

वार्षिक प्रतिवेदन Annual Report (2011-12)



राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय,
ग्वालियर 474 002 म.प्र.
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FOREWORD

The Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya is a growing institution of excellence in academics, research and extension education in agricultural sciences. Over the years the University has generated qualified human resource, innovative technologies through research; transferred improved technologies to farmers' door step through KVKs; and produced quality seed and planting materials.

The University has significantly added new dimensions in education, research and extension activities. The IVth Deans' Committee Recommendations of ICAR have been adopted by the University in UG, PG & Ph.D. education. By upgrading the facilities, academic excellence has been initiated in all programmes of the education.

The University's research programme finds a special place in NARS through the coordinated projects in pulses, oil seeds, cotton, cereals, horticulture and natural resource management. Outstanding research work on chickpea improvement, CMS based pigeonpea hybrid, efficient water management for boosting the productivity of cotton, soybean, mustard, wheat, medicinal and aromatic plants are the some of the noteworthy achievements of this University. Demonstrations, trainings, sangoshties, scientists-farmers interactions, exhibitions, publication of booklets, leaflets, Kishan Mobile Sandesh, TV and Radio programmes are the most effective means of strengthening scientists farmers linkages. The period 2011-12 has been outstanding in terms of achievements in the field of agricultural research and technology innovation.

In the present world scenario, linkages and collaborations hold key to success. Our collaborations with national and international organizations speak volumes about our commitment to enable this University to attain new heights.

The annual report of 2011-12 brought out by the University covers development and progress made in the areas of teaching, research, extension and seed production during the above period. I am confident that this annual report will serve as a show case of the university activities. I would like to thank all the Deans, Directors, Officers of the University, and Heads of the Departments, as well as members of Editorial Board for compiling and editing this report in a comprehensive and presentable manner.

I appreciate the efforts of Dr. B.S. Baghel, Dean Faculty of Agriculture and Dr. Amit Chatterjee, DDFA as well as the Compilation Committee and Publication Team who made sincere efforts for bringing out such a valuable report. The report gives a panoramic view of work accomplished and progress made during the period under report.

(A.K. Singh)

CONTENTS

S.No.	Particulars	Page no.
	FOREWORD	
	EXECUTIVE SUMMARY	1-6
I.	THE UNIVERSITY	7-17
	1. Mission	7
	2. Mandate	7
	3. Area of Jurisdiction	7
	4. Climatic conditions	10
	5. Agro climatic zones	10
	6. Major crops and cropping pattern	11
	7. Organizational setup	13
	8. Governing bodies & University Administration	14
	9. Financial Status	17
	10. Linkages and Collaborations	17
II.	EDUCATIONAL ACTIVITIES	18-46
	1. Profile of the Colleges	18
	2. Admission procedure	20
	3. Allocation of seats and roster	20
	4. Students strength	22
	5. Teaching status	24
	6. Experiential Learning Programme	25
	7. Rural Agricultural/Horticulture Work Experience	27
	8. Students Welfare Activities	29
	i. National Service Scheme (NSS)	29
	ii. National Cadet Corps (NCC)	30
	iii. Cultural Activities	31
	iv. Sports/ Extra Curricular Activities	32
	v. Students counseling and placement	32
	9. Library and Documentation Service	33
	10. Infrastructure Facilities Developed for Teaching Up-gradation	35
	11. PG Research and Thesis Awarded	37
III.	RESEARCH ACTIVITIES	47-107
	Research Projects in operation	47
	1) AICRP on Arid legumes (Guar), Gwalior	47
	2) AICRP on Wheat Improvement, Gwalior	48
	3) AICRP on Pearl millet, Gwalior	50
	4) AICRP on Weed control, Gwalior	51
	5) AICRP on Water Management , Morena	52
	6) AICRP on Oilseed (Rapeseed & Mustard), Morena	54

	7) AICRP on Chickpea, Sehore	59
	8) AICRP on Pigeon pea, Sehore	63
	9) AICRP on MULLaRP, Sehore	64
	10) AICRP on Soybean, Sehore	66
	11) AICRP on Oilseed (Safflower), Indore	68
	12) AICRP on Sorghum Improvement, Indore	70
	13) AICRP on Cotton, Indore	72
	14) AICRP on Dryland Agriculture, Indore	74
	15) AICRP Operational Research Project, Indore	78
	16) AICRP on Salt Affected Soils, Indore	80
	17) AICRP on Integrated Farming System, Indore	81
	18) AICRP on Pigeon pea, Khargone	82
	19) AICRP on Oilseed (Groundnut), Khargone	84
	20) AICRP on Maize, Jhabua	84
	21) AICRP on Medicinal and Aromatic Plants , Mandsaur	85
	22) AICRP on grapes, Mandsaur	86
	23) National Agriculture Innovative Project (NAIP)	86
	24) IAAS Integrated Agro-met Advisory Services	89
	25) Other Projects	92
	❖ Achievements	93
	➤ New varieties developed and released	93
	➤ Technologies generated	93
	❖ Research and extension gap	103
	❖ Future thrust	105
IV.	EXTENSION ACTIVITIES	108-142
	1. Services Provided	109
	2. On Farm Testing	110
	3. Front Line Demonstrations	112
	4. Trainings	116
	5. Other Extension Activities	117
	6. Farmers fair/Kisan Divas	121
	7. Extension Activities other than KVKs	123
	8. Production & supply of technological inputs	127
	9. Soil, Water and Plant Analysis	131
	10. Kisan Mobile Services	132
	11. SAC Meetings	134
	12. News Letters Published	136
	13. Publications	137
	14. Activities of Directorate of Extension other than KVK's (i) Training programmes organized (ii) Workshops/meetings organized (iii) Publications	138
	15. Visitors	142

V.	ACTIVITIES OF SEED PRODUCTION FARMS	143-145
	1. Seed Production	143
	(a) Nucleus Seed Production	144
	(b) Breeder Seed Production	144
	(c) Hybrid Seed Production	145
	(d) Production of Planting Material/Saplings Production	145
VI.	Events organized	146
VII.	Publications	146-150
VIII.	Human Resource Development	151
IX.	Visits Abroad	151
X.	Distinguished Visitors	151

EXECUTIVE SUMMARY

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (RVSKVV) was established on August 19, 2008, to cater the needs of farming community. It is a new but, fast emerging promising university in the field of agriculture and allied sciences.

The mandate of the University is teaching, research and extension with a view to evolve appropriate solutions and technologies in the field of agriculture. It has a network of five colleges (four Agriculture and one Horticulture), five Zonal Agricultural Research Stations (ZARS), four Regional Agricultural Research Stations (RARS), six Special Research Stations (SRS), 19 Krishi Vigyan Kendras (KVKs) and 23 All India Coordinated Research Projects (AICRPs) spread across six agro-climatic zones in 25 districts of the state. In addition to this, other ongoing projects / schemes i.e., non-plan, plan, tribal sub-plan and adhoc projects are also in operation.

During the year 2011-12, the University had undertaken a number of initiatives for the promotion of quality in its mandated areas. The major activities and achievements of the university were as follows:

TEACHING:

- The University offered 2 undergraduate (B.Sc. Ag and B.Sc. Hort.), 11 masters' degree and 9 Ph.D degree programmes in the different disciplines of agriculture and horticulture. The total intake capacity was 670 out of which 364 were in undergraduate (UG) 252 in postgraduate (PG) and 54 in Ph.D degree programme. In the undergraduate level, out of 364 total seats, 308 seats were in B.Sc. (Ag.) and 56 in B.Sc. (Hort.) degree programme. In the post graduate level, out of 252 seats, 189 seats were in M.Sc. Ag. and 63 in M.Sc. Hort. Similarly in Ph.D programme, out of 54 total seats, 42 seats were in Agriculture and 12 in Horticulture discipline.
- During the year 2011-12, total 1918 students were on the rolls of the University out of which 1431 students were on the rolls in UG, 446 in PG and 41 in Ph.D degree programmes.
- In order to provide experiential learning, 351 students of B.Sc. Hort./B.Sc. Ag. of IVth year have taken adequate hands on experience on different aspects of Hort./Ag. to cultivate capabilities suitable to the emerging job markets and build entrepreneurship spirit and business management competence among students in a way that they will be able to generate employment for themselves and others.
- Under Rural Agriculture/Horticulture Work Experience, 351 students of the IV year were placed in different villages, research stations, KVKs to learn and solve the practical problems of the farmers.
- Under NSS programme, different activities like blood donation camp, Beti Bachao Abhiyan, Social awareness camp, activities on AIDS, literacy, Pulse polio Abhiyan and Environment day were organized and 86 students passed 'B' certificate while 2 students passed 'C' certificate examination.

- Under NCC programme, 49 and 22 Cadets passed “B” and “C” certificate examination, respectively.
- University level sports and cultural activities were organized and the University team participated in inter university sports and cultural meet held at PKV, Akola on 16-19 February 2012.
- Through campus interviews, 127 students obtained jobs in leading private and public sector organizations.
- For updating the knowledge of the subject, 42 scientists/teachers/extension personnels participated in various refresher courses and national training programmes conducted by ICAR/SAUs.
- Several infrastructural facilities were developed for up-gradation of teaching such as model class rooms, internet network with CeRA and documentation services in library, hi-tech horticultural units as well as innovative teaching aids.
- Established instructional orchards, herbal garden and seasonal crop cafeteria.
- 16 students of the University qualified in JRF examination, out of which one student of horticulture discipline at College of Horticulture, Mandsaur obtained 4th rank in JRF examination conducted by ICAR.
- 175 students were awarded Master’s degree in different disciplines of Agriculture and Horticulture.

RESEARCH:

- Three new varieties were released and notified *i.e.* RVW 4106 of wheat, RVKG 101 and RVG 201 of chickpea.
- Application of ammonium molybdate @ 1g/kg seed as seed treatment along with *Rhizobium* + PSB was found effective for increasing the productivity of chickpea.
- New *Rhizobium* strain, RVSGRS 114, was found best for enhancing the yield and uptake of nitrogen in chickpea.
- Cultivation of soybean in *kharif* followed by wheat (I year) - chickpea (II year) was the best cropping system in medium black vertisols.
- Integrated weed management + recommended dose of fertilizers gave highest yield in soybean and wheat.
- In soybean-mustard cropping sequence, the highest yield of soybean was recorded with 100 per cent recommended dose of fertilizers. The maximum water use efficiency was obtained with two irrigation at 40 and 70 days after sowing.
- Under irrigated conditions, GW 173 variety of wheat recorded the highest grain yield with 150:60:40 kg NPK/ha, while under rainfed conditions, varieties HI 1531, HW 2004, HI 1500 and MP 3288 gave optimum yield with 60:30 kg NP/ha.
- Twenty Cytoplasmic Male Sterile lines and twenty restorers of pigeonpea are being maintained to develop new hybrids.

- In sesamum, lowest weed density and weed dry weight was found with two hand weeding at 15 and 30 days after sowing.
- In sorghum, application of pendimethalin @ 0.50 kg a.i./ ha with one hand weeding at 30 days after sowing as post emergence was found best as weed management practice.
- In 289 lentil accessions, IG 5080 recorded the highest yield.
- Among 289 heat tolerant germplasm of lentil, the ICARDA germplasm numbers 45113 and 45101 exhibited extra large seed.
- Among different intercropping systems under delayed sowing conditions, the highest equivalent yield, net income and B:C ratio was found with the cultivation of moong.
- Drip fertigation with marginally saline well water and application of one surface irrigation after a period of 75-90 days is feasible and economically viable for cost intensive cultivation of horticultural crops in Vertisols under sub-tropic semi-arid climate.
- Utilization of stored runoff water during winter season, gave the maximum net return and B:C ratio in potato as compared to tomato and chickpea.
- Desi chickpea genotypes *i.e.* IPC 2005-79, JG 923974, IC 552241, GJG 0920, IPC 09-160, IPCK 09-85, Phule 0302-7, JG 14 and IPC 2006-84 as well as *Kabuli* chickpea *i.e.* RVSSG 11, CSJK 54 and IPC 06-143 have been identified as resistant source of *Fusarium* wilt.
- Seed Treatment with *Trichoderma harzianum* + Vitavax Power (4:1) were found effective in reducing wilt and root rot diseases of chickpea.
- The *Cajanus platycarpus* and *Rhynchosia bracteata* both can be used as wild source of resistant against *Phytophthora* blight in pigeonpea.
- Metaflumizone 22% SC @ 600 ml/ha and Flubendamide 48 SC @ 600 ml/ha were found effective against lepidopterous defoliators like green and grey semi loopers in soybean.
- Soybean genotypes, DSb 16 and MACS 1140 were identified as source of resistance against stem fly, *Melangromyza sojae*, while MACS 1039, MACS 1140, MACS 1281 and NRC 80 were found resistant against major insect pest complex of soybean.
- Seed treatment with thiomethxam 70 WP followed by spray of lambdacyhalothrin 5% EC were found best for control of sorghum pests.
- *Desi* chickpea was found better than *Kabuli* chickpea in response to low mean susceptibility index as well as high developmental period of stored grain pests.
- The *Kabuli* varieties of chickpea were found more susceptible to pod borer as compared to *desi* varieties.
- Application of predator *Coccinella septempunctata* @ 5000 beetles/ha minimize the aphid population in mustard and gave higher seed yield.
- Out of 120 lines of Ashwagandha, entry number MWS-215, MWS-90-137, RAS-11 and MWS-216 were superior for highest seed yield.
- Out of 235 lines of opium variety, Mandakani recorded more than 70 kg/ha. latex yield.
- Out of 80 lines of Isabgol, entry No. MIB-1004, RI-88 MIB-201, Selection-10, Sel-51, Udaipur-1, MIB-1001 and MIB 1005 were found superior.
- Among the 24 lines of Safed Musali, entry No. MCB-412 was found superior for fasciculated root yield and sapogamine content.

- Out of 21 gemplasams of Tulsi, MOB-1, MOB-2, MOB-5, MOB-8, MOB-10, and MOB-11 were found superior and high yield genotypes.
- MLS-1, MLS-7, MLS-8 genotypes of Chandrasur were found superior for seed yield.

EXTENSION:

- Under technology assessment and refinement programme, different technologies were assessed in the field of 2490 beneficiaries/farmers.
- To enlighten the farmers on new farming techniques 802 FLD's on oilseeds, 1095 on Pulses, 563 on horticulture, 70 on cotton, 30 on income generating enterprises and other 4657 FLD's were conducted on the farmers field covering an area of 1436.10 ha.
- During 2011-12, a total of 2326 training courses were organized which benefited 59257 participants including farmers and farm women, rural youth, extension personnel and Govt. officials.
- In order to create awareness among farmers of the region, other extension activities in the form of field days (226), Kisan Goshties (176), Kisan Mela (42), exhibitions (113), film shows (548), diagnostic visit to farmers field (599), radio and TV programmes (451), soil health camps (30) and animal health camps (38) were organized which benefitted 282956 farmers/ extension personnel of the region.
- Under mass communication measures, publications in the form of popular articles (134), research papers (85), News letters (96), News paper coverage (851), extension literature (124) were brought out.
- KVK scientists collected 77310 soil and water samples from 1524 villages and after analysis distributed the soil health card to 71829 farmers of the region.
- 9617.45 quintals of quality seeds and (579589) planting material of different crops/plants were produced by the KVKs and distributed to the farmers.
- The SMS of KVK's solved the problems of farmers related to production/protection of crops through farmers call centers.
- Under Kisan Mobile advisory services, 2038 messages related to new technologies were sent to 24087 beneficiaries.
- A total of 44 scientific advisory committee meetings were organized in different KVKs.
- Annual Calendar, Diary, Krishi Vijay (**Rabi Visheshank**), Krishi Vijay (**Phal Visheshank**), Krishi Vijay (**Kharif Visheshank**), Telephone Directory, University News letter, Extension Highlights, Annual Report 2010-11, **Tikau Kheti Ke Live Samekit Kharpatwar Prabandhan** (Technical Bulletin) and **Pyaz Utpadan ki Vaigyanik Kheti** (Technical Bulletin) were published by the Directorate of Extension Services.
- KVK Khargone received Best Biodiversity Garden Award.
- Dr. R.P. Sharma, KVK, Dwas received Rashtriya Gaurav Award.

- Shri Chhatrapal Pateria and Shri Ramesh, adopted farmers of KVK, Datia and Jhabua received the Innovative Farmers Award (ICAR) and Progressive Farmer Award respectively.

FARM ACTIVITIES:

- Under seed production programme, the University produced 684.79 quintals of nucleus seed and 11632.75 quintals of breeder seed of improved varieties of Soybean, Chickpea, Wheat, Pigeon pea, Moong, Urad, Ground nut, Sorghum and Bajra as well as 891 kg hybrid seed of maize, pigeonpea, pearl millet and sorghum.

Glimpses of Different Activities of RVSKVV, Gwalior



Glimpses of Different Activities of RVSKVV, Gwalior



I. THE UNIVERSITY (INTRODUCTION)

1. MISSION

To conduct education, research and extension activities for enhancing productivity, profitability, sustainability of agricultural production systems and livelihood of farming community of the state.

2. MANDATE

- Serve as a centre of higher education in the field of agriculture and allied sciences.
- Conduct of basic, strategic, applied and anticipatory research in the field of agriculture and allied sciences.
- Dissemination of technologies to farmers, extension personnel and organizations engaged in agricultural development through various extension programmes.
- Production and supply of genuine seed and planting materials to the farmers.

3. AREA OF JURISDICTION

The RVSKVV, Gwalior is responsible for Agricultural Education, Research and Extension in following 25 revenue districts of the state.

Revenue Districts

Sheopur, Morena, Bhind, Gwalior, Shivpuri, Guna, Ashoknagar, Datia, Dewas, Ratlam, Shajapur, Mandasaur, Neemuch, Ujjain, Indore, Dhar, Jhabua, Alirajpur, Khargone, Badwani, Khandwa, Burhanpur, Bhopal, Sehore and Rajgarh.

The area under university jurisdiction is a part of the Deccan Plateau and comprises plateaus with mean elevation of 1600 feet above mean sea level; inter spread with the mountains of the Vindhya and Satpura ranges. The maximum height of 1350 m is recorded in Satpura range on the other hand 150 m height is found in Chambal Valley. The main river systems are the Betwa, Chambal, Narmada, Sindh and Tapti. Nearly one third of the state area is covered with tropical forest. The area contains three types of soils varying from alluvial to medium and heavy black Vertisols with six agro climatic zones.

The geographical area of the state under university jurisdiction is 13716133 ha, out of this, 7472072 ha are under cultivation, 2451067 ha under Kharif and 3645672 ha under Rabi fallow. Of the total cultivated area, 49.42% is irrigated. However, the area under irrigation varies from as low as 18.85% in Jhabua district to as high as 75.63% in Datia district (**Table 1**)

The economy of the area is primarily agriculture based. Nearly 75% population is engaged in agriculture. The Malwa region abounds in rich black cotton soil. The low lying areas of Gwalior and Bundelkhand have light soils, whereas the Narmada Valley is formed of deep rich alluvial deposits.

