids best suited for different agro-climatic zones of India.

### 4. AICRP on Sugarcane



#### Objectives:

- a. To carry out research in the field of crop improvement, crop production and plant protection
- b. To work on the evaluation of high yielding, drought resistance and good ratooning potential varieties with higher sucrose.
- c. To develop location/Region specific package of practices for crop production.
- d. To control disease and pests by developing the effective control measures.

## **5. AICRP on Integrated Water Management**



### **Objectives:**

- a. To find out optimum irrigation schedule for crops & cropping sequences of the zone by different irrigation methods.
- b. To find out optimum crop sequence under constraints of water supply.
- c. To find out optimum irrigation requirement of crops under high water table.
- d. Evaluation of different irrigation methods.
- e. Interaction studies of irrigation water with other agri-inputs.
- f. Studies on soils in relation to water management and long term effect of canal irrigation on soil properties.
- g. To improve water use efficiency in canal command.

## **6. AICRP on Fruits (Citrus)**



### **Objectives:**

- a. Collection, conservation and evaluation of germplasm for improvement.
- b. Standardisation of production technology viz., rootstock, population density, nutrition, cropping system, weeds control and water management.
- c. Standardization of crop protection techniques for identified mandate fruits.

## 7. Graimin Krishi Mousam Sewa (GKMS)



- a. To provide location specific weather forecast & agro meteorological advisory (AAS) as per different climatic condition & cropping pattern.
- b. To implement an efficient outreach system so that the farmers receive weather based agro-advisories specific to their areas & crops on real time basis.
- c. To set up operational arrangements for AAS involving extension & information dissemination agencies.

### Facilities

- ❖ **Laboratories:** Well established laboratories in various projects viz, Water management, Tropical Fruits (Citrus), Oilseed and Pulses, Cotton, Sugarcane etc., to serve the purpose of analysis in almost all related disciplines.
- ❖ **Video Conferencing Hall:** Well equipped Video Conference hall to communicate with farmers and Institutional meetings.
- ❖ **Guest House:** A Guest House is established at ARS, Sriganagar to provide accommodation to Agriculture dignities come across the Nation.

### Farms at ARS, Sriganagar 78.2 ha (Cultivated area – 68.2 ha)

- ❖ Citrus Orchard
- ❖ Experimental Unit
- ❖ Seed Production Unit

### Farms at ARSS, Hanumangarh 56 ha (Cultivated 53 ha)

- ❖ Seed Production Unit
- ❖ Experimental Unit

### Recent recommendations included in Package of Practices of the Zone 1b

#### Chickpea

- ❖ Desi Chickpea variety GNG 2144 (Teej for late sown) included in PoP.
- ❖ Desi Chickpea variety GNG 2171 (Meera timely sown) included in PoP.
- ❖ Desi Chickpea variety GNG 1958 (Marudhar timely sown) included in PoP.
- ❖ Kabuli Chickpea variety GNG 1969 (Triveni timely sown) included in PoP.
- ❖ Barley malt varieties RD 2503, DWRUB 52 and DWRUB 64 included in PoP.

## Mustard

- ❖ RGN – 298 for timely sown rainfed conditions included in PoP.
- ❖ RGN – 229 for timely sown rainfed conditions included in PoP.
- ❖ RGN – 236 for late sown irrigated conditions included in PoP.
- ❖ RGN – 145 for late sown irrigated conditions included in PoP.
- ❖ RGN – 73 for timely sown irrigated conditions included in PoP.
- ❖ RGN – 48 for timely sown rainfed conditions included in PoP.

## Cotton

- ❖ Desi Cotton RG – 542, RG – 18, RDH – 9 (Hybrid), RG – 8 included in PoP.

## American Cotton

- ❖ RS – 2013, RST – 9, RHH – 16, RS – 810, RS – 875, Bikaneri Narma, Ganganagar Ageti included in PoP.

