

# DIRECTORATE OF RESEARCH



## Introduction

To provide a systematic and coordinated approach to agricultural research, Agricultural Experiment Station (now named Directorate of Research) was established at Udaipur under the then University of Udaipur in 1964. All the research stations except the research units under the canal command areas which were under the control of Government of Rajasthan were transferred by the Department of Agriculture, Government of Rajasthan to the University in 1976. The Agricultural Experiment Station was renamed as Directorate of Agriculture and was shifted to Jaipur in 1981 and with the establishment of Rajasthan Agricultural University with its headquarters at Bikaner in 1987, the Directorate was shifted to Bikaner in 1992. At that time the Directorate used to provide guidance to various Agricultural Research Stations, sub-stations and college campuses spread over whole state covering the ten agro-climatic zones. With creation of new agricultural university at Udaipur in 2000, followed by a new veterinary university at Bikaner in 2010 and further three more agricultural universities at Jobner, Jodhpur and Kota in year 2013, the jurisdiction of the Directorate of Research, SKRAU, Bikaner was limited to six districts of the state viz., Bikaner, Jaisalmer, Churu, Jhunjhunu, Hanumangarh and Sriganganagar covering three agro-climatic zones namely Irrigated north western plain (Ib), Hyper arid partially irrigated western plain (Ic) and parts of transitional plain of inland drainage (IIa).

The Directorate of Research located at the main campus of the university head quarter at Bikaner has the following mandate for contributing toward sustainable development of agriculture in the state. Presently, 15 All India Coordinated Research Projects, 22 short/ long term projects and many non-plan projects are being undertaken to develop production and protection technologies. The University also undertakes seed production programme under the National Seed Project. Quality seeds of high yielding varieties unquestionably constitute the mortar for productive agriculture.

## Mandate

- To plan, coordinate and monitor need-based agricultural research
- To develop new and improved crop varieties as well as appropriate production technologies for optimal use of natural resources in a sustainable manner
- To coordinate and monitor the breeder seed production
- To develop linkages with national and international organizations for fundamental and applied research
- To strengthen the research capabilities of Zonal Research Stations, and  
To extend consultancy and expertise



Fig-: Map of the Rajasthan showing shaded area under jurisdiction area of SKRAU, Bikaner

### SKRAU Research System and seed production

ARS-Bikaner	ARS-SriGanganagar	ARSS-Hanumangarh	National Seed Project Bikaner
Establishment in 1995 Area- 146 ha	Establishment in 1977 Area- 78.6 ha	Establishment in 1976 Area- 56 ha	Establishment in 1987 Seed Farms: <ul style="list-style-type: none"><li>• MAF-Rozari (508 ha)</li><li>• UCF-Khara ( 250 ha)</li><li>• USF- Bikaner (75 ha)</li></ul>