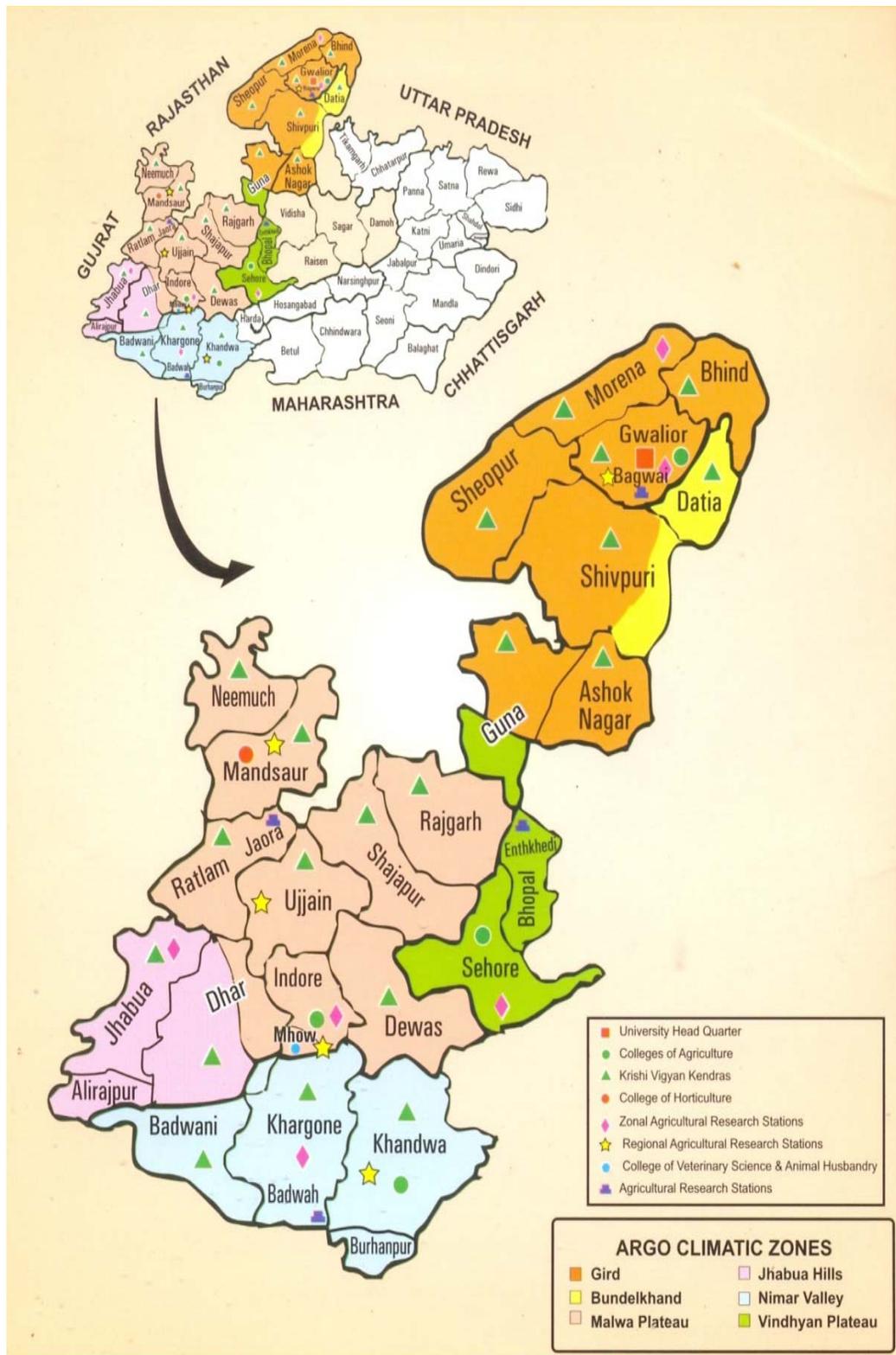


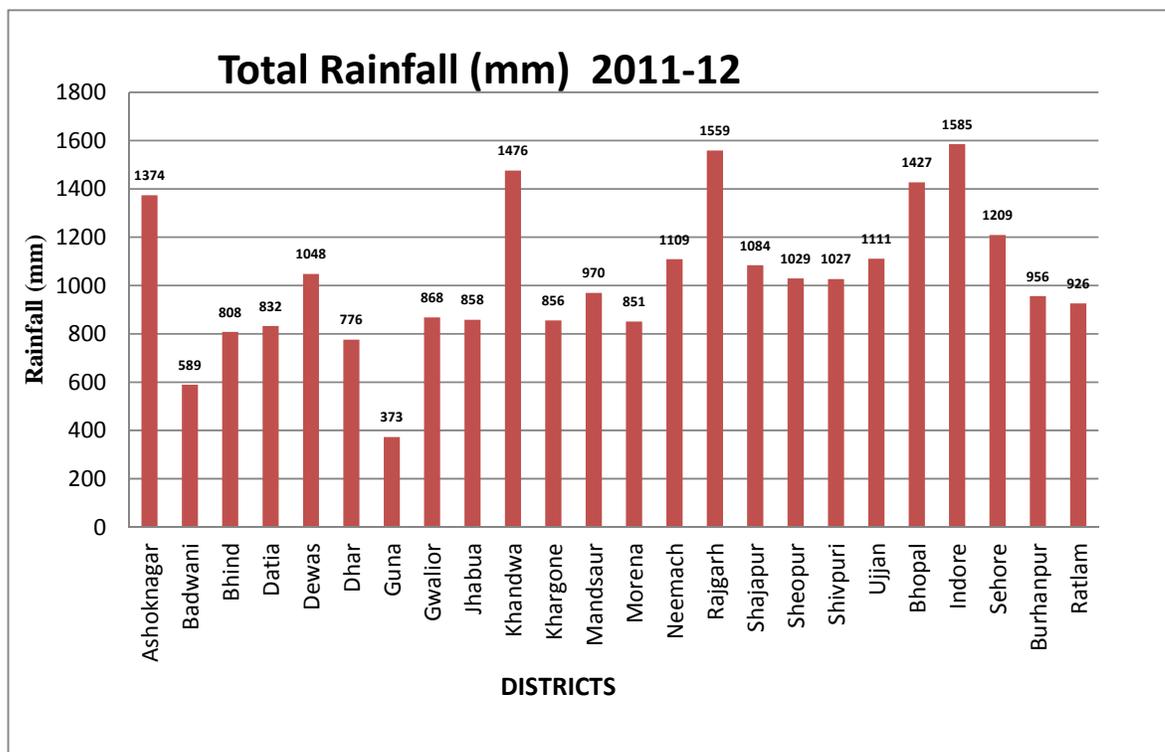
Table 1: Land use pattern and irrigated area in different districts falling under jurisdiction of RVSKVV, Gwalior.

S. No.	Districts	Geographical Area(ha)	Cultivated Area (ha)	Irrigated Area (%)	Fallow Area (ha)	
					Kharif	Rabi
1.	Ashoknagar	467394	307118	37.62	298518	22118
2.	Badwani	529846	228988	37.06	13488	188388
3.	Bhind	445204	320801	32.75	260701	84801
4.	Bhopal	277880	153324	57.86	62624	45224
5.	Burhanpur	342741	104441	35.15	18741	83741
6.	Datia	295874	186714	75.63	143914	50914
7.	Dewas	701307	385801	44.96	16001	142901
8.	Dhar	819541	504454	55.89	32654	252754
9.	Guna	630766	314434	46.99	131734	146034
10.	Gwalior	456449	195723	54.33	134323	35523
11.	Indore	383097	257200	68.70	23500	161200
12 & 13.	Jhabua & Alirajpur	675716	359516	18.85	324616	285016
14.	Khandwa	775616	302512	40.61	7812	203812
15.	Khargone	818557	405668	46.91	26168	313568
16.	Morena	501686	262664	66.48	162864	52464
17.	Mandsuar	551790	358657	52.49	328157	207857
18.	Neemuch	393554	183815	52.88	14615	94515
19.	Raigarh	616300	425763	41.99	50063	258563
20.	Ratlam	486007	332963	43.33	47363	195963
21.	Sehore	656368	385205	59.62	-	134205
22.	Shajapur	618524	453308	46.63	42508	263108
23.	Sheopur	666650	157565	71.78	104065	45865
24.	Shivpuri	995392	393935	40.88	159635	197335
25.	Ujjain	609874	491503	56.72	47003	179803
	Total	13716133	7472072	49.42	2451067	3645672

4. CLIMATIC CONDITIONS

The overall climate varies from semiarid to sub humid with hot summer, cool and dry winter with an average annual rainfall ranging from 600-1000mm. Mean annual rainfall is 1029.21mm

In general, aberrant monsoon behavior is the common feature in the region that usually create abnormal weather conditions including long dry spells of 8-20 days duration in the middle of season.



Rainfall recorded during the year 2011-12

5. AGRO CLIMATIC ZONES

Out of 11 agro climatic zones of the state, following six are under the jurisdiction of RVSKVV, Gwalior:

- Gird Zone
- Malwa Plateau
- Nimar Valley
- Jhabua Hills
- Vindhyan Plateau (Partial)
- Bundelkhand Zone (Partial)

6. MAJOR CROPS AND CROPPING PATTERN

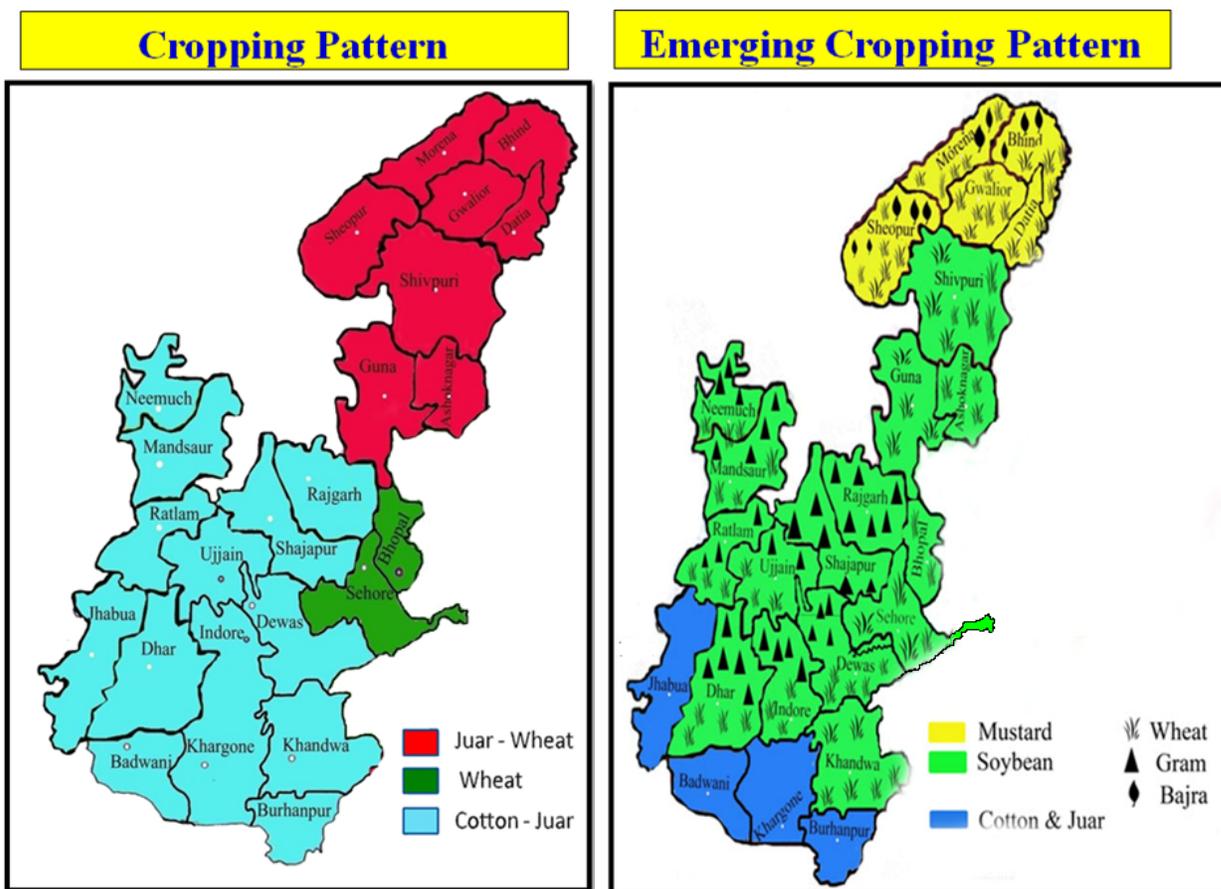
- The main food crops of the area are wheat, rice, lentil and millets. Important among commercial crops grown in the area are pulses, oil seeds, and medicinal crops. The state is poised for a breakthrough in soybean cultivation in pulses. Major crops grown and cropping pattern followed in different agro-climatic zones of the area are given in table 2 and graphically shown in the figure.
- The area coverage of soybean, groundnut and cotton under the jurisdiction of university is 69, 66 and 55 per cent, which contribute to about 68, 67 and 56 per cent in total production of these crops in the state respectively. Chickpea, pea, black gram and wheat contribute about 35, 24, 54 and 48 per cent in their total state production from an area of only 20, 05, 46 and 40 per cent, respectively. The productivity of these crops in the region is higher than the state average.
- Area under horticultural crops is in increasing trend under the university jurisdiction. Guava, ber, aonla and custard apple, in Gird region, orange, grape, chiku, mosambi and acidlime in Malwa plateau; banana, papaya, lime and chiku in Nimar valley and lime, ber, guava, aonla and custard apple in Jhabua hills are blooming well. Among the spice crops, turmeric, corriander, ajwine, chillies, garlic, fenugreek and fennel have their own specialities in different agro-climatic zones. The area coverage under seasonal vegetables and flowers is also showing increasing trend.

Table 2: Major crops and cropping pattern in different Agroclimatic Zones of RVSKVV, Gwalior

Zone	Features		Major crops	Major cropping pattern
Gird zone	Soil	Alluvial	Bajra, Sesamum, Mustard, Gram, Lentil, Wheat and Barley.	Bajra/Sesame/Fallow – Mustard/ Gram/ Lentil/ Wheat/Barley Sugarcane – Fallow/Wheat
	Rainfall	566 – 977 mm		
	Altitude	152-224 msl		
Malwa Plateau	Soil	Deep black soil : Vertisol	Soybean, Cotton, Pigeonpea, Urid, Moong, Maize, Jowar, Gram, Mustard, Wheat and Linseed	Soybean/Cotton/Moong/Urid/Maize/Jowar – Gram/Mustard/Wheat /Linseed/Fallow
	Rainfall	800-1200 mm		
	Altitude	450-675 msl		
Nimar valley	Soil	Deep black soil : Vertisol	Cotton, Pigeonpea, Jowar, G.nut and Sugarcane	Cotton/Pigeonpea/Jowar/G.nut - Fallow
	Rainfall	600 – 800 mm		
	Altitude	450 – 700 msl		
Jhabua hills	Soil	Skeleton gravely	Cotton, Maize,	Cotton/Moong/Maize

	Rainfall	600 – 800 mm	Soybean, G.nut, Urid, Moong and Jowar	/Soybean/G.nut/Urid –Fallow
	Altitude	450 – 700 msl		
Vindhyan plateau	Soil	Medium black soil : Vertisol	Soybean, Wheat, Gram, Lentil and Sugarcane	Fallow/Soybean – wheat/Gram/Lentil Sugarcane - Fallow
	Rainfall	1000–1200 mm		
	Altitude	350 – 600 msls		
Bundelkhand zone	Soil	Clay loam	Sesamum, Urid, G.nut, Moong, Barley, Mustard, Pea, Wheat, Gram and Linseed	Sesamum/G.nut/Urid – Mustard/ Pea/ Barley/ Wheat/ Gram
	Rainfall	750 – 1200 mm		
	Altitude	266 – 560 msl		

MAJOR CROPS AND CROPPING PATTERN



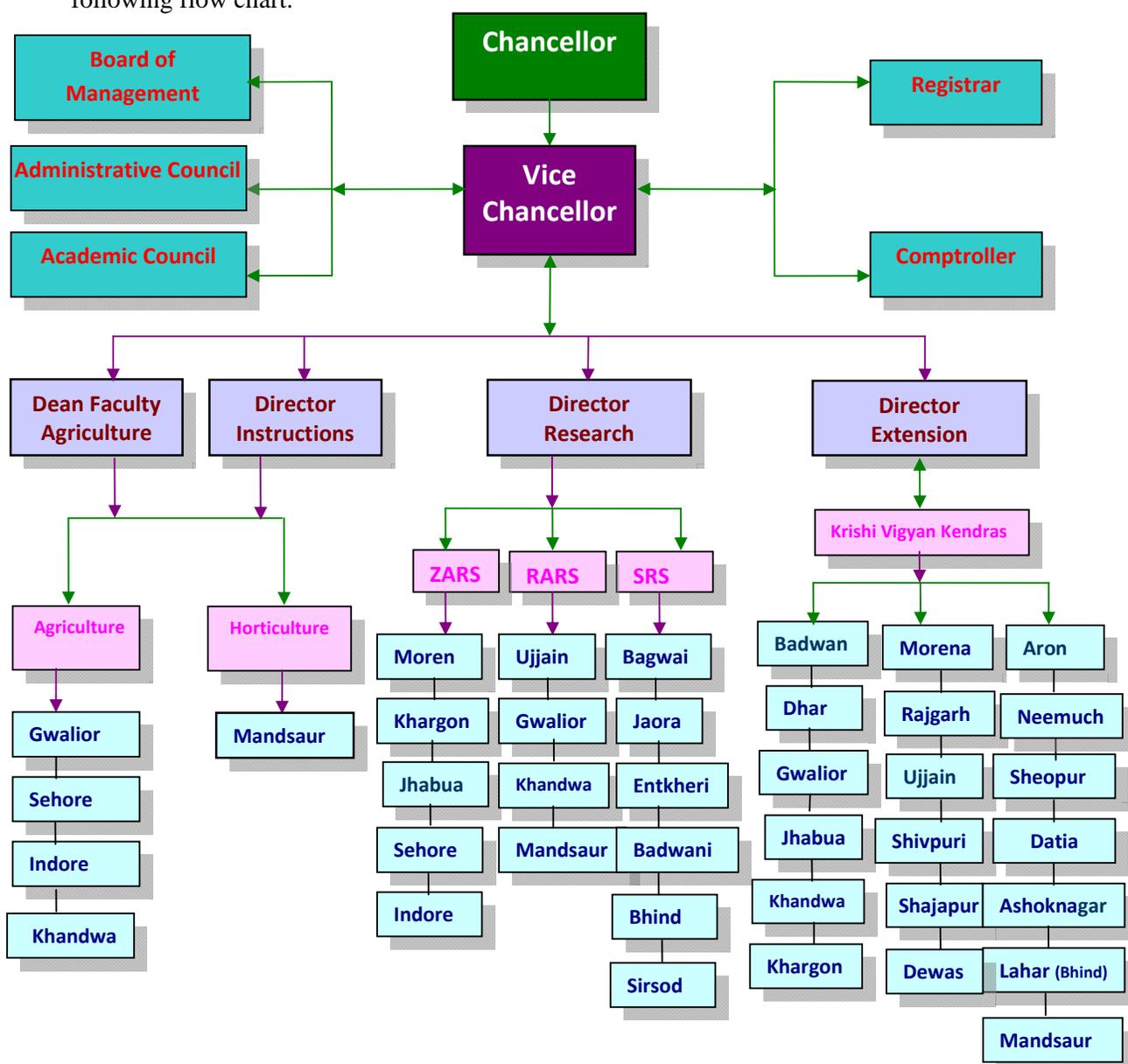
7. ORGANIZATIONAL SETUP

His Excellency, the Governor of Madhya Pradesh, is the Chancellor of the University. Vice Chancellor is the Academic Head and chief executive of the University. He is supported by the following authorities:

- Board of Management
- Academic Council
- Administrative Council

The University encompasses faculty of Agriculture by Faculty Dean. Constituent colleges are headed by respective Deans. Heads of the Departments are the key person for teaching, research and extension of the respective discipline/department.

Director Instructions, Director Research Services and Director Extension Services are responsible university authorities for human resource development, research activities and extension activities, respectively. Registrar and Comptroller support the Vice Chancellor in administration and financial matters. The organizational setup of the university is presented in the following flow chart.



8. GOVERNING BODIES & UNIVERSITY ADMINISTRATION

The Board of Management (BOM) of RVSKVV is the apex-body, empowered to make policy decisions, with the Vice-Chancellor as its chair person who is also the executive of the university. The composition of BOM is given below:

BOARD OF MANAGEMENT

S.No.	Name and address	
1.	Prof. V.S. Tomar, Vice Chancellor	Chairman
2.	Principal Secretary, Kisan Kalyan Avam Krishi Vikas, Bhopal	Member
3.	Secretary, Finance Department	Member
4.	Dr. C.D. Mayee	Member
5.	Dr. Anwar Alam	Member
6.	Shri. Arvind Singh Bhadoria	Member
7.	Shri. Lakhan Singh Yadav	Member
8.	Shri. Prahlad Bharti	Member
9.	Shri. Balaram Patidar	Member
10.	Shri. Karan Singh Uplabdia	Member
11.	Smt. Manorama Menon	Member
12.	Dr. Amresh Kumar	Member
13.	Shri. Samar Vijay Singh	Member
14.	Dr. J.K. Singh	Member
15.	Dr. M.M. Pandey,	Member
16.	Dr. Rajiv Saxena	Non Member Secretary

ACADEMIC COUNCIL

The Academic Council is vested with the responsibility of implementing and monitoring all the academic programmes. The council is headed by the Vice-Chancellor, as chair person and consists of Dean of Faculty, Director Instructions, Director of Research and Director of Extension, University Heads of Departments and Professors as Members. The composition details are given below.

S.No.	Name and Address	
1.	Dr. V.S. Tomar Vice Chancellor RVSKVV, Gwalior	Chairman
2.	Y.M. Kool Dean Faculty of Agriculture RVSKVV, Gwalior	Member
3.	Dr. H.S. Yadava Director Research Services RVSKVV, Gwalior	Member
4.	Dr. S.S. Tomar Director Extension Services RVSKVV, Gwalior	Member
5.	Dr. Y.M. Kool Director Instructions and Student Welfare RVSKVV, Gwalior	Member
6.	Dr. A.K. Singh, Prof. and Head, Dept. of Pl. Br. & Gen., RVSKVV, Gwalior	Member
7.	Dr. R.A. Khan, Retd. Director Instruction, JNKVV, Jabalpur Infront of Dr. Mardan Ali, Ayyaz Ali Marg, Goghar, Distt. Rewa (M.P.)	Member
8.	Dr. H.B.S. Bhadoria, CoA, Sehore	Member
9.	Dr. Rajiv Saxena Registrar, RVSKVV, Gwalior	Secretary

**PROVISIONAL
ADMINISTRATIVE COUNCIL**

S.No.	Name and address	
1.	Dr. V.S. Tomar Vice Chancellor RVSKVV, Gwalior	Chairman
2.	Dr. Y.M. Kool Dean of Faculties RVSKVV, Gwalior	Member
3.	Dr. Rajiv Saxena Comptroller RVSKVV, Gwalior	Member
4.	Two Deans of Colleges nominated by the Vice-Chancellor for a period of one year by rotation 1. Dr. N.S. Tomar, Dean, College of Agriculture, Gwalior and 2. Dr. A.M. Rajput Dean, College of Agriculture, Indore	Member
5.	Dr. Y.M. Kool Director Instructions and Student Welfare RVSKVV, Gwalior	Member
6.	Dr. H.S. Yadava Director Research Services RVSKVV, Gwalior	Member
7.	Dr. S.S. Tomar Director Extension Services RVSKVV, Gwalior	Member
8.	Dr. Dr. Y.M. Kool, Superintendent of Physical Plant / Executive Engineer RVSKVV, Gwalior	Member
9.	Two Heads of Department from Agriculture Faculty, in rotation according to the seniority for a period of one year- 1.Dr. R.L. Rajput, Prof. & Head, Agronomy, RVSKVV, Gwalior 2.Dr. R.N.S. Banafar, Prof. & Head, Horticulture, RVSKVV, Gwalior -	Member
10.	Dr. S.P.S. Tomar Deputy Director Instructions (Student Welfare) RVSKVV, Gwalior	Member
11.	Dr. Rajiv Saxena Registrar, RVSKVV, Gwalior	Secretary

9. FINANCIAL STATUS

RVSKVV, GWALIOR (2011-12)

Grants Received and Expenditure Incurred During (01.04.11 to 31-03-12)

(Rs. Lakhs)

1.	Opening Balance	2259.93
2.	Received Grant in aid from M.P. Govt.	
	(A) Agriculture Department	
	I. Agriculture Plan	890.00
	II. Tribal Sub Plan	400.00
	III. Special Component Plan	360.00
	IV. Agriculture Non-Plan	1900.00
	(B) Others	
	I. Rashtriya Krishi Vikas Yojana (RKVY)	36.03
	II. MPWSRP	75.60
	III Other projects	232.07
3.	I. Indian Council of Agricultural Research(ICAR& KVKs)	2190.34
	II. Development grant (ICAR)	484.36
	III. Government of India (GOI)	42.01
4.	Internal & Other Resources of University	886.50
	Total Received Amount	9675.84
5.	Total Expenditure on Pay & Other Allowances etc.	8827.90
6.	Closing Balance on 31/03/2012	847.94

10. LINKAGES AND COLLABORATIONS WITH INTERNATIONAL ORGANIZATIONS

II. EDUCATIONAL ACTIVITIES

1. PROFILE OF THE COLLEGES:

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya offers both undergraduate and post graduate programme in the faculty of Agriculture At present, university has four colleges of Agriculture and one college of Horticulture under the faculty of Agriculture. The four constituent College of Agriculture are located at Gwalior, Indore, Sehore and Khandwa and one College of Horticulture located at Mandsaur. All these colleges offer Under Graduate and Masters Degree Programmes in different disciplines except COA, Khandwa where only UG programme is offered. Ph.D programme is offered only at College of Agriculture, Gwalior. The list of colleges with their location, year of establishment and degree programme offered are given below.