## Crop Production

- \* On the basis of soil testing, in fields showing low level of Zn (less than 0.60 ppm) 6 kg ZnSO<sub>4</sub>/bigha and in medium level (0.60-1.20 ppm) 3 kg ZnSO<sub>4</sub>/bigha prior to sowing should be applied in the soil.
- \* Use of trace mulch in sugarcane ratoon @ 6t/ha is beneficial in saving of irrigation water by 33 percent.
- \* Five irrigations to wheat at 25 DAS (CRI stage), 65 DAS (jointing stage), 90 DAS (earring stage), 108 DAS (milking stage) and 122 DAS (dough stage) days after sowing by sprinkler are optimum.
- \* Technology generated for sub-surface drainage system in waterlogged area has been recommended
- \* For late sown wheat (end of December) 15cm row to row spacing is recommended.
- \* In gram, 20 quintal of vermicompost/ hectare should be used with half dose of fertilizer for optimum yield and maintaining soil fertility.
- \* Late sown gram (up to 25<sup>th</sup> November) 22.5 cm of row-to-row spacing recommended.
- \* Irrigation, fertilizer, weed control, plant protection, improved variety etc. has been included in sequence as factors affecting mustard productivity.
- \* Desi cotton - Wheat has been found most remunerative crop sequence in the zone. Under constraints of water availability, desi cotton – mustard is suitable crop sequence.
- \* In legume based crop sequences, mungbean – onion has been found more remunerative than mungbean – potato –mungbean and mungbean – garlic – mungbean. The maximum water use efficiency & production efficiency has been observed with mungbean-onion.
- \* Basal application of 20 kg K<sub>2</sub>O/ha has been added in fertilizers manure part of cotton.
- \* Detopping of cotton variety RS-875 at 35 to 40 days after sowing has been recommended for better yields.
- \* Fodder based crop rotation of Barseem – Jowar - Jowar ratoon and Barseem - Maize + Cowpea - Jowar + Cowpea has been added in the package of practices.
- \* In high water table area (0.5 meter to 1.5 meter water table depth) two irrigations (First at 45 DAS and Second at boll formation) in American cotton (Variety RST-9, RS-810) has been recommended.
- \* In American cotton varieties RS-2013 and RST-9, row to row and plant to plant spacing (Geometry) may be kept either 67.5 x 30 cm or 90 x 30 cm without impairing the production.
- \* Hundred kg seed per hectare should be used for optimum yields in bold seeded (30 g/100 seed) kabuli gram.
- \* In mustard crop, under timely sown condition row to row spacing should be kept from 30 to 45 cm.
- \* In new kinnow orchards during initial 4-5 years inter crops can be grown. Mungbean in Kharif and gram in Rabi can be sown with the precaution to leave space of 0.5 meter on both sides of tree in first year and 1 to 1.5 meter in consecutive 2<sup>nd</sup> and 3<sup>rd</sup> year. Use manures and fertilizers as per recommendations.
- \* In fenugreek, irrigation at IW/CPE 0.8 has been found optimum. Four irrigations at vegetative, flowering, pod formation and seed development stages have been recommended.
- \* In American cotton application of half dose of recommended chemical fertilizer (NPK) + 10 tonnes of rotted FYM per hectare and two foliar sprays of urea (2% solution) at peak flowering stage at 15 days interval improves yield thus 50% of recommendation chemical fertilizer can be reduced.
- \* In wheat crop, by treatment of seed with Azotobactor and PSB (Phosphorous Solubilising Bacteria) culture, nitrogen and phosphorous fertilizers can be saved.

- \* In guar (Grain or green manure) – wheat rotation, after two years cropping on fixed site, the recommended nitrogen fertilizer dose can be reduced to half (i.e.30 kg N/ha through farm yard manure + 30 kg N / ha through fertilizer).
- \* In coriander crop, besides pre-sowing irrigation, 3-4 post-sowing irrigation are required for good growth & yield of coriander. When 4 irrigations are available these are to be applied at vegetative (30DAS), flowering (70 DAS), seed formation (100DAS) & seed development (120DAS) stages. If 3 irrigations are available 1<sup>st</sup> irrigation at branching (50 DAS), 2<sup>nd</sup> irrigation at late flowering (90 DAS) & 3<sup>rd</sup> irrigation at seed formation (120 DAS) stages should be applied.
- \* Under irrigated conditions in coriander, 40 kg N/ha is required. Half N should be applied as basal & remaining half N as top dressing after first irrigation.
- \* In fenugreek, inoculation of seed with *R. meliloti* @ 250 g/ha increases yield significantly.
- \* In American cotton for control of weeds, Pendamethalin @ 1.0 kg a.i./ha at pre planting stage has been recommended.
- \* For high water table areas where abundance of irrigation water is available, cotton variety RS-2013 should be grown.
- \* Under wheat – cotton system, in American cotton 12 kg/ha Zinc Sulphate should be applied in zinc deficient soils where wheat has been supplemented with 12 kg ZnSO<sub>4</sub>/ha..
- \* In onion, after transplanting, drip irrigation at 1.0 ETc not only saves 40% of irrigation water than flood system of irrigation but more bulb yields can also be taken.
- \* In onion, through drip irrigation system only 75% recommended doze of fertilizer (i.e. 75 kg N + 75 kg K<sub>2</sub>O/ha) is sufficient which can be given in 4 split at 15 days interval through drip in addition to 50 kg P<sub>2</sub>O<sub>5</sub>/ha as basal dose.
- \* For weed control in sugarcane, herbicide Metribuzin 75 WP @ 1 kg / ha (pre emergence) has been recommended.
- \* In wheat for weed control, weedicide (Sulfosulfuron 75% + Metasulfuron Methyl 5%) @ 32g a.i. in 250 liter of water/ha has been recommended.