**Administrative Staff of Directorate of Research**

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## Research Projects

### All India Co-ordinated Research Projects

Name of projects	Source of finance (75%+25%)	Date of starting	Project Incharge
<b>ARS, Srigananagar</b>			
AICRP on Chickpea	ICAR +State	1988	Dr. Vijay Prakash
AICRP on Cotton	ICAR+State	1967	Dr. Pradeep Kumar
AICRP on Sugarcane	ICAR +state	1999-2000	Dr. B. R. Godara
AICRP Water Management Project	ICAR+ State	1980	Dr. R. P. S. Chouhan
AICRP on Rape Seed & Mustard	ICAR+ State	1993-94	Dr. U. S. Shekhawat
AICRP on Tropical Fruits	ICAR +State	2009-10	Dr. Chandrabhan
AICRP on STCR	ICAR + State	1996	Dr. G. M. Mathur
<b>ARS, Bikaner</b>			
AICRP-AZF(Date Palm)	ICAR + State	1979	Dr. A. R. Naqvi
AICRP on STCR	ICAR + State	1996	Dr. S. R. Yadav
AICRP on Salinity	ICAR + State	1991-92	Dr. Ranjeet Singh
AICRP on Groundnut	ICAR + State	1993	Dr. M. M. Sharma
AICRP on Pearl millet	ICAR + State	1995	Dr. P. S. Shekhawat
AICRP on Forage crops	ICAR + State	1995	Dr. S. S. Shekhawat
AINP on Arid legumes(Mothbean)	ICAR + State	1986	Dr. M. M. Sharma
<b>NSP, Bikaner</b>			
AICRP on Breeder Seed Production	ICAR + State	2006	Dr. M. M. Sharma
AICRP on NSP	ICAR + State	1987	Dr. M. M. Sharma
<b>Others</b>			
Integrated Agro-met Advisory Services	GOI	1996 ARS, SGNR	Dr. Seema Chanwla
Precision Farming Development Centre	NCPAH	1995 ARS, Bikaner	Er. A. K. Singh
Integrated Agro-met Advisory Services	GOI	1995 ARS, Bikaner	Dr. S. P. Singh
<b>Long term other projects</b>			
Gramin Krishi Mausam Sewa	MoES, GOI	1996	ARS, Srigananagar
Precision Farming Development Centre	NCPAH, GOI	1995	ARS, Bikaner
Gramin Krishi Mausam Sewa	MoES, GOI	1996	ARS, Bikaner
Forecasting Agricultural output using Space, Agro meteorology and Land based observations (FASAL) Scheme	MoES, GOI	2011	ARS, Bikaner

**Linkages and Networking with external agencies in Research/Extension/ Teaching (With details)**

Particulars	Agency	Details
<b>MoU signed / Collaboration and Networking with</b>		
<b>International</b>	ICRISAT, Hyderabad	Grant in the form of NFSM (Pearl millet)
<b>National</b>	ICAR, New Delhi	Grant in the form of 7 AICRPs
	NCPCAAH, MoAFW, New Delhi	Grant in Aid in the form of PFDC project
	IMD, MoES, New Delhi	Grant in Aid in the form of Projects GKMS and FASAL
	MEF, Paryavaran Bhavan, New Delhi	Grant for establishment of Botanical garden at ARS, Bikaner
<b>Other Universities</b>	RAJUVAS, Bikaner	
<b>Other organizations</b>		
	RCDF, Lalgargh, Bikaner NRC on Equine, Bikaner CAZRI, Regional Station, Bikaner ICAR-CIAH, Bikaner ICAR-CSWRI, Bikaner	Research/Extension activities
	Department of Agriculture, GOR, Jaipur	Grant for RKVY projects and for extension of developed technologies
	Bayer Crop Science Limited Bio-Science Pvt. Ltd. Insecticide India Ltd. Nargarjuna Agrichem Ltd. National Innovation Foundation-India Deepak Bioseeds Pvt. Ltd. JU Agri Sciences Pvt. Ltd. GSP Crop Science Pvt. Ltd. Rallis India Ltd. PHI Seeds Pvt. Ltd.,etc.	Product verification test trials

**Rastrya Krishi Vikash Yojana (RKVY) projects (On-going)**

Title of project	Location	Start year	Project Incharge
<b>ICT Enabled</b> Agricultural Knowledge Management in North Western Plain Zone-I-b of Rajasthan	ARS, Sriganganagar	2015-16	Dr.B.S. Meena
<b>Mitigating Limitations</b> of groundnut Production in Hyper Arid Region of Rajasthan	ARS, Bikaner	2015-16	Dr. S.L.Godara
<b>Molecular Indexing</b> of Drought Tolerance in Pearl Millet	DOR, SKRAU	2015-16	Dr.Y.Sudarshan
Development and Nutrient Evaluation of value added products of <b>Olive</b>	College of H.Sc.,	2016-17	Dr. Vimla Dunkwal
Role of <b>wool waste as a source of nutrient</b> for crop production and soil improvement in Torripsammments	ARS, Bikaner	2016-17	Dr.S.R.Yadav
Studies on post harvest technology and processing of <b>date palm</b>	ARS, Bikaner	2016-17	Dr. Suresh Kumar
Developing Agri-entrepreneurship among <b>rural youth</b> through mushroom cultivation	ARS, Sriganganagar	2016-17	Dr. S. K.Bairwa
<b>Krishi IQ:</b> Digital Dissemination of Agriculture Practices of Cluster bean and Gram in hyper Arid partially irrigated western plain zone of Rajasthan	IABM, SKRAU	2016-17	Dr.Amita Sharma