CoA, Gwalior (1950)



CoA, Indore (1959)



CoA, Sehore (1952)



RVSKVV, GWALIOR (2008)



CoA, Khandwa (1987)



**CoH, Mandsaur (2002),
Ag. College 1988**

Details of the colleges

S. No.	Name of College with location	Year of Establishment	Degree programme offered (2011-12)	
I Faculty of Agriculture				
1.	College of Agriculture, Gwalior	1950	B.Sc. (Ag.)	
			M.Sc. (Ag.)	
			(1) Agronomy	(2) Entomology
			(3) Ext. Education	(4) Agriculture Economics & F.M.
			(5) Genetics & Plant Breeding	(6) Plant Pathology
			(7) Soil Science & Agril. Chemistry	(8) Fruit Science
			Ph.D	
			(1) Agronomy	(2) Entomology
			(3) Genetics & Plant Breeding	(4) Soil Science & Agril. Chemistry
			(5) Plant Pathology	(6) Agriculture Economics & F.M.
(7) Ext. Education	(8) Fruit Science			
(9) Vegetable Science				
2.	College of Agriculture, Indore	1952	B.Sc. (Ag.)	
			M.Sc. (Ag.)	
			(1) Agronomy	(2) Entomology
			(3) Ext. Education	(4) Agriculture Economics & F.M.
			(5) Genetics & Plant Breeding	(6) Plant Pathology
			(7) Soil Science & Agril. Chemistry	(8) Vegetable Science
3.	RAK College of Agriculture, Sehore	1952	B.Sc. (Ag.)	
			M.Sc. (Ag.)	
			(1) Agronomy	(2) Entomology
			(3) Ext. Education	(4) Genetics & Plant Breeding
			(5) Agriculture Economics & F.M.	(6) Plant pathology
			(7) Soil Science & Agril. Chemistry	(8) Vegetable Science
4.	BM College of Agriculture, Khandwa	1987	B.Sc. (Ag.)	
5.	KNK College of Horticulture, Mandsaur	2002	B.Sc. (Hort.)	
			M.Sc. (Hort.)	
			(1) Fruit Science	
			(2) Vegetable Science	
			(3) Plantation, Spices, Medicinal and Aromatic Crops	
(4) Floriculture & Landscape Architecture				

The university follows the semester system of education. Each academic year has 180 to 200 instructional days. Completion of a degree programme requires successful study of

prescribed courses as approved by the Academic Council of the programme. Course contents of all subjects are periodically updated and new courses are occasionally added to the degree requirement to cope up with the challenges for upcoming technology. The university follows 10 point scale evaluation system approved by the ICAR. It ensures individual attention of each and every student through its advisory system. At Under-Graduate level, for a group of 5-10 students one faculty advisor is appointed for each class and at Post-Graduate level, for each student, an advisory committee consisting of 3-4 faculty members is appointed. The teacher advisory guides, supervises and monitors the academic performance of his/her advisees besides helping them in their personal problems. The advisor also maintains a close contact with parents/guardians of the students and informs them the progress of their works/performance.

2. ADMISSION PROCEDURE

Under Graduate Programmes

Admission in first year of B.Sc. (Ag.) and B.Sc. (Hort.) is done on the basis of the merit list provided by the Professional Examination Board of the State Government, located at Bhopal. The board conducts a Pre-Agriculture Test (PAT) for B.Sc. (Ag.) and B.Sc. (Hort.). The roster for reservation of seats for UG (**Table 3**) and for PG as per provisions made by the State Government for different categories is strictly followed. All possible efforts are made to fill complete seats of different categories by repeated counseling of the students.

Post Graduate Programmes

Admissions in post graduate programmes are made by the university through counselling on the basis of merit list. As per this list, admissions are given to the students in the subject of their choice subject to the availability of seats. The roster of reservation is also followed for these admissions.

Ph.D. Programmes

Similarly, in Ph.D programme admission is made through counseling based on merit list of the applicants.

3. ALLOCATION OF SEATS AND ROSTER:

Intak Capacity at a glance

S.No.	Faculty	Intak Capacity				Total
		Free seats	Payment seats	NRI	ICAR	
1.	B.Sc (Ag.)	220	44	11	33	308
2.	B.Sc (Hort.)	40	08	02	06	56
	Total	206	52	13	39	364
3.	M.Sc (Ag.)	84	84	-	21	189
4.	M.Sc (Hort.)	28	28	-	07	63
	Total	112	112	-	28	252
5.	Ph.D Agriculture	28	14	-		42
6.	Ph.D. Horticulture	08	04	-		12
	Total	36	18	-		54
	Grand Total	354	182	13	67	670

(i) Under Graduate B.Sc. (Ag.)

Allocation of Seats		Boys	Girls	Total
Roster				
Free Seats	Gen.	50	31	81
	ST	36	14	50
	SC	24	11	35
	OBC	44	13	57
Payment Seats		48	02	50
NRI Seats		06	-	06
Nominee/Fellow	ICAR	25	04	29
Total		233	75	308

(ii) Under Graduate B.Sc. (Hort.)

Allocation of Seats		Boys	Girls	Total
Roster				
Free Seats	Gen.	14	06	20
	ST	05	03	08
	SC	05	02	07
	OBC	03	02	05
Payment Seats		-	-	08
NRI Seats		-	-	02
Nominee/Fellow	ICAR	-	-	06
Total		27	13	56

(iii) Post Graduate: M.Sc. (Ag.)

S. N o.	Department	<u>Campus wise seats for PG programmes</u>									Ph.D		
		Master degree										Gwalior	
		Gwalior		Indore		Sehore		Total					
		F	P	F	P	F	P	F	P	ICAR	F	P	
1.	Agronomy	4	4	4	4	4	4	12	12	4	4	2	
2.	Agril. Eco. & FM	4	4	4	4	4	4	12	12	4	4	2	
3.	Entomology	4	4	4	4	4	4	12	12	4	4	2	
4.	Extn. Education	4	4	4	4	4	4	12	12	4	4	2	
5.	Plant Breeding & Genetics	4	4	4	4	4	4	12	12	4	4	2	
6.	Plant Pathology	6	6	4	4	0	0	10	10	3			
7.	Soil Science & Agril. Chemistry	4	4	4	4	0	0	8	8	2	4	2	
Total		35	31	34	32	20	20	89	83	23	16	8	

(iv) Post Graduate: M.Sc. (Hort.) & Ph.D

S. No.	Department	Campus wise seats for PG programmes										Ph.D		
		Master degree										Gwalior		
		Mandsaur		Gwalior		Indore		Sehore		Total		F	P	
F	P	F	P	F	P	F	P	F	P	F	P	F	P	
1.	Fruit Science	4	4	4	4					8	8	08	4	2
2.	Vegetable Science	4	4	-	-	4	4	4	4	12	12		4	2
3.	Floriculture & Landscape Architecture	4	4	-	-	-	-	-	-	4	4			
4.	Plantation, Spices, Medicinal & Aromatic Crops	4	4	-	-	-	-			4	4			
Total		16	16	4	4	-	-	-	-	28	28		8	4

4. STUDENT STRENGTH:

During the academic year 2011-12, a total of 670 seats were offered by the university. Out of them, 364 were in under graduate and 252 in post graduate programmes.

In under graduate programmes, out of total 364 seats, 308 seats were in B.Sc. (Ag.) and 56 in B.Sc. (Hort.) similarly, of the total 252 seats in post graduate programmes, 189 seats were in M.Sc. (Ag.) and 63 in M.Sc. (Hort.). In Ph.D, out of total 54 seats, 42 were in Agriculture and 12 in Horticulture discipline.

During the year under report, a total number of 1918 students were on rolls of the university in different UG (1431 students), PG (446 students) and Ph.D (41 students) programmes

A. Students admitted:

S.No.	Faculty	Fresh admitted students				Total
		Free seats	Payment seats	NRI	ICAR	
1.	B.Sc (Ag.)	220	44	11	33	308
2.	B.Sc (Hort.)	40	08	02	06	56
	Total	206	52	13	39	364
3.	M.Sc (Ag.)	84	84	-	21	189
4.	M.Sc (Hort.)	28	28	-	07	63
	Total	112	112	-	28	252
5.	Ph.D Agriculture	28	14	-		42
6.	Ph.D. Horticulture	08	04	-		12
	Total	36	18	-		54
	Grand Total	354	182	13	67	670

B. Student strength at a glance:

S.No.	Degree Programme	No.of students
1.	B.Sc. (Ag.)	1226
2.	B.Sc. (Hort.)	205
3.	M.Sc. (Ag.)	399
4.	M.Sc. (Hort.)	47
5.	Ph.D (Agri./Hort.)	41
Total		1918

(i) Under Graduate: B.Sc. (Ag.)

Name of the Campus	General		SC		ST		OBC		Total		Grand Total
	B	G	B	G	B	G	B	G	B	G	
Gwalior	40	35	46	15	53	17	115	115	254	82	336
Sehore	86	32	41	19	56	19	72	25	256	94	350
Indore	43	30	36	20	41	19	99	31	219	100	319
Khandwa	18	12	24	11	29	21	85	21	156	65	221
Total	188	109	146	65	179	76	371	92	885	341	1226

(ii) Under Graduate: B.Sc. (Hort.)

Name of the Campus	General		SC		ST		OBC		Total		Grand Total
	B	G	B	G	B	G	B	G	B	G	
Mandsaur	26	16	28	12	30	13	69	16	153	52	205

(iii) Post Graduate: M.Sc. (Ag.)

Name of the Campus	General		SC		ST		OBC		Total		Grand Total
	B	G	B	G	B	G	B	G	B	G	
Gwalior	34	11	28	06	26	06	46	06	110	29	139
Sehore	22	09	18	03	23	09	31	11	94	32	126
Indore	21	22	21	09	20	10	34	07	96	38	134
Total	77	42	67	18	69	25	111	24	300	99	399

(iv) Post Graduate: M.Sc. (Hort.)

Name of the Campus	General		SC		ST		OBC		Total		Grand Total
	B	G	B	G	B	G	B	G	B	G	
Mandsaur	11	03	05	02	06	03	15	02	37	10	47

(v) Ph.D. Programme

Campus	General		SC		ST		OBC		Total		Grand Total
	B	G	B	G	B	G	B	G	B	G	
CoA, Gwalior	15	09	07	02	-	01	04	03	26	15	41
Total-											

5. TEACHING STATUS:

Completion of a degree programme requires successful study of the courses as approved by the academic council of the programme. Every student has to study a set of prescribed courses per semester. The semester wise courses offered and total credits covered in different undergraduate and postgraduate degree programmes are given below.

(i) Under Graduate: B.Sc. (Ag.)

	Courses offered (No.)		Total Credits	
	I Sem.	II Sem.	I Sem.	II Sem.
1 st Year	08	09	21	22
2 nd Year	09	08	23	20
3 rd Year	08	09	20	20
4 th Year	05 RAWE	01 Exp Learn	20	20
Total	30	27	84	82

(ii) Under Graduate: B.Sc. (Hort.)

	Courses offered (No.)		Total Credits	
	I Sem.	II Sem.	I Sem.	II Sem.
1 st Year	11	09	21(13+8)	22(13+9)
2 nd Year	09	08	22(13+8)	19(11+8)
3 rd Year	08	08	20(12+8)	20(12+8)
4 th Year	03	03	20	20
Total	32	28	83	81

(iii) Post Graduate: M.Sc. (Ag.)

S. No.	Department	Courses offered (No.)		Total Credits	
		I Sem.	II Sem.	I Sem.	II Sem.
1.	Agronomy	09	09	21	20
2.	Agricultural Economics & Farm Management	10	09	20	20
3.	Entomology	10	10	21	20
4.	Extension Education	10	10	21	18
5.	Plant Breeding & Genetics	09	10	21	19
6.	Plant Pathology	10	10	20	20
7.	Soil Science & Agricultural Chemistry	09	10	23	23
8.	Fruit Science	09	09	19	19
9.	Vegetable Science	09	09	19	19

(iv) Post Graduate: M.Sc. (Hort.)

S.No.	Department	Courses offered (No.)		Total Credits	
		I Sem.	II Sem.	I Sem.	II Sem.
1.	Fruit Science	10	09	22	16
2.	Vegetable Science	10	09	22	17
3.	Plantation, Spices, Medicinal & Aromatic Crops	10	09	22	17
4.	Floriculture & Landscape Architecture	10	09	22	17

6. EXPERIENTIAL LEARNING PROGRAMME:

As per recommendations of IVth Deans' Committee the B.Sc.(Horticulture)/ B.Sc.(Ag.) graduates must have adequate hands on experience on different aspects of horticulture/agriculture. For this purpose in the final year an experiential learning programme is started with different aspects of horticulture and agriculture.

GLIMPSES OF EXPERIENTIAL LEARNING

1. Protected cultivation of high value crops (COH, Mandasaur)



2. Nursery Production and Management: (COH, Mandsaur)



3. Floriculture and Landscape Gardening: (COH, Mandsaur)



7. RURAL AGRICULTURAL/HORTICULTURAL WORK EXPERIENCE:

As a part of regular curriculum, the final year students of B.Sc. (Ag.) and B.Sc.(Hort) were placed in rural areas for one semester in selected villages through Krishi Vigyan Kendras (KVKs) working in the region where each student is attached to one host farmer for practical training with regards to crop production, crop protection, economics and also dynamics of the rural society. Further, some social activities were also performed by the students like sanitation in the village, plantation in the premises of primary and middle schools.

RAWE/RHWE AT A GLANCE

S.No	Name of college	No. of students	Adopted villages/KVKs	Technologies desminated
1.	Gwalior	79	Karmach kala, Talpur Indrapura, Lalitpura Pandola, Mundla, Sanora, Brodi, Sikroda, Govidpura, Doharikala, Rampur	Seed treatment in rabi pulses, Spacing, Plant protection in soybean, Bajra, sesame, ground nut pigeon pea. and mustard, Soil sampling, Application of Micro-nutrients
2.	Sehore	88		Soil testing, Soil Treatment, Fertilizer application, Organic farming, Identification of weeds, Weed control, Efficient use of appropriate insecticides & pesticides, Inter cropping, Improved seeds, Seed treatments Irrigation, WM, PHM, OM, Nursery management Fruit' flowers & vegetable cultivation, Grading & marketing, Storage, Preparation of soya milk, Income generation activities/ programme, Various developmental programmes in rural areas, Allovera Juice preparation, Biodiversity nursery visits, Medicinal plants identification, Mushroom cultivation., Post harvest technologies, Animal husbandry House hold technologies (Water purification, Fruits and vegetables, preservation, nutrition management, balance diet, sanitation
3.	Khandwa	59	KVK, Khargon and KVK, Badwani	do
4.	Indore	85		do
5.	Mandasur	40	RHRS Jaora -31 KVK, Neemuch-09	Disseminated production, Protection and Post harvest technologies of fruits, vegetables, Medicinal and aromatic plants, Spices and flowering crops among the farmers especially on IPM, IDM, Water Harvesting, moisture conservation and PHM

8. STUDENTS WELFARE ACTIVITIES:

i. National Service Scheme (NSS)

The NSS volunteers of various colleges have actively participated in NSS camps organized during the reporting year. The NSS activities included literacy programmes, HIV/AIDS Awareness Programmes, Environment Protection, Consumer Awareness and Pulse Polio Programmes etc. NSS special camps of 10 days duration were organized for all the final year undergraduate students. These special camps were organized by the colleges to carryout special campaigns and training programmes. College wise details of NSS activities are given below:-



a. College of Agriculture, Gwalior:

College of Agriculture, Gwalior has one NSS unit which is affiliated with Jiwaji University, Gwalior and 104 students enrolled as NSS volunteers during the session 2011-12. In addition to the routine activities, the NSS organized various activities throughout the year.

b. College of Agriculture, Sehore

- Under activities of NSS, organized 7 days special camp at Rafikganj (Sehore) in which 55 students (Boys & Girls) participation and conducted rallies for awareness towards AIDS, literacy, pulse polio, Beti Bachao Abhiyan, Sanitation, tree plantation and other related activities like yuva divas, AIDS divas etc.
- During the year 40 students passed “B” certificate as well as 2 students passed “C” certificate examination of NCC.
- One student of the College Mr. Munesh Kushwah obtained “Gold Medal” in State level Speech Competition held at Ujjain.
- Four students of the College participated in 7 days Special Camp at Pachmarhi, Hoshangabad.

College of Agriculture, Indore

1. Conducted blood donation awareness camp during 7 days rural NSS camp at village Nignoti from 27.01.2011-02.02.2012.
2. NSS volunteers of the College visited door to door and motivated the rural youth for coming forward and to know about the activities and the functions of RRC.
3. Motivated rural women for literacy and droppers to rejoin the school.
4. Conducted theme based IQ test and poster competition for the 8-15 years old children of the village.
5. Organized Social awareness rally and plantation programme in farmers field.
6. Development of play ground.

7. Detailed social survey of various social evils, public health and awareness regarding on going Govt. policies.
8. Organized cultural programme and theme based talks on crop production technology.

c. College of Agriculture, Khandwa:-

- a. Organized speech competition of the students on 25/01/2012 on the occasion of Voters Day
- b. 53 students participated in NSS camp organized on 01/11/2011 to 07/11/2011 in Khalwa village of Khandwa district, M.P.
- c. A seminar was organized on the theme of Wastage of foodgrains on 25/09/2011.

d. College of Horticulture, Mandsaur:-

1. Conducted blood donation awareness camp.
2. NSS volunteers of the College visited door to door and motivated the rural youth/villagers for coming forward and to know about the activities and the functions of RRC .
3. Motivated rural women for literacy and droppers to rejoin the school.
4. Organized Social awareness camp.
5. Assist in development of play ground of volley ball
6. 46 students of College passed “B” certificate examination of NSS.

ii. National Cadet Corps:

The Directorate of National Cadet Corps (NCC) was established in the year 1948 to conduct the activities of NCC under the Ministry of Defence with the Motto of ‘**Unity and Discipline**’ The three colours of the mono represent Army, Naval and Air wing.



a. College of Agriculture, Gwalior

1. Enrollment of NCC cadets in the College: 107 Cadets.
2. Major Dr. H.S. Bhadoria attended CATC NCC camp at Gwalior from 18th July to 27th 2011.
3. 51 Cadets attended CATC NCC camps at Gwalior and 5 Cadets attended Army attachment camp at Gwalior.