### Crop Protection

- Foliar sprays of Ethion 50 EC @ 1600 ml/ha for the control sucking insect - pests and bollworms in American cotton is has been recommended.
- Use of Botanicals, sesamum oil @ 12.5 ml + 1 ml of liquid soap for the control of whitefly in cotton has been recommended.
- Foliar Spray of Acetamprid @ 0.4 ml/ liter of water for the control of whitefly in cotton is suggested.
- For the effective control of aphid in wheat, spray of Methyl demeton 25 EC 1 liter/ha or Thiomethoxam 25 WG @ 100 gm /ha has been recommended.
- In mustard, spray of Thiomethoxm @ 200 g/ ha is effective for the control of aphid.
- Foliar spray of Indoxacarb 14.5 SC @ 1.0 ml/liter of water is effective for the control of bollworm in the cotton.
- Foliar spray of Spinosad 45 SC @ 0.33 ml / litre of water for the control of bollworm in cotton has been recommended
- For the control of dry root of cottonseed treatment with *Trichoderma harzianum* @ 10 g/kg seed and soil application with *Trichoderma harzianum* @ 10 kg/ha pre incubated in 200 kg of FYM for 10 – 15 days has been recommended.
- For the control of color rot and root rot in groundnut, *Trichoderma harzianum* @ 4 kg per bigha should be mixed in 12-15 kg FYM and added in soil 15 days before sowing, simultaneously, seed treatment with 10 gm of *Trichoderma harzianum* powder per kg of seed before sowing has been recommended.
- In gram, for control of root rot, soil application of 10-15 days pre-incubated wheat bran based *Trichoderma harzianum* @ 10 kg/ha mixed with 200 kg FYM/ha is recommended.
- In gram, for control of *Heliothis*, Beta cfluthrin 2.5 SP @ 400 ml/ha or Lambda cyhaloythrin 25 EC @ 400 ml/ha has been added in Package of practices.
- For control of sugarcane shoot borer, Chloropyriphos 10G @ 20 kg/ha at 45 DAS as side placement and 90 DAS as whorl placement is recommended.
- In guar crop, for the control of Jassid and whitefly, spray of *Beauveria bassiana* (2x10<sup>7</sup> CFU/ml) @ 800 ml/ha is recommended.
- For the control of sucking pests and pod borer in mungbean, dusting of Chloropyriphos 1.5% @ 24 kg/ha or Spray of 0.02% Lambda cyhalothrin + 5% NSKE is recommended
- New findings of Insect Resistance Management (IRM) have been incorporated in the package of practices of the zone.
- For the control of termite in wheat crop, 200 ml of Imidachlorpid (Confidor 200 SL) dissolved in 5 Liter of water for 100 kg of seed is recommended.
- For the control of root rot in cotton, seed treatment with Vitavex 200 WP @ 3 g/kg seed has been recommended or seed should be treated with *Pseudomonas fluorescens* @ 10 g/kg of seed.

- In groundnut, soil treatment at the time of sowing with *Gliocladium virens* @ 10 kg /ha mixed with 200 kg FYM along with seed treatment of *Gliocladium virens* @ 10 g/kg of seed is more effective for control of collar rot and root rot.
- New chemicals viz; Emamectin benzoate (Proclaim) 05% SG @ 10 gm a.i./ha (i.e. 200 g/ha) or Spinosad 45 SC @ 60 gm a.i./ha (i.e. 133 ml/ha) has been recommended to control gram pod borer.
- IPM based treatment of NPV  $1 \times 10^9$  PIB/ ml (450 ml/ha) + 600 ml/ha Endosulfan 35 EC at 1 larvae/ meter ETL has been recommended for the control of *H.armigera* in gram.
- Seed treatment with bioagent talc based product of *Trichoderma hamatum* & *Trichoderma viride* in 1:1mixture @ 10 g/kg of seed & spray of same product @ 0.2% after 50 days is effective for control of *Scalerotania* stem rot in mustard.
- For control of whitefly in sugarcane, spray of Acephate 75 SP 800 g/ha or Ethion 20 EC 1 liter/ha is effective.
- In kinnow, foliar spray of Streptocycline @ 0.01% in association with copper oxichloride @ 0.2% and *Pseudomonas fluorescense* @ 0.2% has been recommended for control of citrus canker.
- For integrated disease management of Phytophthora rot of kinnow stem painting with metalaxyl (Ridomil – MZ 72 WP) @ 20 g/l of linseed oil in association with soil drenching with metalaxy @ 25 g/tree or *Trichoderma harzianum* @ 60 g/tree in 30 – 40 litre of water 2 times each during February and August at 15 DAS interval has been recommended.