<b>Crop weather relationship</b> , impact assessment and awareness for negative weather calamities in arid region (zone Ic)	ARS, Bikaner	2016-17	Dr. N. K.Pareek
Standardization of <b>Pressurized irrigation</b> system in marigold for arid region of Rajasthan	COA, Bikaner	2016-17	Dr. R. K Narolia
Training cum demonstration on pulses for quality seed production and <b>seed storage technology</b> at farmer's fields	COA, Bikaner	2016-17	Dr.A.K. Sharma
Developing package of <b>water-saving agro-technologies</b> for improving water use efficiency and productivity of Dill ( <i>Anethumgraveolens L.</i> ) under Western Rajasthan	COA, Bikaner	2016-17	Dr. R.C. Bairwa
<b>Exploring Entrepreneurship</b> Potentials for Farm Women in Animal Husbandry in Rajasthan	DEE, SKRAU,	2016-17	Dr. Chitra Henarry
<b>Metal Composition</b> Lab at Farm Implements & Machinery Testing and Training Centre	Central Workshop	2017-18	Er.Vipin Laddha
Development of Economically Viable Indigenous Cow Based Farming System for Arid Regions	KVK, Bikaner	2017-18	Dr.U. K. Meel
Broom Rape ( <i>Orobanche ramosa</i> ) management in Mustard in light soil	ARS, Bikaner	2017-18	Dr.S.P. Singh
Documentation of farming system and evaluation of varieties and nutrient management in gram & wheat crops in khadin areas of Jaisalmer district of Rajasthan	KVK, Jaisalmer	2018-19	Dr. Deepak Chaturvedi
Evaluation of high yielding strains and post harvest management of Mushroom	ARS, Sriganganagar	2018-19	Dr.S.K. Bairwa
Dissemination of post harvest technologies of arid foods for doubling the farmers income	DOR, SKRAU,BKN	2018-19	Dr. Vimla Dunkwal


### Major Research achievements of last two years

#### Development of crop varieties: Chickpea


	
<b>GNG2171 (2017)</b> <b>Timely Sown Irrigated conditions of NWPZ</b>	<b>GNG2144 (2016)</b> <b>Late Sown Irrigated Conditions of NWPZ</b>

	
<p align="center"><b>GNG 2299 (Purva) , 2018</b> <b>Late sown Conditions for NEPZ</b></p>	<p align="center"><b>GNG 2207 (AWADH) , 2017</b> <b>Late sown Conditions for NEPZ</b></p>





**Mothbean and Pearl millet**

	
<p align="center"><b>RMO 225-1( 2017) at all India level</b></p>	<p align="center"><b>BHB 1202 (2017) for Rajasthan state</b></p>

**Acid Lime Variety**

	<p align="center"><b>Acid Lime Variety</b> <b>Ganganagar AL-1</b> <b>Identified in 2018</b></p> <p align="center"><b>Yield (Fruit/tree):1400-1500 Nos.</b> <b>Yield (kg/tree) : 42-45</b> <b>Fruit weight (g) : 28-35</b> <b>Ascorbic Acid (mg./100 g pulp) : 30.5</b> <b>Rind thickness (cm.) : 0.18</b></p>
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## Fodder crops varieties