4. Performance in B & C certificate examination:

Name of Examination	Cadets Appeared	Cadets Passed	Result (%)
B Certificate Exam	29	27	93 (%)
C Certificate Exam	04	04	100 (%)

- Cadets participated in various social service activities like cleanliness of college campus, tree plantation and awareness of AIDS etc.
- Cadets participated in national functions like Independence Day and Republic Day in the college/University every year.

b. College of Agriculture, Sehore

- The NCC activities are governed by 4 M.P. Infantry Battalion of Bhopal.
- During 2011-12 total 54 students were registered and out of which 22 students passed “B” certificate examination and 18 students passed “C” certificate examination and one student Mr. Lokendra Rajput was awarded the best Firing Shooter in the G.K.Competiton.

c. College of Agriculture, Indore:-

- The NCC activities are governed by the 9 M.P Battalion, NCC, Indore. The activities include, drill, arms training Map reading, field crafts, civil defense, adventurous training, firing, first aid etc. The students also attended different types of camps viz. Annual Training camp, Social Service Camp, All India Summer Training Camp, Advanced Leadership Course, Paratroopers Camp, Army Attachment Camp, National Integration.

iii. Cultural activities:

S.No.	Activities	Winner	Runner
1.	Elocution	Sehore	Gwalior
2.	Debate	Gwalior	Sehore
3.	Extempore	Gwalior	Sehore
4.	Mono Acting	Sehore	Gwalior
5.	Folk Dance	Gwalior	Sehore
6.	Clay Modeling	Indore	Gwalior
7.	<u>Rangoli</u>	Gwalior	Sehore
8.	Mime	Sehore	Indore
9.	Patriotic Group Song	Sehore	Gwalior
10.	Indian Group Song	Sehore	Gwalior
11.	Fine Art on the spot painting	Gwalior	Sehore
12.	Lalit Kala Shiromani	Indore/Sehore	Khandwa

iv. Sports/ Extracurricular Activities

S.No.	Activities	Winner		Runner	
		Male	Female	Male	Female
1.	Chess	Mandsaur		Mandsaur	
2.	Caram			Mandsaur	
3.	Badminton	Gwalior	Indore	Indore	
4.	High jump	Indore	Mandsaur	Sehore	
5.	Long jump		Mandsaur	-	Indore
6.	Shot put throw	Indore		Mandsaur	
7.	Disc throw			Indores	
8.	T.T.	Indore	Indore	Khandwa	-
9.	Kho-kho	Sehore			
10.	Volley ball			Sehore	
11.	Kbaddi			Sehore	

v. Students counseling and Placement

The Directorate of Student Welfare contact several organizations to hold campus interview, so that more number of the students may get job offer after completing their studies. The literature related to language improvement, placement opportunities and career building was also made available to the students. Apart from this, in each college, “**students counseling and placement cells**” have been established to advise and prepare the students in getting suitable jobs. These cells are working as a liaison between colleges and the public and private sector organizations/ institutions which are in need of graduate and post graduate degree holders in various disciplines. During the year under report, campus interviews were held by several organizations.

a. College of Agriculture, Gwalior

During the year 2011-12, 128 students were selected from Agriculture College, Gwalior through university placement cell in the different organizations viz. Bank of Baroda, Reliance Dairy Food Ltd., New Delhi, Madhya Pradesh Water Sector Restructuring Project, Bank of India, Rajiv Gandhi Mission for Watershed Management, Shriram Bioseed Genetics India Ltd., ICICI BANK and Central Bank of India etc.

b. College of Horticulture, Mandasur

S.No.	Name of employee	No. of student
1.	Bank of Baroda	04
2.	ICICI	05
3.	Shriram Bioseed	07
4.	Watershed	10

9. LIBRARY AND DOCUMENTATION SERVICE

a. College of agriculture, Gwalior

S. No	Item	Availability
1.	Text Book & Reference Books	The existing book collection is strengthened with adding of new edition in all agriculture and allied disciplines.
2.	Book Bank	The Libraries are providing books bank scheme for the benefit of the SC, ST & OBC student. Special text-book and reference collection are available in the library.
3.	Competitive Examination Book	This section is strengthened with latest collection which is very useful for the ICAR Examinations, IAS, UPSC, ICAR-JRF /NET, PSC, ARS, SRF, Pre PG & Ph.D. Entrance exams for Banks, Private & Cooperative services.
4.	Digital Library	The digital library infrastructure facility viz., computers with latest configuration, OPAC, Internet facility etc. are fully strengthened in existing Library. The library is well equipped with data capturing unit. There are many CD databases on different disciplines of Agriculture and allied subjects are available in library for students. Electronic information like e-books, CERA, Krishiprabha & Vidyanidhi are also available for students for improvement of academic & research programmes.
5.	e-Books	The library purchased 16 e-Books which can be accessed through I.P. basis.
6.	Other Items	Some Indian and Foreign journals are available for the teachers/scientist, researchers and extension personnels including UG, PG, Ph.D. students.

b. College of agriculture, Sehore

S.No.	Particulars	Number
1.	No. of Books Total available	25869
2.	No. Books purchased during the year	2000
3.	Total No. of Books in Book Bank	441
4.	Total No. of Books Total available	25869
5.	Books purchased during the year	2000

c. College of agriculture, Indore

S. No	Item	Availability
1.	Text Book & Reference Books	The existing book collection is strengthened with adding of new edition in all agriculture and allied disciplines.
2.	Book Bank	The Libraries are providing books bank scheme for the benefit of the SC, ST & OBC student. Special text-book

		and reference collection are available in the library.
3.	Competitive Examination Book	This section is strengthened with latest collection which is very useful for the ICAR Examinations, IAS, UPSC, ICAR–JRF /NET, PSC, ARS, SRF, Pre PG & Ph.D. Entrance exams for Banks, Private & Cooperative services.
4.	Digital Library	The digital library infrastructure facility viz., computers with latest configuration, OPAC, Internet facility etc. are fully strengthened in existing Library. The library is well equipped with data capturing unit. There are many CD databases on different disciplines of Agriculture and allied subjects are available in library for students. Electronic information like e-books, CERA, Krishiprabha & Vidyanidhi are also available for students for improvement of academic & research programmes.
5.	e-Books	The library purchased 16 e-Books which can be accessed through I.P. basis.
6.	Other Items	Some Indian and Foreign journals are available for the teachers/scientist, researchers and extension personnels including UG, PG, Ph.D. students.

d. College of agriculture, Khandwa

Library facility with CeRA provided to students. New building of library will be completed by March 2013.

e. College of Horticulture, Mandsaur

1. No. of books purchased (up to 31st March 2012)

Book purchased from	No. of Books
V.V. fund	764

2. Subject wise list of total number of books purchased:

S. No.	Subject	No. of books
1.	Agronomy	32
2.	Agriculture Economics	37
3.	Statistics	12
4.	Chemistry and soil science	32
5.	Horticulture	346
6.	Extension	17
7.	Plant Pathology	116
8.	Botany, Plant Breeding and Genetics	76
9.	Agriculture Engineering	2
10.	General Books	62
11.	Entomology	32
	Total	764

3. Database:

- 1) Horticulture database CD's from 1964-2005 and
- 2) Horticulture database CAB abstract from 1996 to 2009 are also available.

10. INFRASTRUCTURE FACILITIES DEVELOPED FOR TEACHING UP-GRADATION

a. College of Agriculture, Gwalior:

S.No.	Department	Facilities Developed
1.	Agricultural Economics and Farm Management	Nil
2.	Soil Science and Agricultural Chemistry	New instruments viz TOC analyzer, soil particle analyzer, Autoclave, potentio-metric titrator, pH meter and EC meter were purchased One LCD projector was purchased for teaching, presentation etc. New books were purchased to upgrade knowledge & departmental library
3.	Extension Education	One LCD projector and Desktop Computer purchased for teaching and presentation
4.	Plant Breeding and Genetics	Desktop Computer, Printer, LCD Projector, Projector screen, Offline UPS, Seed counter, Electronic Balance Gel Rocker, Vortexes, Magnetic stirrer, Dry bath, Tinifuge, Deep Freezer (-20 ⁰ C), Digital Orbital shaker Plastic ware for Tissue culture lab, were purchased
5.	Agronomy	Renovation of laboratory (UG, PG) & Ph.D. class room Purchased agronomical equipments: Padestal fan victor, Laboratory poly ware, Laboratory glass ware, Chemicals, TDR moisture meter, Top pan balance, Battery sprayer, Herbicides and insecticides, seed displayers & Gunny cloth bag, E.Kel plus superior microprocessor and data management software, E.Kel plus auto sequencing micro processor, Rotary flask shaker, U.V. lusble spectrophotometer. E. Four stage

b. College of Agriculture, Sehore

- a. Examination hall for 200 examinees is being constructed on first floor .
- b. New books of Rs.3.00lakh have been purchased as per new syllabii of UG/PG .
- c. Two instructional manuals one each in Entomology and Genetics&Plant breeding have been pulished
- d. New equipments & laboratory chemicals have been purchased.
- e. Furniture for examination hall (200 nos) has been purchased.

c. College of Agriculture, Indore

S.No.	Department	Facilities Developed
1.	Extension Education	One LCD projector and Desktop Computer purchased for teaching and presentation
2.	Plant Breeding and Genetics	Desktop Computer, Printer, LCD Projector, Projector screen, Offline UPS, Seed counter, Electronic Balance Gel Rocker, Vortexes, Magnetic stirrer, Dry bath, Tinfuge, Deep Freezer (-200C), Digital Orbital shaker Plastic ware for Tissue culture lab, were purchased
3.	Agronomy	Renovation of laboratory (UG, PG) & Ph.D. class room Purchased agronomical equipments: Padestal fan victor, Laboratory poly ware, Laboratory glass ware, Chemicals, TDR moisture meter, Top pan balance, Battery sprayer, Herbicides and insecticides, seed displays & Gunny cloth bag, E.Kel plus superior microprocessor and data management software, E.Kel plus auto sequencing micro processor, Rotary flask shaker, U.V. lusble spectrophotometer. E. Four stage automatic and neutralizer scrubber.

d. College of Agriculture, Khandwa

Plant Pathology and Entomology Laboratories have been modernized. Model class room and examination hall have been furnished. Biotechnology lab has been furnished. NARP building has been renovated.

e. College of Horticulture, Mandsaur

1. Renovation of UG/PG laboratories of :
 - a) Fruit science
 - b) Floriculture and Landscape Architecture
 - c) Medicinal and Aromatic Plants
 - d) Plantation and Spice Crops
 - e) Post Harvest Management
 - f) Vegetable Science

- g) Plant Breeding
- h) Computer lab.
- i) Botany and Plant Physiology
- j) Biotechnology
- k) Biochemistry and Food Science
- l) Agronomy
- m) Entomology
- n) Plant Pathology
- o) Soil Science and Agriculture Chemistry
- p) Nematology and Microbiology
- q) Extension education
- r) English language lab.

2. Renovation of ARIS Cell.
3. Construction of poly house, Green house and Net House.
4. Establishment of Instructional cum Research Herbal Garden for teaching, research and extension purpose.
5. Establishment of Seasonal Crop cafeteria of Vegetables, Spices and Flowering plants for teaching purpose by concerning departments.
6. Development of infrastructure facilities for High-tech Horticulture.
7. Establishment of Instructional cum Research fruit Orchard of different fruit crops in 12.0 ha at College of Horticulture, Mandasaur.
8. Development of Herbal Garden for Teaching, Research and Extension Purpose.

11. PG Research and thesis awarded:

a. College of Agriculture, Gwalior

S.No.	Department	Title
1.	Agricultural Economics and Farm Management	<ul style="list-style-type: none"> • Resource use efficiency of chickpea production in Gwalior district of Madhya Pradesh. • An economic study on production and marketing of soybean in Aaron block of Guna district • An economic analysis of storage losses of wheat production in Gwalior district of M.P. • An economic analysis of marketing of mustard crop in Morar block of Gwalior district of M.P. • A study on impact of self help group on economic status of farmers in Morar block of Gwalior district of Madhya Pradesh. • Economic evaluation of the Rajeev Gandhi watershed development programme in Vidisha district of M.P. • A study on economics of mustard cultivation in Bhind district of M.P.

		<ul style="list-style-type: none"> • Impact of post harvest management technique and marketing of wheat in Khargone district of M.P. • Marketable surplus and post harvest losses of wheat in Gwalior district of M.P. • Impact of watershed programme on beneficiaries in Shivpuri district of M.P. • A study on economics of Pigeon pea production in Khargone district of M.P.
2.	Soil Science and Agricultural Chemistry	<ul style="list-style-type: none"> • DTPA extractable micronutrients (Fe, Mn, Cu and Zn) in soil of Morena district of Madhya Pradesh. • Nitrogen use efficiency under INM practices in mustard crop in alluvial soil of Gird zone. • Dynamics of some soil quality parameters as influenced by different plant materials and nitrogenous fertilizer. • Behaviors of water and nitrate movement in Typic Ustochrepts soils of Northern Madhya Pradesh. • Performance of Berseem varieties at different levels of nitrogen and Phosphorous • Effect of integrated nutrient management on Physico-Chemical properties under long term pearl millet-mustard cropping sequence in a sandy clay loam soil • Effect of integrated nutrient management in depletion build up of DTPA- extractable micronutrient cations under pearl millet- mustard cropping sequence
3.	Extension Education and Rural Management	<ul style="list-style-type: none"> • A study on Television Viewing Behaviour of Farmers in Deori block of Sagar district of M.P. • A study on Career choices Among Under Graduate and Post Graduate students of RVSKVV, Gwalior • A study on ICT exposure regarding Animal Husbandry Practices of Dairy Farmers in Morar Block of Gwalior district of M.P. • Impact of training programme of KVK on wheat production technology among the farmer of Bhitwar block of Gwalior district of M.P. • A study on Knowledge and adoption of organic farming among the farmer of Morar block of Gwalior district M.P

4.	Entomology	<ul style="list-style-type: none"> • Incidence of Pod borer complex on different varieties of pigeon pea [<i>Cajanus Cajan</i> (L.) millsp.] at different fertility levels. • Bioefficacy of newer insecticides against gram pod borer (<i>Helicoverpa armigera</i> Hubner). • Bio efficacy of chemical and botanical insecticides against mustard aphid, <i>Lipaphis, erysimi</i> (Kalt.) and their natural enemies. • Screening of Sorghum [<i>Sorghum bicolor</i> (L.) Moench] Germplasm against major insect pest. • Studies on pest complex of brinjal with special reference to IPM of brinjal. • Efficacy of newer insecticides along with neem oil against mustard aphid, <i>Lipaphis erysimi</i> (Kalt.) and their natural enemies.
5.	Plant Breeding and Genetics	<ul style="list-style-type: none"> • Study of GXE interaction in Pearl millet
6.	Plant Pathology	<ul style="list-style-type: none"> • Studies on web blight of moth bean (<i>Vigna aconitifolia</i>). • Studies on wilt (<i>Fusarium oxysporum</i> f.sp. <i>lentis</i>) of lentil (<i>Len culinaris</i> Medik). • Evaluation of fungitoxicity of <i>Parthenium hysterophorus</i> against some fungal pathogens. • Studies on Anthracnose (<i>Colletotrichum capsici</i> f.sp. <i>cyamopsicola</i>) of Guar. • Studies on Anthracnose (<i>Colletotrichum capsici</i> f.sp. <i>cyamopsicola</i>) of clusterbean. • Studies on wilt (<i>Fusarium oxysporum</i> f.sp. <i>ciceri</i>) of chickpea (<i>Cicer arietinum</i> L.). • Studies on some aspects of <i>Sclerotinia sclerotiorum</i> causing white blight of mustard. • Studies on <i>Alternaria</i> blight of marigold. • Evaluation of <i>Calotropis</i> leaf extract against some fungal pathogens. • Studies on some aspects of Pearl millet caused by <i>Pyricularia setariae</i> Niskado. • Evaluation of <i>Ipomea carnea</i> leaf extract against some fungal pathogens. • Evaluation of <i>Tagetes erecta</i> against some fungal pathogens • Evaluation of <i>Aloe vera</i> against some fungal pathogens
7.	Agronomy	<ul style="list-style-type: none"> • Performance of wheat (<i>Triticum aestivum</i> L.) varieties to different dates of sowing under irrigated condition in Northern region of M.P.

		<ul style="list-style-type: none"> • Integrated weed management in cowpea (<i>Vigna unguiculata</i> L.) • Weed management in mustard (<i>Brassica juncea</i> L.) • Effect of sowing date and varieties on growth, yield attributes and yield of soybean (<i>Glycine max</i> L.) • Response of new wheat varieties in different dates of sowing under northern M.P. • Effect of weed management practices in clusterbean (<i>Cyamopsis tetragonoloba</i> L.) based intercropping system
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		<ul style="list-style-type: none"> • Effect of fertility levels and row spacings on yield attributes and yields of clusterbean (<i>Cyamopsis tetragonoloba</i> L.) • Integrated weed management in okra (<i>Hibiscus esculentus</i> L.) • Effect of varieties and nutrients management on productivity, profitability and nutrient uptake of Clusterbean (<i>Cyamopsis tetragonoloba</i>) • Effect of sowing time and moisture conservation practices on yield attributes, yield, quality and water use efficiency of mustard (<i>Brassica juncea</i> L.) • Management of weed flora in wheat (<i>Triticum aestivum</i> L.) under various fertility levels in different combination of herbicides.
8	Horticulture	<ul style="list-style-type: none"> • Effect of integrated nutrient management practices on growth and yield of Chilli (<i>Capsicum annum</i>) cv. Pusa Jwala • Response of gibberellic acid and nitrogen on radish (<i>Raphanus sativus</i> L.) cv. Hill queen • Studies on the performance of different tomato (<i>Lycopersicon esculentus</i> Mill.) varieties under Gwalior conditions. • Effect of IBA and bio-fertilizers augmented growing media on air layered plants of guava (<i>Psidium guajava</i> L.) cv. Gwalior 27 • Performance of different Chrysanthemum (<i>Chrysanthemum morifolium</i>) varieties under gird region of M.P.

b. College of Agriculture, Sehore

S.No.	Department	Title
1.	Agricultural Economics and Farm Management	Economics of Poultry Production in Sehore district of MP
		A study on optimum combination of crop and livestock enterprise in Dewas district of MP
		Diversification of agriculture in sehore district of MP
		An analysis of market arrivals' and process of soybean in Sehore regulated market
		Resources use efficiency of onion cultivation at different levels of adoption in Sehore district of MP
		An economic analysis of adoption of improved pulses production technology in sehore district of M.P.
		An economic analysis of potato and tomato production in sehore district of MP
		Production possibilities of pigeonpea in MP
2.	Agricultural Extension Education	A Study on empowerment of farm women under self help group in Sehore block of Sehore district of MP
		A study on training needs perceived by the adopted farmers at KVK in Dewas district of MP
		A study on knowledge and adoption behavior of irrigated wheat growers in Ichhawar block of Sehore district
		A study on role performance of women Gram Panchayat members in relation to their socioeconomic attributes of Dhar district of MP
		Technological gap in adoption of recommended chickpea production practices in Ashta block of Sehore district of MP
		A study on adoption behavior of vegetable growers in relation to their socio-economic and psycho attributes in Hoshangabad district of MP
		A study on repayment behavior of crop loan beneficiaries of budhani block of Sehore district of MP
		An analytical study on impact of NHM among the beneficiaries in Khargone district of MP
3.	Agronomy	Performance of soybean varieties under varying fertility levels
		Efficacy of post emergence herbicides on weed intensity, weed control efficiency and productivity
		Efficacy of post emergence herbicides on weed flora and productivity of soybean
		Performance of soybean varieties under different fertility levels and organic sources through vermi-compost

		Performance of newly developed genotypes of lentil under different planting densities
		Effect of pre and post emergence herbicides on weed growth and yield of black gram
		Effect of land configuration and levels of irrigation on productivity and economics of chickpea
		Effect of organic, inorganic manure and bio-fertility on growth, yield attributes and yield of lentil under rainfed condition
4.	Genetics and Plant Breeding	Stability Analysis for Yield and its traits in Soybean (<i>Glycine max</i> (L.) Merrill)
		Characterization for economic traits in exotic Germplasm of Soybean (<i>Glycine max</i> (L.) Merrill)
		Characterization of chickpea germplasm (<i>Cicer arietinum</i> L.) under rainfed condition
		Evaluation, characterization and categorization of pigeon pea (<i>Cajanus cajan</i> (L.) Mill sp. Elite germplasm for morphological and elite traits.
		The effect of EMS on M ₁ generation in pigeonpea (<i>Cajanus cajan</i> (L.) Mill sp.
5.	Entomology	Reaction of some pigeon pea (<i>Cajanus cajan</i> L.) genotypes to pod borer complex
		Incidence of gram pod borer, <i>Helicoverpa armigera</i> (Hubner) in chickpea influenced by growing degree days and weather parameters
		Field screening of some promising chickpea genotypes against gram pod borer, <i>Helicoverpa armigera</i> (Hubner)
		Studies on seasonal incidence and control of major insect pests of soybean with new and recommended insecticides

c. College of Agriculture, Indore

S.N.	Department	Title
1.	Agriculture Economics & Farm Management	Economics of functionalities and efficiency of cotton marketing in Khargone block
		Economic study on diversification of agriculture in Mhow block of Indore district
		Economic of post harvest management technique and marketing of chilli in Khandwa district of MP
		Economic analysis of production and marketing of cotton

		in Dewas district of MP
		Economic study of market efficiency and market arrivals of selected crops in krishi upaj mandi Jabalpur
		Economic analysis of production constraints of major rabi crops in Dhar district of MP
		Economic of production and marketing of Sorghum in Khargone district of MP
2.	Extension Education	A study of the Women Entrepreneurship in Self-Help Groups.
		Impact of FLD on Soybean growers of adopted villages of KVK.
		Impact of ATIC training in increase in knowledge & adoption.
		Impact of Farmers Field School in increase in knowledge, skill & adoption.
		Study on District Poverty Initiative Programme (DPIP) in Barod block of Shajapur District.
		Study of the T.V. Viewers of the Agril.Programmes telecasted by Doordarshan
		Impact of Seed Village Programme in increase in knowledge & adoption
		Adoption Behavior of farmers adopting Drip Irrigation.
3.	Entomology	Comparative response of bio-pesticides and safer insecticides against insect pests of okra (<i>Abelmoschus esculentus</i> L. Moench)
		Comparative response of insecticides, bio and ready-mix combination pesticides on insect pests of soybean.
		Variability in Chickpea (<i>Cicer arietinum</i> L) genotype for resistance to <i>Bruchus chinensis</i> L.
		Bioefficacy of Pyroproxifen 10% EC against sucking pests and their enemies of cotton in Madhya Pradesh
		Reaction of sorghum genotypes against major insect pests and their natural enemies
		Efficacy of insecticides against major insect pests of soybean, (<i>Glycine max</i> (L.) Merrier)
4.	Agronomy	Study on effectiveness and compatibility of different agro-chemicals on growth and yield of soybean (<i>Glycine max</i> (L) Merrier)
		Evaluation of contingent crop production practice under delayed on set of monsoon condition
		Integrated nutrient management in different types of maize
		Effect of nutrition management and plant density on Bt

		cotton hybrids under partial irrigated condition
		Real-time contingent crop planning under aberrant monsoon condition for Malwa region
		Studies on nutrient management practices on leaf ridding in Bt cotton
		Effect of sulphur application on yield and quality of rainfed soybean (<i>Glycine max</i> (L) merrier)
		Effect of integrated weed management on growth and yield of kharif Sorghum
		Assessing the performance of sorghum Genotypes in changing climate
5.	Soil Sci. & Agril. Chemistry	Performance of distillery and sugar industry waste on reclamation and crop production of wheat in sodic vertisols
		Assessment of soil quality and performance of chickpea under permanent manurial trial on soybean chickpea sequence in rainfed vertisols.
		Sulphur status and farms in soils of Tank Khurd of Dewas district of M.P.
6.	Vegetable Science (Horticulture)	Genetic variability, correlation in bittergourd (<i>Momordica charantia</i> . L)
		Study of growth ,yield and quality parameters in okra (<i>Abelimoschus esculentus</i>)
		Performance of tomato (<i>Lycopersicon esculentum</i> Mill.)
		Study of new fertigation grade nitrogen level on the growth, yield and quality parameters in tomato (<i>Lycopersicon esculentum</i> Mill.)
		Performance studies on some kharif onion(<i>Allium cepa</i> L.) varieties under malwa condition.
		Effect of different levels of nitrogen and spacing on growth, yield and quality of radish (<i>Raphanus sativus</i>) under protected cultivation.
		Evaluation of early, medium and processing variety of potato (<i>solanum tuberosum</i> L.)
7.	Plant Pathology	Studies on integrated management of dry root rot of soybean (<i>Glycine max</i> L.)
		Physiological behaviour of races of chickpea wilt

		pathogen (<i>Fusarium oxysporum</i> f. sp. ciceri)
		Studies on nutritional utilisation of differentiation of races of <i>Fusarium oxysporum</i> f. sp. ciceri initiating wilt in chickpea (<i>Cicer arietinum</i> L.)
		Isolation and bio-efficacy of native <i>Trichoderma</i> strains against wilt and root rot pathogens of chickpea (<i>Cicer arietinum</i>).
8.	Plant Breeding	Diversity assessment among germplasm accessions of soybean
		Heterobeltiosis and Lire x Tester analysis of grain yield and it's attributes in <i>Sorghum bicolor</i> (L.) Moench.
		Callusing and Organogenesis in <i>Buchanania lanzan</i> (Sprang)
		Study on genetic divergence for yield and its component traits in Safflower (<i>Carthamus tinctorius</i> L.)
		Molecular characterization of Soybean infecting Yellow Mosaic Virus employing Rolling Circle Amplification (RCA)
		Callusing and Organogenesis in <i>Stevia rebaudiana</i> (Bert.) Berto
		Study of clustering pattern of Safflower (<i>Carthamus tinctorius</i> L.) genotypes for yield and its attributes with special reference to drought tolerance
		Character association and genetic divergence studies in <i>Sorghum bicolor</i> (L.) Moench.

d. College of Horticulture, Mandasaur :

S. No	Title
1.	Effect of Packaging & Post Harvest Treatment on Quality of Tomato During Storage
2.	Effect of Nitrogen, Phosphorus & Potassium on Growth, Yield & Quality of Ginger Cultivars (<i>Zingiber officinale</i> R.)
3.	Effect of Antioxidants on Growth, Yield, Quality & Secondary Metabolites in Garlic (<i>Allium sativum</i> L.)
4.	Studies on Dehydration Characteristics of Carrot (<i>Daucus carota</i> L.)

5.	Effect of Nitrogen & Micronutrients on Growth, yield & Quality of Ber (<i>Zizyphus mauritiana L.</i>) cv. Gola Under Malwa Plateau of M.P.
6.	Response of Pot Mum Cultivars to Micronutrient sprays
7.	Studies on Drying of Garlic (<i>Allium sativum L.</i>)
8.	Optimization of NPK for Growth, Yield & Quality of Guava (<i>Psidium guajava L.</i>) cv. L-49 Under Malwa plateau Condition
9.	Effect of pre-treatment & drying methods on Quality of Dehydrated Pea (<i>Pisum sativum L.</i>)
10.	Effect of Plant Growth Regulators & Growing Media on Seed Germination & Growth Vigour of Papaya (<i>Carica papaya L.</i>) Seedling cv. Barwani Red
11.	Integrated Nutrient Management Studies in Chrysanthemum (<i>Dendranthema grandiflora Tzvelev</i>) Under malwa Condition
12.	Studies on Crop regulation through Chemicals in Guava (<i>Psidium guajava L.</i>)cv Chittidar”
13.	<i>In vitro</i> Microprooagation Studies in Sandalwood (<i>Santalum album L</i>)”
14.	Effect of Pre-harvest Spray of Chemicals on the Quality of Pomegranate Fruit (<i>Punica granatum L.</i>) cv. Mridula
15.	Studies on Heterosis & Combining Ability in Pea (<i>Pisum Sativum L.</i>)
16.	Performance of Potato Varieties under different level of Nitrogen for Growth, Yield & Quality
17.	Effect of Nitrogen level on Yield & Quality of Seed in French Bean
18.	Response of different cultivars of China Aster (<i>Callistephus chinesis L. Nees</i>) to Gibberellic Acid
19.	Studies on the effect of fruit of different aonla (<i>Emblica officinalis gaertn.</i>) cultivars on preparation, storage & quality of candy
20.	Effect of Nitrogen & Phosphorus on Growth Yield & Quality of Black Cumin (<i>Nigella sativa L.</i>)
21.	Effect of Planting Geometry on Growth & yield of Kharif Onion (<i>Allium cepa L.</i>)
22.	Effect of Foliar spray of Micronutrient on Growth yield & Quality of Guava (<i>Psidium guajava L.</i>) cv. Dharidar
23.	Genetic Variability & Path Analysis in Garlic (<i>Allium sativum L.</i>)

III. RESEARCH ACTIVITIES:

RESEARCH PROJECTS IN OPERATION

1. AICRP on Arid Legumes, Gwalior

- ❖ Eleven entries were tested in IVT, out of these entries HGS-3-52 gave, significantly highest seed yield (3271 kg/ha), net monetary return (Rs.1,53,374/-ha) and BCR (11.76) over all the varieties but at par with RGR 11-1 and CAZG 11-2 entries. The lowest seed yield (1805 kg/ha) was obtained by RGR 11-3 entry.
- ❖ Results showed that application of 20 kg Nitrogen per hectare as basal gave significantly highest seed yield (2481 kg/ha), net monetary return (1,13,596/-ha) and B:C ratio (8.97).
- ❖ Results showed that the significantly highest clusterbean equivalent yield(1850 kg/ha), net return (Rs.80,773/ha)and B:C ratio (6.66) were obtained with sole clusterbean followed by clusterbean + pearl millet intercropping (3:1 row ratio). Whereas weed management practices, the higher clusterbean equivalent yield (1368 kg/ha),net return (Rs. 54,150/ha and B:C ratio 4.88) was recorded with two interculture at 25 and 45 DAS, which was at par with the application of Imazethapyr 90 gm. a.i./ha, as PoE at 25 DAS.
- ❖ The result of survey, to know the existing status and production constraints of the arid legumes grown in different agro-climatic zone was conducted by Gwalior center in Gwalior and Shivpuri Districts of Madhy Pradesh, Clusterbean is the main arid legumes grown in Gwalior, Bhind, Morena, Shivpuri, Datia and Sheopur Districts. It indicated that clusterbean is grown mainly on the onset monsoon in above districts of M.P. In the area under clusterbean, the main prevalent high yielding varieties are HG-563 & HG-365. The majority of farmers (90 %) sow the crop by broadcasting method. Only 9-10% farmer are sow the crop in lines using tractor drawn seed drill at a row distance of 30cm. Almost farmers of the Gwalior and Shivpuri districts adopted no seed treatment in clusterbean. Only 1-2% farmers treat the seed with Rhizobium, whereas 6-8% farmers treat the seed with fungicide and 7-9% with insecticide. The farmers are not at all using N and P fertilizer in clusterbean but 8-10% farmers using recommended dose of fertilizer. The main rotations followed in M.P. are Guar-Wheat and Guar fallow. Mainly (80-85%) crop is without weeding, whereas 1-2% are weeded by hand weeding. Whereas 7-9% farmers used chemical. Bacterial leaf blight (20-25%) is major disease, but no farmers are adopting disease control measures. Major insects attacking the crops are Jassid (8-10%), Aphid (12-15%) and white fly (10-11%) but only 2-5% farmers go for insecticidal spray to control these insects.

2. AICRP on Wheat Improvement, Gwalior

- ❖ Among 11 new entries and 3 check tested in SVT (TS), RVW - 4198 (7590 kg/ha) followed by GW 322 (7168 kg/ha) and RVW4197 (7066 kg/ha) was significantly superior over checks MP 4010 (6737 kg/ha) and RVW 4106 (6453 kg/ha).
- ❖ Among 11 new entries and 3 check tested in SVT (TS), New entry RVW 4199 (6511 kg/ha) followed by GW 322 check (6239 kg/ha) and RVW 4194 (6101 kg/ha) was significantly superior over other new varieties.
- ❖ In AVT (TS) the Ten new entries along with 4 check varieties tested, showed that new entry HI 8725 D (8665 kg/ha) followed by HI 8726 D (8600 kg/ha) and HI 8498 D C (8374 kg/ha) was significantly superior over other varieties and checks HI 1544 C (6856 kg/ha), MPO 1215 D C(7337 kg/ha) and GW 322 C(6669 kg/ha).
- ❖ In AVT (LS), Among the Seven new entries and 3 check, MP 3336 (6437 kg/ha) showed significantly superior followed by MP 4010 C (5964 kg/ha) and HD 3095 (5833 kg/ha).
- ❖ In NIVT 2, Thirty four new entries tested along with 2 checks revealed that HI 1590 (7672 kg/ha) followed by RAJ 4293 (7531 kg/ha), MP3382 (7248 kg/ha), HI1588 (7237 kg/ha) produced significantly higher grain yield of wheat over other varieties but at par with checks GW 322 (7051 kg/ha) and MACS 6222 (6996 kg/ha).
- ❖ In NIVT 4, Thirty two new entries tested along with 4 checks revealed that HI 8737 (8100 kg/ha) followed by DDW 23 (7934 kg/ha) and NIDW 295 C (7594 kg/ha) produced significantly higher grain yield compared to check PBW 291 (6349 kg/ha) but at par with NIDW 295 C (7594 kg/ha), HI 8498 C (7002 kg/ha) and DBW 17 C (6426 kg/ha).
National Nurseries
- ❖ In National Genetic Stock Nursery genotypes *T. aestivum* (97) along with 5 checks viz., DBW 17, Sonalika, HI 8498 and MP 4010. Genetic stock included disease resistant (58), yield components and quality (39). Genotypes showed significant variability for yield and its attributes. The promising genotypes for Days to heading were PHS 1107, 1108, 1109, VW 0770 for Days to maturity GW 2007-77d, PHS 1108, for Plant height (cm) K 0716, WR 2100, HD 2987, HUW 626, MACS 5009, HI 8682, RAJ 4083, for Tillers /m HI 1571, MACS 5009, HD 2864, LBPY 07-13, for Grain /spike PHS 1104, UP 2691, HS 507, DBW 49, PBW 627, HD 2998, WH 1021, MACS 3313, MACS 6222, WH 1062, for 1000 grain weight (g) were LBPY07-12, PHS 1109, MPO 1220D, PHS 1101, 1104, 1108, 1103, 1107, 1102, 1106, LBPY07-14, GW 2007-77D, for Spike length (cm) was PHS 1108.

- ❖ In Yield Component Screening Nursery 130 entries along with 4 checks were tested and identified superior genotypes viz., three genotypes for days to heading, 25 genotypes for plant height, 38 for tillers per metre, 6 for grain per spike, 11 for 1000 grain weight.
- ❖ The 14th Segregating Stock Nursery consisted of 87 segregating populations (F₂-F₃) that including segregating generations of wheat from hybrid programme (30), rice-wheat programme (25), leaf blight programme (21) and durum wheat programme (10) of DWR, Karna were used for single plant selection. Gwalior Centre selected 299 SPS form 77 segregating populations.
- ❖ Elite International germplasm nurseries I consisted of 119 genotypes of *T. aestivum* along with 4 checks. The promising lines for grain yield were 43rd IBWSN-1153, 43rd IBWSN-1190, 43rd IBWSN-1148, 43rd IBWSN-1086, 43rd IBWSN-2059, 18TH SWAYT 348, 43rd IBWSN-1197, 43rd IBWSN-2056, 18TH SWAYT 342, 21st HRWSN-2076
- ❖ Out of 1387 germplasm lines evaluated, the promising lines identified are EC 556487, GW 03-5, PHS 0723, MP - 4200 for yield components viz., days to heading, days to maturity and grain yield (g/ plant).
- ❖ About 282 SPS progenies were evaluated for yield and other characters 14th SSN nursery progeny rows. Out of these 83 progenies of F₃₋₄ generation were promoted in AG I generation.
- ❖ About 156 SPS progenies were evaluated for yield and other characters Station Segregating progeny rows. Out of these in 22 progenies of F₃₋₄ generation were promoted and these will be tested in AGI generation.
- ❖ Out of Twenty three lines evaluated, only eleven promising lines showed high grain yield and has been promoted for further evaluation in advanced generation AG II or SVT trial and IPPN trial.
- ❖ Out of 31 selections promoted from AG I to Advanced genotypes evaluation II were evaluated for grain yield and days to heading. The seven promising entries may by promoted in SVT trial and IPPN trial.
- ❖ Forty crosses and their 13 parents were evaluated for yield performance and its attributes. All the lines and testers showed significant variation for yield. The F₂ generation will be evaluated in ensuing season
- ❖ Sixty two crosses were attempted in the 2 parents sets in Line X tester mating design.
- ❖ New entry MACS 3828 gave significantly higher grain yield (6650 kg/ha) under normal sown conditions which was followed by HI 1544 (6457 kg/ha). The mean yield obtained

under normal planting (6220 kg/ha) was significantly higher than late planting (4672 kg/ha).

- ❖ Check variety HD 2932 gave significantly higher grain yield (5764 kg/ha) under late sown conditions followed by MP 4010 (5300 kg/ha). Under very late sown condition check variety HD 2864 gave significantly higher grain yield (4899 kg/ha) followed by new entry RAJ 4238 (4858 kg/ha). The mean yield obtained under late sown condition (5287 kg/ha) was significantly higher than very late planting (4484 kg/ha).
- ❖ Check HI 8498 gave significantly higher grain yield (6670 kg/ha) followed by MPO 1215 (6439 kg/ha) when wheat was sown during 12-18 November.
- ❖ In the experiment on row-spacing, The highest yield was obtained at 15.0 cm row spacing (5385 kg/ha) which was followed by 17.5 cm (5007 kg/ha). Check variety HI 1544 gave significantly higher mean yield 5129 kg/ha followed by GW 366 (5066 kg/ha).
- ❖ Two irrigations at CRI and late tillering stage gave significantly higher grain yield in comparison to one and no irrigation. New entry HI 1572 gave the highest yield (3939 kg/ha) followed by MP 3288 (3843 kg/ha) and HI 8627 (3657 kg/ha) when crop irrigated at CRI and late tillering stage.
- ❖ Under rain-fed situation, wheat genotypes MP 3288 out yielded over other entries across the nitrogen levels and gave the highest yield (3123 kg/ha) at 60 kg N and 30 kg P₂O₅/ha followed by HI 1572 (2898 kg/ha).

3. AICRP on Pearl Millet, Gwalior

- ❖ RVSBP-1 a high biomass variety developed by the center gave maximum fodder yield in AICRP trial of 13 locations of the country.
- ❖ RVSBH-23 contributed for AICPMIP Testing in 2012.
- ❖ 276 Pearl millet germplasm were maintained by sibbing/ selfing
- ❖ 14 A & B pairs maintained by making A x B crosses.
- ❖ Attempted 49 hybrid combinations with different 14 ms lines.
- ❖ 131 promising restorers screened for various morphological and meteric traits
- ❖ 15 advanced restorer lines submitted for DNA finger printing in 2011-12
- ❖ Explore the possibility of summer crop.& their seed setting
- ❖ Attempt has been made for hybrid seed multiplication in winter season 2011-12
- ❖ Station's Hybrid RVBH-22 gave highest grain yield of 46.2 q/ha followed by RVBH-23 (45.2q/ha.) than check GHB-744. The seed multiplication of these hybrids are being taken up in winter/ summer 2011.
- ❖ Two hybrids that is RVBH – 10 & 12 found good seed setting in Summer trial at (35⁰c-40⁰c).

4. AICRP on Weed control, Gwalior:

- ❖ Under long term herbicidal trial pearl millet-wheat cropping system, it is noted that hand weeding twice at 30 and 60 DAS (weed free) treatment gave maximum grain yield 4577 kg/ha and net return of Rs. 41366/ha as compared to other treatments. Consequently application of isoproturon @ 0.75 kg/ha + 2,4-D @ 0.5 kg/ha and isoproturon @ 0.75 kg/ha + one hand weeding at 60 DAS were also more effective weed management practices for control of mixed weed flora in wheat.
- ❖ In pearl millet (under pearl millet-wheat cropping system) weed free treatments recorded the highest grain yield followed by atrazine @ 0.5 kg/ha PE + one hand weeding at 30 DAS. However, application of atrazine @ 0.5 kg/ha PE proved profitable because of BCR was higher than other treatments. Atrazine applied to pearl millet @ 0.5 kg/ha either alone or along with 10 q/ha FYM to pearl millet persisted in soil for 45 days.
- ❖ To control of grassy and broad leaf weeds particularly phalaris minor higher yield and net return were obtained with combined application of sulfosulfuron + pinoxaden (25 + 40 g/ha) after weed free treatment. It was closely followed by sulfosulfuron + metribuzin (25 + 105 g/ha). In case of alone application of sulfosulfuron 25 g/ha was also effective to control of weeds than other herbicides.
- ❖ 2,4-D sodium salt applied to wheat at 0.5 and 1.00 kg/ha persisted in soil up to 30 and 45 days after application respectively. Sulfosulfuron 25 g/ha persisted in soil up to 45 days while clodinafop (60 g/ha), metribuzin (175 g/ha) and pinoxaden (50 g/ha) persisted in soil up to 30 DAA.
- ❖ Herbicides sulfosulfuron 20 g/ha and clodinafop 60 g/ha applied to wheat in farmers' fields do not persist in post harvest soil as per bioassay study using maize as test plant.
- ❖ For effective control of grassy and broad leaf weeds lowest weed index, higher yield, net return and benefit cost ratio was observed with application of idosulfuron + mesosulfuron 400 g/ha followed by pinoxaden + 2,4-D (50 + 500 g/ha), pinoxaden + metsulfuron (50 + 4 g/ha) as POE after weed free (2, hand weeding at 28 & 45 DAS) treatment.
- ❖ It is concluded that weed free treatment recorded higher seed yield, net return and B.C. ratio followed by 1 hoeing + H.W. at 20 & 40 DAS. Among the herbicides the application imazethapyr @ 75 g/ha with the combination of one hand weeding at 40 DAS and pendimethalin + 1 H.W. at 40 DAS were recorded higher yield, net return and BC ratio in cowpea.

- ❖ It is concluded that 2 hand weeding at 30 and 50 DAS and mulching (after seed germination) fetched maximum yield and net return as well as BCR followed by pendimethalin @ 1.0 kg/ha + 1 HW at 30 DAS and one hoeing.
- ❖ Oxyfluorfen leaches in soil up to 30 to 40 cm in alluvial soil and the leaching decreases to 20 to 35 cm by amendment of FYM as per bioassay technique using maize as test crop.

5. AICRP on Water Management, Morena:

- ❖ About 36.60% (3140 kg/ha) increase in the yield was recorded in rain water management and application of balanced fertilizer doses as comparison to average farmers' yield (20.00 kg/ha). The border strip irrigation method with balanced fertilizer application recorded (35.47%) average increase in yield of mustard with (176.66 kg/ha/cm) WUE as compared to farmers' practices (95.00 kg/ha/cm). Improved practices of irrigation increased grain yield of wheat by 30.67% (6110kg/ha) and WUE of 147.57 kg/ha-cm over farmer's practices (4100 kg/ha and 82.00 kg/ha-cm).
- ❖ The amount of water released from sprinkler heads was 9 % more in the inner segments in comparison to outer / peripheral segments. Each sprinkler covered approximately 200 m² wetted area. Under sprinkler method of irrigation, wheat yield increased by 29.39 % (4677 kg/ha) with saving of 20-25% water over border strip irrigation method (3251 kg/ha). Wind direction and speed affects the performance of irrigation under sprinkler system of irrigation but it is more effective at the time of sowing and early stage of crop growth.
- ❖ In soybean mustard cropping system, the highest seed yield of soybean (18.17 q/ha), production efficiency (20.19kg/ha/day), net returns (Rs. 41917kg/ha/day) and B: C ratio (4.17) was registered with the 100% RDF. The mean response due to 100% RDF was 27.86% and 16.29% in seed yield over 50% and 75% RDF, respectively in soybean. The maximum WUE (140.4 kg/ha-cm), production efficiency (81.11 kg/ ha/ day), seed yield (20.08q/ha) net returns (Rs. 58216/ha) and B: C ratio (5.05) was recorded under irrigation applied at 40 and 70 DAS. Similarly, highest WUE (141.8 kg/ha-cm), production efficiency (18.07 kg/ha/day), seed yield (21.68 q/ha) net returns (Rs. 55258 /ha) and B: C ratio (4.51) was registered under 125% RDF in mustard.
- ❖ Pearl millet grain yield increased significantly with increasing levels of fertilizer from 50% RDF to 125% RDF. The percent increase in grain yield over 50% RDF was recorded 12.38% (260 kg/ha), 29.66% (633 kg/ha) and 54.76 % (1150 kg/ha) under 75%, 100% and 125% RDF, respectively. The highest gross returns (Rs. 32001/ha), net return of Rs.