	
<b>Lucerne-Krishna (2016) at all India level</b>	<b>Sewan grass-Jaisalmeri sewan (2016) at all India level</b>
	
<b>Pearl millet-Raj bajra-1 (2015) for Rajasthan state</b>	<b>Dhaman grass-Bikaneri dhaman (2015) for Rajasthan state</b>

### Varieties included in Package of Practices:

- Wheat varieties WH-1105, DPW 621-50 and HD-3086 for timely sown & DBW-90 for late sown conditions included in PoP of Zone 1b.
- Barley varieties RD- 2592, RD-2624 & RD- 2552 has been included in PoP for salt affected area of the zone 1b.
- Mustard variety RGN 298 has been recommended for cultivation in rainfed areas of zone 1b.
- Clusterbean variety HG 2-20 included in PoP for rainfed conditions in zone 1b
- Three varieties of chickpea viz., GNG 1969, GNG 1499 and GNG 1488 in PoP of zone 1c
- Two varieties of Oat viz., JHO-822 and HJ- 8 were included in PoP of zone 1c.
- Two varieties of groundnut viz. HNG 123 and RG 425 (RAJ Durga) in PoP of zone 1c



## Crop production technology

Growth regulators have their role to play in enhancing the productivity of cotton. The results of the experiment indicated that Ethrel @ 8.5  $\mu$ mol/sq at square initiation followed by MH @ 500 ppm at 95 DAS significantly enhanced the productivity of cotton. In another experiment in the cotton crop, foliar spray of Maleic hydrazide (MH) (6 hydroxy-3-(2H) Pyridazinone) @ 500 ppm at 75 & 125 DAS or Cycocel (CCC) @ 100 ppm at 75 DAS and 125 DAS were found effective in increasing the seed cotton yield at Agricultural Research Station, Srirangapatna.

In another study result of the experiment indicated that raised bed with plastic mulch gave significantly higher seed cotton yield as compared with rest of the treatments with or without plastic mulch. Irrigation with drip at 0.8 Etc was found optimum irrigation schedule. In case of canal closer or some other reasons if sowing is not possible in time then the crop may be raised in plastic bags and transplanted in field up to 30<sup>th</sup> May with drip irrigation without any yield loss.

In organic approach treatments in another experiment, 100% N through FYM recorded highest mean seed cotton yield followed by 50% N through FYM + 50% N through crop residue + gypsum @ 150 kg/ha.

## Nutrient Management

### Pearl Millet

Application of 75% of RDF + PSB + *Azospirillum* culture (200-250 ml/ha) + 5 t FYM/ha gave significantly higher yield and net return and B : C ratio in zone 1c.

### Chickpea

Deficiency of micronutrients particularly of zinc has become wide spread affects the yield of crops. To manage the need of zinc requirement in chickpea, foliar application of  $ZnSO_4$  @ 0.5% was found effective for enhancing grain yield in chickpea in zone 1b.

Soils of arid region showed Potassium deficiency in many places and the results of the experiment indicated that application of 20 kg  $K_2O$ /ha along with basal dose of fertilizers has recommended in chickpea cultivation in zone 1c.

### Oat

Good production of grain along with green fodder of oat is a need of the hour in arid region where economy is mainly depended on animals. The results indicated that two foliar sprays of  $ZnSO_4$  @ 0.5% first at 10 days after first cutting and second at 10 days after first spray increased the yield of fodder oat in zone 1c.

### Wheat

Zinc deficiency in wheat is a common problem throughout the state. Foliar spray of chelated zinc at 3 gm/litre of water at vegetative & flag leaf stage was sufficient to meet out the deficiency of zinc in wheat crop for zone 1(b) soils.

## **Sugarcane**

Application of 24 kg/ha Zinc sulphate in furrows at sowing and foliar spray of 1% ferrous sulphate thrice at weekly interval gave significantly higher yield in sugarcane with RDF for zone 1(b).

## **Brinjal**

Application of 80 per cent RD of fertilizers (96 kg N, 64 kg P<sub>2</sub>O<sub>5</sub> & 48 kg K<sub>2</sub>O/ha) was found optimum dose for kharif brinjal. This dose should be given in 12 equal splits each at an interval of 10 days for zone 1(b).

## **Fertigation in Tomato**

Fertigation with 100 kg N, 40 kg P<sub>2</sub>O<sub>5</sub> & 40 kg K<sub>2</sub>O/ha through water soluble fertilizers in 9 equal splits each at an interval of 15 days produced significantly higher tomato yield than all other treatments for zone 1(b).

## **Micro Nutrients Scheduling in Kinnow**

Three foliar applications of combined solution of FeSO<sub>4</sub>, CuSO<sub>4</sub>, and ZnSO<sub>4</sub> each @ 0.5% is recommended for optimum yield in Kinnow before flowering stage, at fruit formation stage (ber sized fruits) and 40 days after second spray in zone 1c.

## **Irrigation Management**

### **Cluster bean**

Clusterbean is a crop which is very sensitive to irrigation scheduling. To get maximum benefit from irrigation point of view, first irrigation at vegetative stage (25-30 DAS) and second at grain development stage (60-65 DAS) was appropriate for optimum production for zone 1(b).

### **Drip Irrigation Schedule and Fertigation in Bitter Gourd**

Fertigation in drip system with 80 kg N, 32 kg P<sub>2</sub>O<sub>5</sub> & 32 kg K<sub>2</sub>O/ha through water soluble fertilizers in 12 equal splits each at an interval of 11 days gave significantly higher yield in bitter gourd. In another experiment the results revealed that bitter gourd should be irrigated at 0.8 ETC (LT) for optimum yield for zone 1(b).

### **Irrigation and fertigation management in Chilli**

Drip irrigation schedule at 1.0 Etc (LT) has been found suitable to increase the fruit yield and quality of chilli in zone 1b. Application of 120% RD (84kg N, 60kg P<sub>2</sub>O<sub>5</sub>, 60kg K<sub>2</sub>O per ha) in 9 splits at an interval of 13 days has been found most appropriate schedule in chilli for yield maximization in zone 1b.

### **Drip Irrigation in Brinjal**

Drip irrigation in brinjal at 0.8 ETC with mulch was found optimum and this treatment saved 34.09 % of irrigation water over surface irrigation and 15.68 % even over drip irrigation scheduled at 1.0 ETC without plastic mulch for zone 1c.

## Moisture Conservation in Cluster bean

In rainfed areas, sowing of clusterbean at 60 cm row spacing followed by earthing by hand plough or running wheel hoe at 25 and 35 DAS was found beneficial for moisture conservation and sustaining yields for zone 1c.

## Irrigation Scheduling for Nappier Bajra Hybrid for Fodder Cultivation

In NB hybrid irrigation schedule with depth of 60 mm at 1.0 IW/CPE ratio was found beneficial. This schedule would be applied during different months as follows:

Month	Details of Irrigation Schedule
March	4 <sup>th</sup> week of March to 1 <sup>st</sup> week of April – NB hybrid sowing by root slips & establishment (60 x 60 cm geometry) require 4 irrigations first at sowing and subsequent 2-3 days interval.
April	Thereafter, 3 irrigations at 10 days interval from 2 <sup>nd</sup> week April to 1 <sup>st</sup> week of May.
May to 15 July	Further, 10 irrigations about weekly interval from 2 <sup>nd</sup> week of May to mid July.
16 July to 15 Sept.	Monsoon rains occur and hence irrigations would be given during gaps only. Irrigation at 10 days interval meet out water requirement of the crop.
16 Sept. to October	6 irrigations at 8-10 days interval required during this period.

## Weed Management

### Cotton

Application of pendamethalin extra @ 0.75kg a.i./ha as PPI+ one hoeing was found effective in controlling the weeds in *hirsutum* cotton and increased the seed cotton yield for zone 1(b).