25436 /ha, additional return of Rs. 9772/ha and B:C ratio 4.87 was observed under 125% RDF applied to pearl millet . In wheat, irrigation applied at CRI, tillering, booting and milk stage produced significantly higher grain yield (4374 kg/ha) and production efficiency (34.90 kg/ ha/ day). However maximum WUE (144.2 kg/ha-cm) was recorded with 3 irrigations applied at CRI, booting and milk stage in wheat. The highest WUE (148.5 kg/ha-cm) and production efficiency (36.78 kg/ha/day) grain yield of wheat (4630kg/ ha) was recorded under 125% RDF. The application of fertilizer at 75%, 100% and 125% RDF resulted in 8.22%, 15.92% and 23.13% increased in grain yield of wheat over 50% RDF. Combination of four irrigation and 125% RDF gave maximum grain yield of wheat (4630kg/ha), net return of Rs. 54320/ha and B: C ratio of 3.54.

- ❖ A Study on irrigation and nutrient management for pearl millet -mustard -sunflower cropping sequences for chambal command was carried out. *The maximum grain yield (29.79 q/ha) of pearl millet was achieved under 125% RDF pooled over 3 years. The pearl millet grain yield increase by 17.39%, 34.84% and 55.150% under 75%, 100% and 125% RDF over 50% RDF, respectively and maximum net return of Rs. 21381/ha and B:C ratio of 4.25 was obtained under 125% RDF with additional net return of Rs 8526/ha over 50% RDF. The highest WUE was recorded under the combination of one irrigation given at 40 DAS + 125%, RDF (142.35 kg/ha-cm) in mustard. However, the treatment combination of two irrigation at 40 and 70 DAS with 125% RDF gave maximum seed yield of mustard (2357 kg/ha), oil production (933.6 kg/ha), protein production (490.25 kg/ha), net return (Rs. 30297/ha) and B:C ratio 3.49. while in sunflower, 8 days irrigation interval + 125% RDF treatment combination recorded maximum seed yield (1862 kg/ha), production efficiency (21.81 kg/ha/day), net return (13385/ha) and B:C ratio (1.92). Though maximum WUE was recorded under 16 days irrigation interval + 125% RDF (65.45 and 71.83 kg/ ha-cm).*
- ❖ Effect of irrigation scheduling and sulphur levels on soybean-mustard cropping sequence in sandy loam soils of Gird zone was tested. Seed yield of soybean (1558 kg/ha), net return (Rs. 15628 /ha), B:C ratio (2.35) was recorded maximum under 125% RDF. The nutrient use was decreased with increasing level of fertilizer from 125% to 50% RDF while in mustard the combination of two irrigation at flower irrigation + seed develop + 100% RDF recorded maximum seed yield of mustard (2315 kg/ha), nutrient use (14.41 kg/kg of grain), production efficiency (19.22 kg/ha/day), net return

(Rs. 46447/ha), B:C ratio (5.20), oil production (941.2 kg/ha) and protein production (477.9 kg/ha). However highest WUE was noted under one irrigation applied at flower initiation stage + 100% RDF (135.47 kg/ha/cm).

- ❖ Effect of irrigation scheduling and fertilizer management on the productivity of cluster bean-wheat crops sequence in alluvial soils of chambal command was studied. All the growth and yield components, production efficiency (17.08kg/ha/day) seed yield (23.73q/ha), net returns (Rs. 26350/ha) and B:C ratio of clusterbean was obtained (3.20) with the application of 50% RDF + 5 tonnes FYM + 2.5 tonnes vermicompost/ha. While in wheat treatment combinations of irrigation CRI+ tillering + booting + flowering + milk stage application of 50% RDF+ 5t vermicompost recorded highest grain yield, net return, B:C ratio and production efficiency of wheat over other treatment combinations. However water use efficiency was registered maximum in combination of irrigation at CRI + tillering +booting flowering + milk stage with 50% RDF + 5t / ha vermin compost.
- ❖ A study was carried out on groundnut-coriander cropping system in chambal command area moisture regimes and sulphur levels. In groundnut maximum seed yield (2562kg/ha) and net return (Rs. 36156/ha) was obtained under 125% RDF. Nutrient use of NPKS (192.8, 48.0, 192.0 and 132.7 kg per kg of grain) was recorded maximum under 50% RDF. The production efficiency (27.81 kg/ha/day) was recorded maximum with 125% RDF. While in coriander, the production efficiency (16.50 kg/ha/day), WUE (66.37kg/ha-cm), seed yield (1940 kg/ha), net monetary return (Rs. 84400/ha) and B:C ratio (7.69) of coriander was recorded maximum with combination of three irrigations applied at 20, 40 and 60 DAS + 100% RDF.

Study on effect of irrigation scheduling on the productivity and water use efficiency of rabi oilseed in chambal command showed that irrigation at 40 and 75 DAS (18.98 q/ha) and 40kg/ ha sulphur (20.66q/ha) were observed better for obtaining higher yield from rabi oilseeds crop. Among the oilseed crops mustard record highest seed yield (21.49 q/ha) than sunflower (18.32q/ha) and safflower (12.92 q/ha)

6. AICRP on Rapeseed and Mustard, Morena:

- ❖ Three trials of toria namely IVT, AVT-1 and SVT and seven trials of mustard namely; IVT(Irrigated), IVT (late sown), IVT (Quality), IHT (Irrigated), AVT-1 (Quality), SVT-I and SVT-II (WRR) were conducted under AICRP-R&M.at ZARS, Morena during 2011-12.

- ❖ In toria, the highest seed yield was recorded in entries namely; RH-0701 (2198 kg/h), RMT-08-7 (1654 kg/h), RMT-08-10 (1605 kg/h), RMT-08-6 (1259 kg/h)TK 7-16 (1241kg/h), RMT-08-2 (1062 kg/h); whereas checks PT-303 and Bhawani gave (1012 kg/h) and 864 kg/h seed yield respectively. The strain RH-0701 had highest seed index (6.93 g) followed by RMT-08-7 (3.99 g) which is higher than checks PT-303 (3.44 g) and Bhawani (3.28 g). The highest oil yield 940 kg/h was obtained in RH-0701 followed by RMT-08-6 (545 kg/h).
- ❖ In Mustard, SKM 904 gave highest seed yield (3235 kg/h) followed by DRMRIJ-21 (3062 kg/h), RMWR-09-5 (3037 kg/h), RMM-07-1 (2914 kg/h), DRMRIJ-1103 (2815 kg/h), RMM-09-10 (2617 kg/h), LES-44 (2568 kg/h), RMM-09-6 (2494 kg/h), RMWR-09-4 (2198 kg/h), RGN-73 (2183 kg/h), RMWR-09-5 (2000 kg/h), whereas, checks Kranti, Pusa bold gave 2593 kg/ha and 2469 kg/h seed yield. Albeli, LES-43 and DRMRIJ-1103 had highest seed index 6.59 (g), 6.28 (g) and 6.00 (g) respectively. Remarkably, the strains SKM-904 (1327 kg/h) and DRMRIJ-21 (1215 kg/h), DRMRHJ-1103 (1200 kg/h) and LES-44 (1035 kg/h) gave higher oil yield along with seed yield. KMRL 11-1 (111 days) was found an earliest maturing strain among all strains. JMWR-08-3 has given 47.4, 12.2 and 9.41 percent higher seed yield over Vardan, Kranti (NC) and Navgold (ZC), respectively in 16 trials across the zone II under late sown irrigated conditions. This strain has shown superiority for oil yield by 44.0, 12.0 and 8.0 percent over Vardan, Kranti (NC) and Navgold (ZC), respectively during 4 year multiplication testing.
- ❖ In Long term fertility experiment on cropping systems experiment ten fertility levels i.e. control 50%, 100% NPK, 100% NPK + S@ 40 kgha⁻¹, 100% NPK + Zn @ 25 kgha⁻¹, 100% NPK+B@ 1.0 kgha⁻¹, 100%NPK + FYM 2.5t/ha, 100% NP and 100% N/ha⁻¹ were tried in R.B.D. design with three replication. The seed yield was significantly increased with increasing fertility levels. The fertility level 150% of RF produced significantly higher seed yield (2465 kgha⁻¹) which was followed by 100% NPK + FYM @ 2.5 t/ha (2210 kgha⁻¹), 100% NPK + Zn @ 25 kgha⁻¹ (2200 kgha⁻¹) and 100% NPK (2101 kgha⁻¹) and lowest seed yield produced by control plot (1848 kgha⁻¹).
- ❖ Under Drought management studies in rape seed mustard three agrochemicals viz. urea @ 1%, Thio urea 0.05% and KNO₃ @ 1% were sprayed at 50% flowering, 50% pod filling and 50% flowering +50% pod filling stage with control and water spray treatment. These all eleven treatments were tried in three replications under RBD design. The treatment effects were found non significant on seed yield whereas the higher seed yield

of 2830 kg ha^{-1} was recorded with the treatment foliar application of 1% KNO₃ at 50% flowering +50% Pod filling stage which was seconded by foliar application of 1% Urea at 50% pod filling stage (2656 kg ha^{-1}). The control plot produced the minimum seed yield of 2292 kg ha^{-1} .

- ❖ Under inter cropping of rape seed mustard with wheat trial a total of seven treatments which included two crops i.e. wheat and mustard as sole and three treatment of inter cropping viz., wheat + Mustard (3:1), wheat + Mustard (6:1) and wheat + Mustard (9:1) and two treatments of mixed crop wheat + Mustard (80%+20% ratio) and wheat +Mustard (90%+10% ratio) were tested in three replications under R.B.D. In this trial crop wise seed yield were recorded separately under different treatments and ultimately these yields were converted into mustard equivalent seed yield in all treatments for comparing the treatment effects. Thus on the basis of mustard equivalent seed yield, the inter cropping of wheat +Mustard (3:1) was found the best (3820 kg ha^{-1}) which was followed by wheat + mustard (9:1) and wheat + mustard (6:1) producing 3276 and 3185 kg ha^{-1} respectively.
- ❖ Studies on the fertilizer use efficiency in rapeseed mustard were conducted in three consecutive years i.e. 2009-10, 2010-11 and 2011-12. In this trial only 12 fertility levels were tried in three replications under RBD design. On the basis of three year mean, the maximum seed yield (2759 kg/ha) was obtained with the treatment 100% (N+ P₂O₅) +sulphur @30 kg + Znso₄ @ 25 kg + Boron @1.0 kg/ha which was significantly superior to with and without seed treatment by Azotobactor & PSB three fertility levels i.e. 50%, 75% and 100% N + P₂O₅ and at par with 100% (N+P₂O₅)+ sulphur @ 30 kg ha⁻¹ (2627 kg/ha), 100% (N+ P₂O₅) + Znso₄ @25 kg/ha (2520 kg/ha) and 100% (N+ P₂O₅) + Boron 1.0 kg/ha(2488 kg/ha). The lowest seed yield of 1476 kg/ha was noticed in control plot. No significant effect of treatments was observed on oil content.
- ❖ In competitive behavior of mustard varieties against weed trial a set of eight varieties were tried under weed free and weedy check conditions during two consecutive years i.e. 2010-11 and 2011-12. On the basis of two year mean data the weed free condition in mustard was found significantly superior for seed yield (2726 kg ha^{-1}) over weedy check (2432 kg ha^{-1}). The variety JM-4 recorded higher seed yield (2707 kg ha^{-1}) and JM-3 (2703kg ha^{-1}) overall varieties except Maya (2618 kg ha^{-1}) and Rohini (2608 kg ha^{-1}) which was at par with each other. Lowest seed yield 2127 kg ha^{-1} was produced by Basanti variety.

- ❖ A trial was conducted for Herbicidal control of weeds in musard. In this experiment a total of twelve treatments were tested under RBD with three replications on the basis of two consecutive years mean data, the maximum seed yield of 2832 kg ha^{-1} was recorded in treatment weed free which was at par with oxadiargy 0.09 kg ha^{-1} PE (2753 kg ha^{-1}), isoproturon 1.0 kg ha^{-1} PE (2658 kg ha^{-1}) and quizalofop 0.06 kg ha^{-1} POE (2574 kg ha^{-1}). The herbicide clodinafop 0.06 kg ha^{-1} POE Isoproturon 1.0 kg ha^{-1} POE and control plot produced lowest seed yield 2172 kg ha^{-1} , 2118 kg ha^{-1} and 2189 kg ha^{-1} respectively. The post emergence application of Isoproturon recorded the mild phytotoxic effect on mustard.
- ❖ A total of seven entries i.e. Divya, HYT-33, Kranti, Maya, PAC-437, PBR 357, coral-437 and Rohini (2010-11) and five entries i.e. Kranti, Maya, Rohini, PBR-357, and Coral -437 (2011-12) were grown under four date of sowing i.e, 30 September, 10, 20 and 30 October 2010-11 and 2011-12. On the basis of two year mean data the crop sown on 10th October gave significantly higher seed yield (2591 kg ha^{-1}) than 30th September (2380 kg/ha) and 30th October (2035 kg ha^{-1}) sowing dates but at par with 20th October (2482 kg ha^{-1}).
- ❖ All the entries were found at par to each other for seed yield except Maya (2189 kg ha^{-1}) and PBR-357 (2275 kg ha^{-1}). Entry Kranti produced maximum seed yield (2453 kg ha^{-1}). The seed yield results of Divya, HYT-33 PAC-437 and coral -437 could not be interpreted as these entries were tried only one year.
- ❖ Thirty four entries were tested against mustard Aphid inculding susceptible checks. Non was found hundred% toleranat to mustard aphid, but some entries i.e. Rohini, DLSC-1, Kiran , RTM-1212 and T-27 were promising to mustard aphid.
- ❖ JMM-927 was found promising entry among all the tested entries against mustard aphid under protected and un protected conditions. The highest seed yield 3439 kg/ha was recorded in JMM-927 and lowest 1934 kg./ha seed yield was recorded in BSH-1 (Minimum).
- ❖ Aphid was 1st appear in 50st standered week in this year. The maximum aphid activities occurred during 2nd to 7th std week. The maximum aphid population was occurred 6th std week and there after aphid population was declined and reduced minimum level in 12th std week.
- ❖ The lowest aphid population (1.00) was recorded in spray of imidaclorpid 17.8 SL @ 20 g ai/ha @ 2.5 ml/liter of water followed by Thiamethoxam 25 WG @ 2.5 g/liter of water.

- ❖ The highest seed yield 2795 kg/ha was recorded in spray of imidacloprid 17.8 SL @ 20 g ai/ha 2.5 ml/liter of water over control 2027 kg/ha (minimum).
- ❖ The highest seed yield 2982 kg/ha was recorded in spray of Dimethoate 30 EC@ 1 ml/one liter of the water followed by *Verticillium lacanii* @ 10⁸ CS/ml over control (1988 kg/ha) followed by Dimethoate 30 EC@ 1 ml/liter followed by *Coccinella septempunctata* @ 5000 beetals/ha.
- ❖ More than 148 germplasm lines of initial and advanced generation were screened against various diseases, like Alternaria blight, White-rust, Downey Mildew, Powdery mildew and Sclerotinia stem rot out of which 25 entries were found resistant to white-rust and downey mildew remaining were susceptible to WR and DM.
- ❖ The maximum 68 & 67 % symptoms of white-rust were observed in variety Varuna and Rohini respectively. In case of Alternaria blight two entries viz. EC-399299 and EC-339000 were free from the AB and rest of the entries showed disease severity up to 34-37% in Rohini and Varuna respectively.
- ❖ 20 germplasm lines were found resistant to powdery mildew disease and maximum 100% symptoms were observed on the plants
- ❖ In case of Sclerotinia stem rot, 8 germplasm lines were found free from Sclerotinia stem rot disease, out of 34 entries were screened in artificial inoculation condition and rest of the entries showed disease intensity up to 100% in Varuna variety.
- ❖ The highest seed yield (3089 kg/ha) was recorded in seed treatment with Propiconazole @ 0.1% followed by spray of the same chemical @ 0.1% at 50 and 65 DAS followed by the seed treatment with mixture of Ipridione + Carbendazim (1:1) @ 2g /kg seed followed by removal of three lower leaves. The basal application of ZnSo₄ @ 15 kg/ha, Borex 10 kg/ha and Sulphur 30 kg/ha was also recorded good yield (2939 kg/ha).
- ❖ On the basis of two year mean data the highest seed yield 3185 kg/ha was recorded by spray of Mencozeb @ 0.2% at the time of flowering stage followed by 3131 kg/ha seed yield was produced by treatment ZnSo₄ + Borex + Sulphur @ of 15, 10 and 30 kg/ha respectively.
- ❖ In advanced IVT quality mustard trial, a total of eight entries were tested. The genotype NC-Kranti was found as the best for oil content (41.9%) and oil yield (1035 kg/ha) which seconded by RH (OE) 0903 and LES-44 for oil content (40.54%) and oil yield (988 kg/ha) respectively.
- ❖ In the trial entitled “Drought management study in rapeseed-mustard“, a total of 11 foliar spray treatments were tested on mustard crop. The maximum oil content (41.96%) was

recorded with the treatment T8 i.e. the plot sprayed two times (50% flowering + 50% pod filling stage) by Thio – urea @ 0.05%. Whereas for oil yield, the treatment T11 (1153 kg/ha) was the best in which the plot also sprayed two times by 1.0% KNO₃ at 50% flowering + 50% pod filling stage.

- ❖ In the trial on the fertilizer use efficiency in rapeseed-mustard”, 12 fertility levels were tested. And the maximum oil content (41.27%) was recorded with the fertility level 50% (N + P₂O₅). No additional effect of different fertility levels applied in combination with azatobactor + PSB seed treatment was recorded on oil content. For oil yield, the treatment 100% (N + P₂O₅) + Sulphur 30kg/ha + Zinc 25 kg/ha + Boron 1.0kg/ha was found as the best (1216 kg/ha) which closely followed by the treatment 100% (N+P₂O₅) + Sulphur 30 kg/ha (1155kg/ha).
- ❖ In the trial entitled “temporal adjustment for higher rapeseed – mustard productivity in changing climate scenario”, a set of five entries was grown under four sowing dates ranging from 30.09.2011 – 30.10.2011 at an interval of 10 days.
- ❖ For oil content, the entry PBR-357(41.75%), 30 sept. to 10 oct. 2011 sowing period (42.10-41.74%) and the interaction PBR-357 X 30.09.2011(42.53%) was appeared as the best. The best interaction for oil yield was found as Rohini X 10 10.2011 (1212kg/ha) which followed by Kranti X 10.10.2011(1122kg/ha).
- ❖ In the trial entitled “ Integrated disease management in mustard crop “ , a total of 10 treatment were tested and found that the treatment basal dose of Zinc sulphate (ZnSo₄) @ 15kg/ha + Borax @ 10 kg/ha + Sulphur @ 30 kg/ha and the treatment seed treatment with Ipridione + Carbandazim (1:1) @ 2.0 g/kg seed followed by removal of three lower leaves was found as the best which recorded maximum oil content (39.98%) and oil yield (1191 kg/ha) respectively.
- ❖ In the trial “Management of major disease of Indian mustard using micro-nutrient” , only 10 treatments were tested and found that the T6 i.e soil application of Borax @ 10 kg/ha + sulphur @ 30 kg/ha and T9 i.e spray of mancozeb @ 0.2% a.i. in late afternoon hours at 50 DAS was the best for oil content (39.82%) and oil yield (1357 kg/ha) respectively whereas the treatment T7 i.e soil application of ZnSO₄ @ 15 kg/ha + Borax @10 kg/ha + Sulphur @ 30 kg/ha followed closely for both oil content (39.51%) and oil yield (1301 kg/ha).

7. AICRP on Chickpea, Sehore

- ❖ Seed yield varied 715 to 2178 Kg/ha among 24 genotypes tested in IVT (Rain fed) genotype GJG 0904 recorded the highest yield followed by BGD 1070 and BGD 1069.

- ❖ Among 30 genotypes tested in IVT (Desi), Phule G 0215-2 recorded the highest yield followed by Phule G 0204-4.
- ❖ In IVT (Kabuli), IPCK 06-143 recorded the highest yield of 3031 Kg/ha. BG 3025 ranked second followed by KAK 2.
- ❖ Extra Large Seeded Kabuli JGK 18 were recorded the highest yield followed by IPCK 08-120.
- ❖ In 6 genotypes tested in AVT -1 (Kabuli), JGK 1 (ch) recorded the highest yield followed by CSJK 1 (AVT-2).
- ❖ Seed yield ranged from 2248 to 3392 Kg/ha among tested genotypes in SVT (Desi). SG 96046 recorded the highest seed yield followed by ICCV 09105 and SG 98243.
- ❖ In Kabuli SVT genotype SG 97311 recorded highest yield followed by ICCV 10407.
- ❖ In PYET (Desi) seed yield ranged from 1790 to 2974 Kg/ha among 30 tested genotypes. ICCV 03203 recorded the highest yield followed by ICCV 06103 and SG 98241.
- ❖ In PYET (Kabuli) seed yield ranges from 1167 to 2237 Kg/ha and genotype ICCV 10301 and ICCV 10305 recorded high yield.
- ❖ Seed yield ranged from 1630 to 2931 Kg/ha among tested genotypes in SVT late sown (Desi). SG-09831 recorded the highest seed yield followed by SG-96032.
- ❖ In Kabuli SVT late sown genotype SG-950149 recorded highest yield followed by ICCV-05315.
- ❖ Sixty four crosses including six national crosses as mentioned were made to introduce early maturity, multiple disease resistance and drought tolerance in high yielding genetic background of chickpea.
- ❖ Seventy four F₁s were grown and true F₁s were identified
- ❖ Twenty six F₂s were raised to produced F₃ seeds
- ❖ Forty nine F₃s Combinations and their selected individual plant progenies were sown and 1500 single plants selected.
- ❖ Nearly seventy eight combinations of F₄s were evaluated and SPS were harweted separately.
- ❖ Thirty eight F₅, eighteen F₆ twenty eight F₇ and sixteen F₈ generations were advanced and homogeneous and homozygous lines were harvested as bulk.
- ❖ Desi lines ICC 920412, PAOLL 3168, SG 98220 and SG 98229 and Kabuli lines ICCV 8313, ICCV 06302, ICC 09301, ICCV 07308 and ICCV 7306 advance generation lines appeared as promising lines for yield and other attributes.