### Mustard

- a) For control of *Orobanche* in mustard, two sprays of glyphosate first at 25 DAS @ 25g/ha (Commercial product 60 ml) and second at 55 DAS @ 50g/ha (Commercial product 120 ml) along with 1% ammonium sulphate was found effective. The dose and time should be strictly followed for efficacy of the spray in zone 1c.



Orobanche infested mustard plot (Untreated)



Glyphosate treated (25 and 50 g/ha at 25 and 55 DAS, respectively) mustard plot

b) Application of Pendamethalin 38.7 CS @ 0.75 per ha as PPI was found appropriate for control of common weeds in mustard in zone 1b.

### **Mungbean**

Application of Imazethapyr + Pendimethalin (2+30%) @ 2400 ml/ha(Commercial dose) in 500 litre water as pre emergence in mung bean to control both grassy and broad leaved weeds in the presence of proper soil moisture in zone 1c.

### **Groundnut**

Application of 2.4 lit/ha imazithapyr + pendimethalin (2 + 30% pre mix company made) as pre emergence (moist soil and bright sunshine are primary condition for its affectivity) with 500 litres water control both grassy and broad leaved weeds and recorded significantly higher yield of groundnut as compare to other treatments for zone 1c.

### **Mitigation of heat stress**

- a) Terminal heat stress is a common and serious problem in winter season crops particularly of wheat in Rajasthan. Foliar application of silicic acid (150 ppm) at flag leaf & milk stage was found effective for mitigation of heat stress for zone 1b OR, Foliar application of silicic acid (100 ppm) + thiourea (250 ppm) has been found effective to mitigation of heat stress in wheat in zone 1b.
- b) Foliar spray of 1% KNO<sub>3</sub> at flowering and pod fillings stages has been beneficial for moisture stress management in mustard in zone 1b.

### **Diseases management in Wheat**

Seed treatment with carboxin 37.5% + thiram 37.5% @ 2g/kg seed followed by soil drenching of carbendazim 25% + mancozeb 50% mixture (75WP) @ 1kg/ha at time of first irrigation has been found effective against foot/root rot disease in wheat for zone 1b.

### **Root rot and wilt management in Chickpea**

Soil application of *Trichoderma harzianum* + *Pseudomonas fluorescens* (5kg each/ha) with 100 kg vermicompost at the time of field preparation followed by seed treatment with *Trichoderma harzianum* + *Pseudomonas fluorescens* (@ 4+4 gm/kg seed each) for control of root rot and wilt in chickpea was found effective. OR, In case, *Pseudomonas fluorescens* is not available, soil application of *Trichoderma harzianum* (10kg/ha) with 100 kg vermicompost at the time of field preparation followed by seed treatment with *Trichoderma harzianum* @ 8 gm/kg seed was also found effective for control of root rot and wilt in chickpea in zone 1b & 1c.

### **Yellow rust management in Wheat**

On appearance of the disease, foliar spray of Propiconazol (25 EC) or Tebuconazol (25.9 EC) @ 1ml/litre of water was recommended for zone 1b. If needed second spray may be given at 15days interval .



## **Integrated disease management in Mustard**

For integrated disease management in mustard, seed treatment with Metalaxyl (35 SD) @ 6gm/kg seed & first spray of Mancozeb (75 WP) @ 2 gm/litre of water at 60 days & second spray after 15 days with Propiconazol (25 EC) @ 0.5 ml/litre of water was recommended for zone 1b.

### **Bacterial leaf blight of Clusterbean**

Application of streptomycin 500 ppm (seed soaking)+ Streptomycin 250 ppm + copper oxychloride (0.2%) first spray at disease appearance and second at 15 days interval was found effective against management of bacterial leaf blight for zone 1c.