- ❖ In a trial conducted on Irrigation management for chickpea under different land configuration it is observed that sowing of chickpea on BBF significantly gave 8 % higher grain yield (2387 kg/ha) over flat bed sowing. Two irrigation one each provided at pod development stage and branching significantly gave 26% higher grain yield (2617 kg/ha over one irrigation).
- ❖ In a trial on Evaluation of AVT 2 genotypes at different plant population levels under irrigated/rainfed conditions it is found that RVSJG 102 recorded significantly higher grain yield (1605 kg/ha) than all the varieties tested. lowest grain yield was recorded with CSJK 1 (1258 kg/ha). The higher plant population 33 plants/sqm closer spacing (30 x 10 cm) gave significantly higher yield (1535 kg/ha) over wider spacing (45 x 10 cm) 22 plants /sqm.
- ❖ In a trial conducted on nutrient management in chickpea based cropping system pooled analysis indicated that inclusion of chickpea once in a two years soybean-wheat crop cycle were at par but gave significantly 22 % higher chickpea equivalent yield (2529 kg/ha) over continues soybean- wheat rotation. Similarly, inorganic nutrient application of RDF of chickpea/wheat resulted significantly increased yield (2506 kg/ha) over control treatments but at par with application of Vermicompost @ 2 t/ha + Boifertilizer.
- ❖ Locally isolated *Rhizobium* strain RVSGRS 117 could increase the grain yield of chickpea by 16% as against control (1141 kg/ ha). However this was at par with the yield increqase obtained under check *Rhizobium* strain JGRS 105.
- ❖ *Rhizobium* strain RVSGRS 114 & LGR 21143 could enhance the grain yield of chickpea by 18.7 & 17.6 % over control (1213 kg/ ha) this was equal to yield obtained with 40 kg N/ ha. (1486 k/ha)
- ❖ In an evaluation of carrier material for *Rhizobium* trial, synthetic carrier material (1520 kg/ ha) and lignite carrier material (1480 kg/ ha) were found identifcal in performance but these were superior over control (1244 kg/ ha)
- ❖ PGPR Psuedomonas strain PSM 3 (Hisar) found to enhance the yield of chickpea by 20.8 % over control. *Rhizobium* inoculation alone could increase 14.2 % yield over control (1250 kg/ ha).
- ❖ Combined inoculation with Priformospora indica + *Rhizobium* + PSB+ PGPR could enhance yield of chickpea by 22.0 % over control (1320 kg/ ha). Yield increase due to *Rhizobium* inoculation alone was 14.3 % only.
- ❖ In a trial on the use of PSB with *Rhizobium*, PSB-3 (Rahuri) + *Rhizobium* and PSB-2 (Ludiana) + *Rhizobium* could produce yield of 1600 & 1620 kg/ ha respectively as

against control yield of 1410 kg/ ha. This was equivalent to yield obtained with 20 kg N + 40 kg P₂O₅/ ha(1710 kg/ ha)

- ❖ Under least susceptibility trial of chickpea twenty seven entries were tested against *Helicoverpa armigera*, the entry BG 372 recorded the lowest pod damage (3.56%) and PSR 3 closely followed by H 02-39 (3.63% pod damage and PSR 3).
- ❖ In the testing of AVT entries against *H. armigera*, the entry JGK 1 recorded the lowest pod damage (1058%) and the lowest PSR 2, and was categorized in the fourth non-significant group with respect to yield (1329 kg/ha).
- ❖ In the International chickpea *Helicoverpa* resistance screening nursery, the average pod damage was very low (5.30%) in 25 genotypes tested, but the genotypes ICCV 09118, ICCV 37, ICCV 08311, 5034, ICCV 09106, ICC 15996 and ICCV 10 exhibited high yield potential under unprotected conditions.
- ❖ The pooled data of three years (2009-10, 2010-11 and 2011-12) on efficacy and economics of newer molecules tested against *H. armigera* reveal that Rynaxypyr 20 SC @ 75 ml/ha proved effective and economic in managing the pod borer on chickpea.
- ❖ The larval population of *H. armigera* on chickpea was found active from 51 Standard Weather Week (seedling stage of the crop) till initiation of maturity of the crop (11th SWW) with two peaks at bud initiation and at flowering stage. Relatively higher larval population was observed during reproductive phase of the crop growth. Relatively higher larval counts (1.50 l/ml) were recorded in JGK 1 than JG 130 (0.98 l/ml).
- ❖ The monitoring studies through pheromone traps exhibited highest (87.0) male/day/trap in the 52nd SWW (last December) at 50% flowering stage of the crop. The higher (26.31 male/trap/day) catches were recorded from the trap installed in JGK 1 field than that of JG 130 (19.59 male/trap/day).
- ❖ Based on the index of susceptibility, the *desi* varieties of chickpea were found resistant to *Callosobruchus chinensis* under storage, while the *kabuli* varieties were highly susceptible. The *desi* varieties exhibited a longer developmental period than the *kabuli* varieties. The F₁ progeny exhibited noticeable differences with *desi* varieties registering lesser adult survival and weight loss as compared to *kabuli* varieties
- ❖ None of the entry was free from wilt. Entries In *Kabuli* types of chickpea JGK 2005-301 , JGK 1 , CSJK 54 and IPC 06-143 were found resistant to wilt. In IVT ELSK two entries AKG 2002-1K and JGK 16 have shown wilt resistant reaction.
- ❖ PBG 5 in AVT (*Desi*) was resistant to wilt whereas, in IVT JG 24, IPC 07-19, IPC 08-11 and H 08-18 were resistant, in Late sown category, entries PG 0101, RVSSG 8 and IPC

2006-84 were resistant to Fusarial wilt. In rain fed IVT four entries were wilt resistant viz. GJG 0814, H 08-93, GJG 0904 and IPC 08-68.

- ❖ Four entries from ICRISAT in CWRRN none of the entry was found resistant to wilt, however tolerant reaction was observed in some.
- ❖ Differential reaction of *Fusarium oxysporum* f. sp. *ciceri* on 13 chickpea differentials indicates presence of race 4 in sick plot.
- ❖ Resistant to wilt was confirmed in GLK 28125, JG 2001-4 and BCP 136.
- ❖ Amongst the national chickpea germplasm 14 entries exhibited wilt resistant reaction.
- ❖ Seed treatment with *T. harzianum* + Vitavax Power (4:1) was effective against Wilt.
- ❖ A new threat to chickpea cultivation was detected in soybean-chickpea cropping system at Sehore, causing severe mortality in early sown crop. The pathogen was identified as *Colletotricum dematium*. Some of the known wilt resistant varieties like JG 315 were susceptible to this pathogen causing 40-50 % losses.

8. AICRP on Pigeonpea, Sehore:

- ❖ In IVT (early) trial at station level, genotype AKT 1852 gave highest yield of 2101 kg/ha. However, it was at par with the zonal check TJT 501 (2009 kg/ha). At zonal level, no entry could surpass the yield of checks. Hence, entries could not be promoted to AVT 1 in central zone.
- ❖ In IVT (medium) trial, at station level Phule T 002-2 ranked first giving yield of 3357 kg/ha. However, at zonal level, although it yielded higher (1939 kg/ha) over local check JKM 189 and zonal check TJT 501, it could not out yield national check ICPL 87119 (1990 kg/ha).
- ❖ In Drought Tolerant Trial, under rainfed condition, TAT 9629 ranked first giving yield of 1890 kg/ha, closely followed by JSA 59 (1818 kg/ha). TTB 7 and GT 101 has comparatively higher root length of 52.0 cm. Root weight (23.9 g/plant), shoot weight (198.7 g), root/shoot length ratio (0.36) of genotype GT 101 was also highest.
- ❖ In Hybrid Evaluation Trial (Early duration) positive heterosis for seed yield over check parent ranged from 0.1 to 11.1 %. The highest increase was recorded in hybrid ICPH 2341 (1468 kg/ha), followed by ICPH 2441 (10.0 % -1457 kg/ha). Maturity of the hybrids ranged from 145 to 150 days

- ❖ In State Varietal Trial maturity of the entries ranged from 169 to 172 days. Only one genotype RVSA 07-21 gave higher yield 8.5 % (2043 kg/ha) over the best check (1875 kg/ha) in medium duration type. In early duration RVSA 10-1 gave 15.3% higher yield. The maturity of this entry was 150 days . Both of these entries are included in IVT (medium) and IVT (Early) duration trial of 2012-13.
- ❖ In demonstrations of improved technology the yield increment ranged from 17.0 to 50.0 per cent in various farmer's field with mean increase of 35.8 per cent over farmer's practices. In varietal replacement of local variety, yield of early duration improved variety TJT 501 ranged from 930 to 1070 kg/ha, while medium duration variety JKM 189 gave yield from 1100 to 1300 kg/ha . The mean increase over local varieties was about 30%
- ❖ Breeder seed production of Variety JA 4 and parents (ICP 2043 A and ICP 2043 B of hybrid RVAH 2671) has been produced and maintained.
- ❖ Twenty CMS lines of pigeonpea have been maintained through hand pollination.
- ❖ Out of 31 entries of AVT and IVT, RVKP 249 , RKVP 260 and WRG173 were showed resistance against wilt incidence and entries AKT HR 2001-18, AL-1702, AL1778, and NTL 554 ,Phule resistance against Phytophthora blight incidence.
- ❖ In breeding lines JSA 07-3, JSA 07-10, JSA 07-12, and JSA 07-22 were showed moderately wilt resistant.
- ❖ Out of thirteen entries of National Genetic stock ICPL 87091, IPA-15F, and BAHAR showed moderately resistance reaction against Phytophthora blight.
- ❖ Out of thirty one entries of PWSMD Nursery ICPL20133, ICPL20138, ICPL99050, ICP 11298 and ICPL 20117 were showed more than 20% wilt incidence and rest of the entries resistant to wilt.

9. AICRP on MULLArP, Sehore

- ❖ The genotype ACM 05-007 recorded highest seed yield of 1543 kg/ha followed by RVSU 60 (1507 kg/ha) and IPU 10-17 (1366kg/ha). The early genotypes were KU 96-3 , COBG 759, VBG 09-005 and UH 08-05(80 days)

- ❖ The genotype RVSU 11-8 recorded highest seed yield of 3083 kg/ha followed by RVSU 11-3 (3000 kg/ha) and RVSU 11-2 (1817 Kg/ha)). The early genotypes were RVSU 11-2 (80 Days).
- ❖ The genotype PKV AKM 4 recorded highest seed yield of 2067 kg/ha followed by AKM 09-2(1849 kg/ha and GM 08-09(1817 Kg/ha)). The early genotypes were AKM 8802, AKM 09-2, ML1464 and MH 539-1(63 Days).
- ❖ The genotype RVSM 11-9 recorded highest seed yield of 2142 kg/ha followed by RVSM 11-4 (1942 kg/ha) and ML 131 (1900 Kg/ha)). The early genotypes were RVSM 11-5 and RVSM 11-7 (63 Days).
- ❖ Application of Pendimethalin 30 EC + Imazethapyr 2 EC (Vallore 32) @ 0.75 kg/ha-PE.yielded 1222 kg/ha which was intern at par with pendimethalin 1.0kg/ha
- ❖ JU3 recorded maximum seed yield (1106 kg/ha) followed by OBG 27 (1047 kg/ha.) and JU 86 (1046 kg/ha).
- ❖ In Initial Varietal trial (IVT Large seed + Extra Large) The genotypes RVL 48 recorded the highest seed yield of 1431 kg/ha followed by IPL 324 (1389 kg/ha).RVL 48 was observed early maturing genotype (99 days) .
- ❖ In Station varieties trial (AVT-1 Bold + Extra bold), The genotypes RVL 11-6 recorded the highest seed yield of 1729 kg/ha followed by RVL 11-5 (1708 kg/ha). RVL 11-6 was observed early maturing (101 days). Seed sizes of all tested genotypes were ranged from 2.6 to 3.5 g/100 seeds.
- ❖ In initial varietal trial IVT (Extra Early) the genotypes JL 3 recorded the highest seed yield of 1111 kg/ha followed by IPL 532 (1000 kg/ha). IPL 533 was observed early maturing (100 days). Seed sizes of all tested genotypes were ranged from 2.00 to 2.8 g/100 seeds.
- ❖ In Field pea Initial Varietal Trial (IVT) Tall the genotypes IPF 11-15 recorded the highest seed yield of 1463.1 kg/ha followed by IPF 11-13 (1389 kg/ha and pant p 186 (1291.8 kg/ha). KFP 115 was observed early maturing. Seed sizes of all tested genotypes were ranged from 11.94 to 15.92 g/100 seeds.
- ❖ In Initial Varietal Trial IVT (Dwarf) the genotypes IPFD 11-5 recorded the highest seed yield (1782.6.7kg/ha) followed by VL 55 (1639.0 kg/ha) and HPF 919 (1463.1 kg/ha). HFP 919 & IPFD 11-5 was observed early maturing (108.67 days). Seed sizes of all tested genotypes were ranged from 10.41 to 18.28 g/100 seed.
- ❖ In Advance Varietal Trial (IVT) Tall the genotypes IPF 10-21 recorded the highest seed yield of 1691 kg/ha followed by Vikash (Ch) (1649 kg/ha and pant RFP (1635kg/ha). IFP

10-21 was observed early maturing. Seed sizes of all tested genotypes were ranged from 12.01 to 15.05 g/100 seeds

- ❖ In Advance Varietal Trial (IVT) Dwarf the genotypes VIKAS recorded the highest seed yield of 1581.60 kg/ha followed by IPFD 10-12 (1448.5 kg/ha) and Adersh (1291.67 kg/ha). IPFD 10-12 was observed early maturing (108.67 days). Seed sizes of all tested genotypes were ranged from 13.0 to 20.0 g/100 seed.
- ❖ Weed management in lentil: Among the weedicides application of Pendimethalin 30 EC + Imazethapyr 2 EC 0.75 kg/ha as pre emergence recorded grain yield (698 kg/ha) of lentil closely followed by Pendimethalin 30 EC + Imazethapyr 2 EC 1.0 kg/ha (765 kg/ha) and was found on par with two hand weeding (824kg/ha) during both the years over rest of the treatments. Among the herbicides, Imazethapyr @ 37.5 g ai/ha at 30 DAS and Quizalofop-p-ethyl @ 50 g ai/ha at 30 DAS were found statistically on par with Pendimethalin 1.0 kg ai/ha at pre emergence but significantly superior to weedy check.

10. AICRP on Soybean, Sehare:

- ❖ In Initial varietal trial comprised 42 entries including three checks. Entry KS 112 gave highest yield (2847.7 kg/ ha) followed by RVS 2001-18 (2757.2 kg/ ha) with 95 days maturity.
- ❖ In Advance varietal trial out of six entries tested, entry NRC 86 gave the highest yield of (1881.4 kg/ ha) followed by JS 20-29 (1733.3 kg/ ha) with 102 days maturity. Similarly station trail RVS 2007-6, RVS 2007-17 and RVS 2007-28 gave yield level of (2600 kg to 3030 kg/ha).
- ❖ Nearly 650 germplasms were grouped for various economic trials.
- ❖ Nearly 26 crosses of diverse specific donors were attempted.
- ❖ F₂-F₆ grown, single plant and superior progenies were selected for further testing
- ❖ In optimization of seed rate and row spacing of newly released soybean varieties. Variety JS 95-60 gave higher yield at 30 cm row spacing with 75 kg/ha seed rate. Whereas, JS 97-52 yielded higher with 45 row spacing and 55 kg/ha seed rate.
- ❖ In optimization of nutritional schedule for newly released soybean varieties, the higher dose of nutrients with 125 % RDF along with 5 t FYM/ha recorded higher yield. Variety JS 95-60 was significantly better than variety JS 97-52 for gain yield and net return.
- ❖ In study of efficacy of sulphur (Mahadan bensulf commercial product), application of mahadan 25 kg/ha (containing 90 % sulphur) was significantly at par with its higher doses i.e 37.5 & 50 kg/ha.

- ❖ Heavy population of Grey semilooper, *Gesonia gemma* (16.2 larvae /mrl) Green semilooper *Chrysodexis acuta* (10.50 larvae /mrl) were recorded during first week of August. Extent of damage by stem fly and girdle beetle were recorded 90 and 30.0 per cent respectively

Bio control agents recorded on semiloopers:

- i. Parasitic fungus, *Beauveria bassiana* infected 80% larvae during August 3rd week – 1st week of September
 - ii. Dipterous fly, *Apentalis* sp. 3-5 % parasitisation of early instars during July 4th week to 1st week of September. Promising Entries Identified under Advanced varieties trial against major pests
 - iii. Stem fly- CSB-08-08, DS 12-5, KS -103, NRC -86, SL -871, DS 25-14, DSb -16 and VLS 75, MACS 1140
 - iv. Girdle beetle – MACS 1039, MACS 1140, MACS 1281 and NRC 80
 - v. Semiloopers - BASU 40
- ❖ In Screening of new genotypes L 129, H2P5, F1P21 showed resistance against major pest of soybean.
 - ❖ Sutathian 40EC @800 ml/ha and Spintoram 12 % SC @ 375 ml /ha were found to equivalent to standard check Quinalphos 25 EC @ 1500 ml /ha against soybean pest complex .
 - ❖ Three insecticides with variable spray volume were evaluated against major insect pests. There was no significant difference in incidence of semiloopers due to variable spray volume at 20 days after germination .However, triazophos 40 EC was relatively less effective against major insect than the rynaxypyr 20SC and indoxacarb 14.5 SC. and also did not show significant difference in yield levels due to variable spray volume.
 - ❖ Metaflumizone 22%SC @ 600 & 750 ml /ha. was found effective against lepidopterous defoliators like green & grey semiloopers.
 - ❖ Survey conducted at cultivator's field (2011-12) showed the incidence of collar rot, YMV and Rhizoctonia root rot.
 - ❖ In trap nursery trial, CS, bacterial pustule and MLS were found to be major disease.
 - ❖ Out of total thirty-eight entries eight entries viz. MACS 1340, JS 20-35, KDS 699, KBS 2010, RKS66, NRC 89, NRC 90 and VLB 201 showed Highly resistant reaction to MLS. Highly resistant reaction to bacterial pustule was noticed in entry JS 20-35 while entries AMS 56 and JS 335 showed absolute resistant reaction. Eight entries JS 20-38, MACS

1366, JS 40-41, ABS 18, KS 112, PS 1505, KDS 378 and JS 9560 showed moderately resistant reaction to bacterial pustule.

- ❖ Out of Fifty entries one entry VLS 76 showed resistant reaction to cotyledonary leaf spot /Entries BAUS 40, CSB-08-09, CSB-08-08, DS 12-15, DS-27-11, DSb 18, JS 2003-8, JS 20-29, KBS 8VLS 76 and VLS 59 showed moderately resistant reaction to myrothecium leaf spot.
- ❖ In AVT II, Out of thirty one entries entry MACS 1281 exhibited high resistance and entry VLS 63 absolute resistance reaction to myrothecium leaf spot. Three entries viz. PS 1466, VLS 75, VLS 59 were moderately resistant to myrothecium leaf spot.
- ❖ Studies on influence of seed dressing fungicides and bioagents on culturable plant growth microbes indicated increase in rhizobial, PSB and *Pseudomonas* count after 30 days of sowing.
- ❖ A screening trial was conducted by taking 30 genotypes of soybean during kharif 2011. out of these genotypes JS 2002-2 gave highest nodule number per plant (58.36) followed by JS 2002-21 (55.15), whereas, check (JS 335) gave 41.62 nodule per plant.
- ❖ A field trial was conducted by taking 9 treatments including different combination of Allwin legume in soybean crop. The highest NN and NDW were recorded in the treatment (T2) of 100 % RDF followed by T9 which was combination of 75% RDF + 5 Kg Allwin legume (soil application in furrow) per hectare as basal +Allwin legume spray @3 g/litre at 20 DAS and 45 DAS.

An interactive effect of AM fungi and PGPR was conducted by taking 9 treatments on growth attributes of soybean (JS 95-60) under microcosm conditions. The highest NN and NDW were recorded in the treatment T8 (*Acinetobacter calcoaceticus* + Sulphur oxidizing bacteria + *Burkholderia arboris* + AMF) followed by T6 (Sulphur oxidizing bacteria + AMF). The AMF (T4) stimulated NDW and increased up to 71% over uninoculated control (T9).

11. AICRP on Safflower, Indore:

- ❖ In the Initial Varietal Trial (IVT), entry IVT-11-15 recorded highest yield of 3366 kg. /ha followed by IVT-11-2 (2169 kg/ha) and IVT-11-29 (2008 Kg/ha).
- ❖ In Initial and Advanced Hybrid Trial –I (IAHT –I), Hybrids IAHT 11- 6 recorded the highest yield of 2452 Kg /ha followed by IAHT 11-4 (2222 Kg/ha) and IAHT 11-5(2077 Kg/ha).
- ❖ In Advance Varietal and Hybrid Trial-II(AVHT-II), entry AVHT-II-11-2 gave the highest yield of 2351 kg/ha followed by AVHT –II-11-3(2093 Kg/ha).