### **Root rot of Mothbean**

Application of *Trichoderma harzianum* + *Pseudomonas fluorescens* seed treatment (4 + 4 gm./kg seed) + soil application of *T. harzianum* + *P. fluorescens* (1.25 + 1.25 kg) in 50 kg FYM each/ha.) was found effective for management of root rot of mothbean.

## **Management of collar rot and leaf spot in Groundnut**

Seed treatment with *Tebuconazole* 2DS @1.5 g/kg + furrow application of *T. viride* @ 4.0 kg enriched with 50 kg FYM/ha + Broadcasting of *T. viride* @ 4.0 kg enriched with 50 kg FYM/ha at 40 DAS + Two foliar spray of Tebuconazole 25.9% @1.0 ml/litre starting from initiation of foliar disease and second spray at 15 days interval was found most appropriate and effective for management of collar rot and leaf spot diseases for zone 1b.

## **Phyllody management in Sesame**

Seed treatment with imidachloprid 70 WG @ 5.0 g/kg seed + two spray of thiomethoxam @ 0.5 g/litre at 50 and 65 DAS + one spray of streptomycin 150 ppm + copper oxychloride @ 2.0 g/litre at 75 DAS was found effective for phyllody management in zone 1b.

## **Pod borer management in Chickpea**

Foliar application of Indoxacarb 14.5 SC @ 60 g a.i./ha followed by Rynaxapyr @ 18 g a.i./ha has been found effective for controlling pod borer in chickpea in zone 1b.

*Neem* oil @ 1.0 % followed by NPVHa @ 450 LE/ha + 2 kg Jaggery/ha effectively controlled the pest and this technology could be used in organic gram for zone 1b.

## **Insect pest management in Mungbean**

Application of dichlorvas 76 SL@ 0.50ml + quinalphos 25 EC @ 1.0 ml/lit of water were effective to control insect pest in mungbean in zone 1b.

## **Management of sucking pest in Mothbean and Clusterbean**

Seed treatment with fipronil (5% SC) @ 4 ml/kg seed of moth bean/ clusterbean was found effective for management of sucking pest in zone 1c.

## Bare root transplanting in Kinnow

At Sriganaganagar, bare root transplanting may be done successfully in month of September, October & February with the treatment of 200 mg IBA + 1 g carbendanzim with wetted moss grass up to 48 hours. This technology significantly reduces cost of transportation.

## Soil Test Crop Response technology for Radish

For yield target of 300 q/ha of radish crop in this zone (1c), 40 kg N + 58 kg P<sub>2</sub>O<sub>5</sub> + 87 kg K<sub>2</sub>O along with 25 tones per hac. FYM is required. Full dose of phosphorus and half dose of Nitrogen and Potassium as basal and remaining dose of Nitrogen and Potassium should be applied at root forming stage.






## Post harvest technology




### Date Palm:

Nutritive value	Status	Products developed
<ul style="list-style-type: none"> <li>▶ Highly nutritious with high calorific value (3150 calories /kilogram of fresh fruits)</li> <li>▶ Sugars: 60-65%</li> <li>▶ Fiber: 2.5%</li> <li>▶ Protein: 2%</li> <li>▶ Fat : less than 2%</li> <li>▶ Minerals : 2% (iron, potassium, calcium, copper, magnesium, chloride, sulphur and phosphorus etc.)</li> </ul>	<p>Date palm is grown on 275 hectare area in Bikaner district.</p> <p>Date palm in India does not attain <i>pind</i> (soft date) stage on trees due to rains coinciding the ripening period of fruits (June end to September). Therefore, mostly fruits are harvested at <i>doka</i> stage (hard ripe stage).</p>	<ul style="list-style-type: none"> <li>• Pickle (with aloe vera, green mango, ginger)</li> <li>• Squash (with guava, mango)</li> <li>• Sauce (with tomato)</li> <li>• Jam (with mango, pineapple, apple, ginger, papaya)</li> <li>• Health bar (with dry fruits)</li> <li>• <i>Chhuara</i> and <i>pind khajur</i></li> </ul>

### Bajra (Pearl Millet):

<p>▶ Bajra has high nutritive value and is staple food of arid region.</p> <p>▶ It is a rich source of calcium, iron, dietary fiber and micro nutrients.</p> <p>▶ Nutritive value (Per 100g)          Energy: 361 Kcal.          Protein: 11.6 g          Fat: 5.0 g, Fiber: 1.0 g          Carbohydrate: 67.5 g          Ca: 42.0 mg., Fe: 8.0 mg          P: 296. mg., ZN: 3.1 mg.</p>	<p><b>Status</b>          More than 50% of area under Bajara cultivation is in Rajasthan.          Pearl millet is not under consumption in the urban population.          Also pearl millet flour is having low shelf life and develop rancidity.          Pearl millet can be subjected to various processing techniques like blanching, germination, soaking to overcome problems of poor digestibility, bitter taste and rancidity.</p>	<p><b>Products developed</b></p> <ul style="list-style-type: none"> <li>• Bajra biscuit (sweet)</li> <li>• Bajra cookies</li> <li>• Bajra cake</li> <li>• Bajra kurkure</li> <li>• Bajra khakra</li> <li>• Bhakarvadi</li> <li>• Idli/dosa/upma</li> <li>• Donuts</li> <li>• Nankhatai</li> <li>• Burfi</li> <li>• Thepla</li> </ul>
		

### Olive:

<p>Nutritive value of olive          Energy: 146 K Cal          Carbohydrate: 3.84 g          Sugars: 0.54 g, Fiber: 3.3 g          Total fat: 15.32g          Saturated fat: 2.02 g          Mono unsaturated fat: 11.31g          Poly unsaturated fat: 1.30 g          Protein: 1.03g, Beta Carotene: 20 mg, Vit. E: 3.81 mg</p> <p>▶ Olive is a rich source of calcium, iron, vitamin-E, vitamin-A, vitamin-K, magnisium, copper, potasium and amino acids</p>	<p><b>Status</b>          Olive is planted on 182 ha. area in Government farms in Rajasthan.          With increasing plantation of olive in the state of Rajasthan there was need for development of technology for value addition in Olive.</p>	<p><b>Products developed</b></p> <ul style="list-style-type: none"> <li>• Olive tea</li> <li>• Olive pickle</li> <li>• Olive mouth freshner</li> <li>• Olive toffee</li> <li>• Olive cake</li> <li>• Olive biscuit</li> <li>• Pizza</li> <li>• Olive cookie</li> </ul>
		

### Seed Production

Under AICRP on Rapeseed & Mustard a Seed Hub has been established at ARS, Sriganganagar in NFSM scheme. Under this hub breeder, foundation & certified seed of mustard will be produced (600 qtls in the year 2018-19 & 750 qt in the year 2019-20).

**Breeder and T/L Seed Production of different crops**

S.N.	Crops	2016-17 (Q1)		2017-18 (Q1)	
		B/S	T/L	B/S	T/L
1.	Wheat	869.60	1137.76	474.99	712.08
2.	Barley	--	--	--	220.28
3.	Chickpea	459.20	515.00	598.87	454.98
4.	Mustard	02.30	02.50	04.60	01.00
5.	Fenugreek	--	28.69	--	--
6.	Groundnut	219.50	152.00	93.35	233.30
7.	Guar	48.00	139.27	49.50	118.71
8.	Moth	57.75	16.75	58.58	54.38
9.	Mung	24.63	238.54	02.29	132.71
10.	Cowpea	07.00	24.46	--	06.26
11.	Cotton	11.20	05.00	17.00	--
<b>Total</b>		<b>1699.18</b>	<b>2259.97</b>	<b>1299.18</b>	<b>1933.7</b>

**Note: BS = Breeder Seed, T/L = truthfully labelled**