- ❖ In Initial Station Varietal Trial (ISVT) entry ISVT-15 recorded the highest yield of 2889 Kg/ha followed by ISVT-2(2778 Kg/ha), ISVT-10(2667 Kg/ha) and ISVT-1 (2611 Kg/ha) against the check JSF-1 (2222 Kg/ha).
- ❖ In Preliminary Station Varietal Trial (PSVT), genotype RVS-11-17 yielded 2995 kg /ha. Followed by RVS-11-7 (2738 kg/ ha) and RVS-11-9 and RVS-11-15 each yielded 2432 Kg/ha again the check JSF-1(2196 kg / ha)
- ❖ In Advance Station Varietal Trial (ASVT), spiny tall genotype JSI-132 recorded significantly highest yield of 2452 kg/ha followed by JSI-116 (2403 kg /ha).
- ❖ In germplasm evaluation, some genotypes performed excellent viz GMU 3923 (2139kg/ha), GMU 3964 (2206kg/ha), GMU 3843 (2211kg/ha), GMU 3839, and GMU 3883 each yielded 2333 kg/ha, GMU 3852 (2428 kg/ha), GMU 37842 (2472 kg/ha) GMU 3821 (2500 kg/ha), GMU 3807(2550 Kg/ha), GMU 3841(2611 Kg/ha), GMU 3876(2722 Kg/ha), GMU 3814(2889 Kg/ha), GMU 3837(2917 Kg/ha), GMU 3840(3017 Kg/ha) GMU 3803(3106 Kg/ha) and GMU 3877(3944 Kg/ha).
- ❖ Among breeding material, a spiny tall genotype OPP-10 recorded highest yield 3025 kg/ha.
- ❖ The yield maximization in safflower, all the recommended package of practices was followed under a large plot of 2000 m² on JSI-97 variety. The obtained seed yield was 1800 kg/ha, under (one) irrigated condition
- ❖ In the experiment conducted to study the response of AVT-II safflower entries to fertilizer application, 100% recommended dose of (60:40:20) NPK treatment gave significantly highest grain yield (2587 kg/ha) and total return Rs. (64675/ha), highest net return (Rs.51225/ha) and highest B:C ratio (4.80) and significantly effect on test weight, plant height, and volume weight.
- ❖ The varietal performance averaged over different levels of fertilizer applications superiority of variety V5 gave highest yield (2562 kg/ha) with highest total return (Rs 640344/ha) and net return Rs. (51217/ha) and B: C ratio (5.02)
- ❖ In the experiment conducted to study the response of AVT-II entries of safflower for different four sowing dates. The 15th November sowing date seems to be significantly better in term of seed yield and highest gross return, net return and BC ratio. The entries performance variety V1 gave significantly higher grain yield (2618 kg/ha) as compare to other entries with highest gross return, net return and BC ratio.

- ❖ In assessment of fertilizer recommendation for safflower an experiment, N 60 P40 fertilizer application gave significantly highest grain yield (1825kg/ha), total return Rs. (45633/ha), net return (Rs.29483/ha) and B: C ratio (2.84)

In Comparative productivity, Profitability and resource use of non-spiny safflower to other rain-fed rabi crops experiment different rabi rain-fed inter crop in (3:1) ratio of chickpea, linseed and wheat in safflower. The safflower equivalent grain yield annageri variety was gave the highest grain yield (2953kg/ha), significantly as compare to other other non spiny variety and intercrops, highest gross return (Rs 73833/ha), net return (Rs 60383/ha) and B: C ratio (5.49).

12. AICRP on Sorghum, Indore:

- ❖ Six coordinated trials viz AHT, IHT, AVT, IVT, HN and IAVHT (SS) were conducted in *Kharif* 2011. The entries were tested for grain yield, fodder yield and other characters. Seven entries from Indore centre were evaluated in different coordinated trials.
- ❖ Under the Group efforts trials F3-94, F4-5, F5-27 were evaluated and selections made.
- ❖ Under sorghum genetic resources management three experiments were conducted and 227 germplasm lines were evaluated for DUS.
- ❖ Three station trials including SVT-I (20 entries), SVT-II (20 entries) and SHT (64 entries) were conducted.
- ❖ Fifty five MS lines were maintained and evaluated. 40 Restorers from Indore and ICRISAT were evaluated and seven found promising.
- ❖ A new programme was initiated to improve existing MS lines (IMS 9A) for plant height and maturity.
- ❖ Under agronomy discipline 5 trials were conducted on response of pre released sorghum and sweet sorghum genotypes to fertility levels, integrated nutrient management, response of newly released cultivars to date of sowing and integrated weed management in sorghum.
- ❖ Sorghum hybrid SPH 1647 and SPH 1648 and sweet sorghum varieties SPSSV 40 and SPV 19SS were found promising.
- ❖ All hybrids and sweet sorghum varieties responded up to 100% RDF (80: 40: 40 kg N: P2O5: K2O ha-1).
- ❖ Among the organic sources of nutrient, application as FYM @ 5t / ha, vermicompost@2.5t/ha and FYM @2.5t/ha+ vermicompost @1.25t/ha were at par but recorded significantly higher than the yields of control. In terms of total monetary returns,

application of 80: 40: 40 kg N: P₂O₅: K₂O ha⁻¹ along with 5 t FYM in sorghum recorded maximum total monetary returns.

- ❖ 15 Th June is found ideal time of sorghum and recorded 108.3 % higher grain yield than yield of 30th June sowing. Sorghum genotypes, CSH 16 and CSH 23 are found promising.
- ❖ Application of pendimethalin @ 0.50 kg a.i. ha⁻¹ with one hand weeding at 30 DAS and application of atrazine @ 0.25 kg + pendimethalin @ 0.50 kg a.i. as pre emergence + 2,4D 0.50 kg a.i. ha⁻¹ as post emergence were found effective weed management practices for sorghum.
- ❖ The level of shoot fly incidence was 24 to 80% in late sown crop. While, stem borer infestation observed at moderate level i.e., 15-39 percent .The aphid infestation level was negligible at all the situations in general crop. Head worms and bugs appear to be regular (moderate) but infestation level showed an increasing trend.
- ❖ A set of four coordinated trials of AHT,AVT,IHT,IVT (GS&DP) in which AHT SPH-1653, SPH-1680,SPH-1678,SPS-1641, in AVT CSH-18 (LC),CSV-20, CSV-15, IS 18551 and IS 2205, in IHT SPH-1706,SPH-1710& in IVT SPV-2109,SPV-2114,SPV-2117,CSV-15 were recorded as partially tolerant to shoot fly. In AHT SPH-1679, SPH-1647, in AVT CSH-18 (LC),CSV-20, CSV-15, in IHT SPH-1704, IS-18551,IS 2205,SPH 1709in IVT SPV-2123, CSV-15, SPV-2116, SPV-2112, IS-2205 were recorded as partially tolerant to shoot borer.
- ❖ Another set B (GS&DP) of AHT, AVT, IHT & IVT was conducted under high pressure of shoot fly by late sowing ,among these trials AHT recorded SPH-1648, SPH-1647 , SPH-1668 in AVT CSV-17,CSV-20,CSV-23,IS-18551,IS-2205, in IHT IS-18551,CSH-18(LC),SPH-1706,SPH-1707,IS-2205,in IVT CSH-18(LC),SPV-2117, SPV-2120,CSV-15,IS-2205 were noticed as partially tolerant to shoot fly ,while for stem borer in AHT SPH-1635,in AVT CSV-17,CSV-20,CSV-23 in IHT CSH-23,SPH-1703,SPH-1705CSH-16,SPH-1704,in IVT SPV-2114, SPV-2124, SPV-2121,CSV-23 noticed as partially tolerant .
- ❖ In trial DP- SF ICSV-700, ICSV-705, IS-18551, IS-2205, Satpani for shoot fly resistance / tolerance and C-43, P-35, PGN-57, PFGS-37, ICSV-700 for shoot borer resistance / tolerance.
- ❖ Under Interdisciplinary research program on multi-pest resistance/agronomic characters A trial was conducted with 68 entries in RBD and another trial was conducted with 525 entries including checks (without replication) for screening of breeder's materials against their reaction to shoot fly -34/66,EJ-9,EJ-44,E-45,E-73,E-96,163, E-104,E-99.

- ❖ Selected genotypes 45 received from ICRISAT were screened out for their reaction to the sorghum pests to identify the suitable materials for future need following materials were noted promising IS-4995,IS-35805,ICSV-25026,IS-17726 for shoot fly and ICSV-711,ICSV-705,IS-4646,IS-5469 for shoot borer.
- ❖ Management of sorghum pests and their natural enemies with low cost management approaches. was sown on 27.06.11, with seven treatments replicated thrice. Seed treatment with thiomethxam70 WP followed by spray of lambdacyhalothrin 5% EC found the best. Succession and population dynamics of the pests and their natural enemies was sown on 28.06.11 Non replicated with 4 cultivars namely Vidisha 60-1,JJ 1041, SPV 1820 & SPV 1862.

13. AICRP on Cotton, Indore:

- ❖ In the year 2011-12 under the AICCIP project, six breeding trials, four agronomy trials, two TMC trial, FLD's and station trials were conducted. In national trials (rainfed) namely IET of *G.hirsutum*s, (Br.02 (b) 35 entries and in PHT i.e. intra hirsutum hybrids (Br 05 (b)) 16 hybrids were tested. Observations recorded in IET (Br 02 b) revealed the significant differences for various characters under study. The highest seed cotton yield was given by the entry NDLH 1928(1219 kg ha⁻¹), followed by TKH 1225 (1196 kg ha⁻¹), TSH0259 (1187 kg ha⁻¹), LC (1144 kg ha⁻¹) and SCH 1002 (1106 kg ha⁻¹) respectively. Entry RAH 1004 and RS 2622 (676 and 684 kg ha⁻¹respectively) were the lowest seed cotton yielder. Maximum ginning outturn (above 36%) was recorded in the entries PH 1081, ZC NH 615/Sahana and GBHV 177. Among the intra hirsutum hybrids (Br 05 b), the highest seed cotton yield in GSHH 2646(1407 kg ha⁻¹) followed by GTHH 191 (1244 kg ha⁻¹) was recorded. Trend for lint yield was commensurate with the trend of seed cotton yield. The lower seed cotton yield was recorded in AHH 0702 (677 kg ha⁻¹). The highest ginning outturn in RAHH 1001(36%) and number of boll (20.21) in RAHH 1001 was recorded.
- ❖ In Zonal experiments viz. PVT (Br 03 b), CVT (Br 04 b), CHT (br 05 b) 07, 13 and 15 entries respectively were tested under rainfed conditions. In PHT (*hxb*) experiment (Br 15 a) 11 entries were tested in irrigated conditions. Experimental results of PVT (Br 03 b) revealed that the entry SCS 793 (1189 kg ha⁻¹) and GBHV 170 (1084 kg ha⁻¹) were significantly superior and at par over other entries with respect to seed cotton yield. The highest lint yield of 411 and 325 kg ha⁻¹ respectively was also noted in both the entries. Zonal check (NH 615) gave the lower seed cotton yield (748 kg ha⁻¹) as well as lint yield

(289 kg ha⁻¹) with higher ginning outturn (36.91%). Entries tested in CVT (*Br 04 b*), H 1353 had the highest seed cotton yield (1249 kg ha⁻¹) which was significantly superior over others. Lint yield ranged between 455 to 258 kg ha⁻¹. Performance for lint yield was almost similar like seed cotton yield. The highest ginning outturn (%) was noted in entry ZC (NH 615) (36.88).

- ❖ Among intra *hirsutum* hybrids (05 b), the highest yield (1405 kg ha⁻¹) was given by the entry GSHH 2729 which was significantly superior over rest of the entries. Other entries viz. NHH 225 (1267 kg ha⁻¹), MRC 7385 (1231 kg ha⁻¹) SHH 485 (1224 kg ha⁻¹) and NHH 324 (1220 kg ha⁻¹) were also at par among themselves. Entry DHH 1062 gave the lowest seed cotton yield (961 kg ha⁻¹). Higher Lint yield was recorded in NHH 225 (478 kg ha⁻¹) whereas ginning outturn was in NHH 324 (37.89%).
- ❖ Eleven inter specific hybrids (H x B) tested in Br 15 a revealed that the entry GSHB 922 gave the highest seed cotton yield (1323 kg ha⁻¹) followed by GSHB 929 (1240 kg ha⁻¹). Both the entries were statistically superior and at par. Trend of lint yield commensurate to seed cotton yield and it was 442 and 405 kg ha⁻¹ respectively. The highest ginning outturn 35.50% was noted in entry SHHB 1002 while number of boll per plant (52.27) in entry ZC (DCH 32).

In preliminary varietal trial of *G. hirsutum*(*on station*), Twelve elite genotypes were tested under rainfed conditions for screening purpose. Besides this, parental lines of K- 2, Vikram, R B 50, JK 35, IH 67 etc were maintained. Some SPS were done for evaluation with different objectives

- ❖ Cotton Hybrid RAHH-259 gave almost similar seed cotton yield 1384 kg ha⁻¹ as compared to 1334 kg ha⁻¹ with check hybrid ^{Ankur}- 651. Among the planting geometry 60 x 60 cm inter and intra row spaced crop gave significantly higher seed cotton yield 1447 kg ha⁻¹ as compared to 1371 kg ha⁻¹ with 90 x 60 cm planting geometry whereas the lowest yield of 1259 kg ha⁻¹ was recorded when crop was planted at a distance of 60 x 45 cm spacing.
- ❖ Application of 100:50:25 kg NPK ha⁻¹ produced higher seed cotton yield of 1435 kg ha⁻¹ over 60:30:15 kg NPK ha⁻¹ (1274 kg ha⁻¹) being on par to 80:40:20 kg NPK ha⁻¹ (1367 kg ha⁻¹).
- ❖ Bt. Cotton hybrids GK 205 at closer spacing of 60 x 60 cm with a dose of 150% RDF (225:113:90 kg N:P:K ha⁻¹) was found more suitable over all rest treatment combination in terms of seed cotton yield , net returns (Rs.ha⁻¹), B:C ratio.

- ❖ The application of RDF based on soil test values +5t FYM ha⁻¹ + 2 foliar sprays of 2% each of KNO₃ + 2% DAP during flowering to boll development stages was found more remunerative by seed cotton yield (1618 kg ha⁻¹) , net returns of Rs. 38441 ha⁻¹ with B:C ratio of 3.22 as compared to all rest treatments except treatment - RDF based on soil test values + FYM @ 5t ha⁻¹ + 2 foliar sprays of 2% DAP during flowering to boll development stages which was gave net return of Rs. 35326 ha⁻¹ with B:C ratio of 3.20.

The various treatments did not have any impact on yield of cotton. However (T₇) application of nutrient through organic based on P equivalent basis + *in-situ* green manuring of sun hemp recorded numerically more seed cotton yield (574 kg ha⁻¹) and this was closely followed by 556 kg ha⁻¹ due to treatment T₄ (5 t ha⁻¹ VC+ seed treatment with Azotobactor + PSB) respectively. Whereas the lowest mean yield 488 kg ha⁻¹ was noted under the treatment control (T₈).

14. AICRP on Dryland Agriculture, Indore:

- ❖ In experiment to study the effect of drip irrigation and mulch on growth and productivity of Guava and Aonla grown under dryland conditions, three mulches and two methods of irrigation were tested. The growth of both fruit plants was enhanced by the use of mulches. Amongst the three mulches tested it was exhibited that organic residue mulch found to be best followed by polythene and *Glyricidia* mulch. With regard the method of irrigation, drip irrigation system proved to be better than basin method.
- ❖ The study on Catchments – Storage Command Relationship for enhancing water productivity in micro –watershed revealed that the net return of `6650 ha⁻¹ (B: C ratio 1.27) per ha was recorded by sweet corn-green cobs, followed by Tomato `55370 ha⁻¹ with B: C ratio 2.23 planted after sweet corn. Whereas, soybean recorded net return of `22017 ha⁻¹ (2.69 B: C ratio) in *Kharif*. Similarly, in *Rabi*, potato crop gained ` (-) 25383 ha⁻¹ net return. The net return of `17807 ha⁻¹ was recorded by Chickpea with B: C ratio of 2.62 grown after soybean. The vegetables *viz.*, Bottle gourd (30 plants), sponge gourd (12 plants), bitter gourd (40 plants) and Sem (*Dolicus lablab*) (10 plants) were planted on the bunds of farm tank whose perimeter is of 160 m and the income thus, generated was of `5661.
- ❖ Study on the effects of rainfall on resource losses and crop productivity of soil with the objective to assess the effects of runoff, soil and nutrient losses with rainfall pattern on erosive index at Indore revealed that the Kinetic energy of rainfall is highest in the month

of July ($294.64 \text{ m t ha}^{-1} \text{ cm}^{-1}$), followed by August ($292.23 \text{ m t ha}^{-1} \text{ cm}^{-1}$) and September ($269.74 \text{ m t ha}^{-1} \text{ cm}^{-1}$). July seems to be the most erosive month as it has recorded highest Erosion Index of 24.20 followed by the month of August (20.84) for Indore.

- ❖ Among different intercropping systems evaluated in delayed sowing under rainfed semi arid conditions in *Vertisols* shows that maximum and significantly higher Moong equivalent yield of 1208 kg ha^{-1} , RWUE of $0.66 \text{ kg ha}^{-1} \text{ mm}^{-1}$ with a net income of `28611 ha^{-1} and B: C ratio of 2.75 were attained by Sunflower with 20% higher seed rate, followed by Sunflower with normal seed rate gave a Moong equivalent yield of 1107 kg ha^{-1} , RWUE of $0.53 \text{ kg ha}^{-1} \text{ mm}^{-1}$ with a net income of `21707 ha^{-1} and B: C ratio of 2.17. The *Sesamum* with 20% higher seed rate system gave the lowest Moong equivalent yield of 272 kg ha^{-1} , RWUE of $0.34 \text{ kg ha}^{-1} \text{ mm}^{-1}$ with net income of `11898 ha^{-1} and BC ratio of 1.40 in the season.
- ❖ In an experiment on contingent crop planning, seven *Kharif* / late *Kharif* crops viz., Sweet corn (for green cob, variety-Sugar Queen), Corn (for seed variety-NK 6240), Cluster bean or *Guar* (H - 563), Soybean (JS 93-05), Mothbean (Local), Horsegram or *Kulthi* (Local) were planted to identify the suitable and remunerative *Kharif* crop for changing weather conditions in rainfed *Vertisols* of *Malwa* Plateau of western M.P as an alternative of soybean at Indore. The maximum net returns of `57244 ha^{-1} was recorded by Maize variety NK 6240 with B: C ratio 5.40, followed by Sweet Corn (Sugar queen) grown for green cob with net return of `30956 ha^{-1} and B: C ratio of 3.38
- ❖ Contingent crops practices under aberrant monsoon condition of *Malwa* region, to combat the abiotic stress the effect of spraying of VAM-C 50 % SL @ 3.75 l ha^{-1} ; potassium Solution @ 2%; thiourea @ 250 g ha^{-1} at the reproductive stage of the crop were studied on four crops viz., Soybean, Maize, Blackgram and Horsegram. The treatment, spraying of VAM-C 50 % SL @ 3.75 l ha^{-1} recorded the significantly high seed yield ha^{-1} of Soybean 2095 kg, Maize 1759 kg, Blackgram 397kg and Horsegram 656 kg followed by the spraying of potassium Solution @ 2% (Soybean 2077 kg, Maize 1696 kg, Blackgram 352 kg and Horsegram 656 kg per ha) as compared to the control *i.e.*, without spray (Soybean 1728 kg, Maize 1283 kg, Blackgram 254 kg and Horsegram 378 kg per ha) and spray of VAM-C 50 % SL @ 3.75 l ha^{-1} on Soybean, Maize, Blackgram and Horsegram recorded 17.5, 27.0, 35.9 and 42.3 % higher seed yield respectively, than control (no spray of chemical).
- ❖ In a permanent manurial trial of soybean – Chickpeacropping sequence with 9 treatments of N and P at Indore, FYM @ 6 tha^{-1} + $20 \text{ kg N} + 13 \text{ kg P}_2\text{O}_5 \text{ ha}^{-1}$ was superior with maximum soybean yield 1992 kg ha^{-1} , RWUE of $1.40 \text{ kg ha}^{-1} \text{ mm}^{-1}$, net income of

- 36241ha⁻¹ and B: C ratio of 2.75 in the *Kharif* season and 1372 kg ha⁻¹ of yield, RWUE of 0.96 kg ha⁻¹ mm⁻¹, net returns of 44594ha⁻¹ with B: C ratio of 5.34 from Chickpea in the *Rabi* season. In both *Kharif* and *Rabi* seasons, the control gave lowest yield, RWUE, net returns and B: C ratio of both the crops in the sequence.
- ❖ Resource Conservation and Improving Soil Quality by low-till and organic farming strategies for *Malwa* region at Indore were studied in an experiment and the treatment comprising application of organics along with 50% RDF gave the highest seed yield (1519 kg ha⁻¹) followed by 100% organics application (1403 kg ha⁻¹), RDF (1368 kg ha⁻¹), these treatments were at par with each other and gave significantly higher yield as compared to control where no fertilizer was applied. Economic analysis revealed that there was a significant difference in the net return and B: C ratio due to different treatments.
 - ❖ Direct and residual effects of Sulphur on yield, quality and S use efficiency were tested at Indore with Soybean-Chickpea cropping system by applying 20, 40, 60 and 80 kg S ha⁻¹ through Gypsum to Soybean only, Chickpea only and to both crops in rotation. The highest B: C ratio of 3.26 was attained by application of S @ 60 kg ha⁻¹ to Soybean only and 2.94 by application of S @ 60 kg ha⁻¹ to Chickpea only, whereas, 60 kg ha⁻¹ sulphur applied to both the crop & season recorded highest B: C ratio 2.99 as compared to other doses of sulphur. The data over years showed that the maximum net return of 53044 ha⁻¹ and B: C ratio of 3.32 was recorded by the application of S @ 60 kg ha⁻¹ to Soybean only and to Soybean – Chickpea both net income of 49648 ha⁻¹ and B: C ratio of 2.96
 - ❖ In a study on efficient management of micronutrient application for soybean-chickpea sequence revealed that among Mo, Zn, B, Fe (applied in soil and sprayed as foliar), that application of two spray of Mo (Foliar) @ 0.1% with recommended dose of fertilizer (T3) gave highest seed yield during both the seasons (Soybean 1675 kg ha⁻¹ and Chickpea 982 kg ha⁻¹) and total net return of 69364ha⁻¹ with B: C ratio of 3.89, followed by treatment Mo (Soil Application) 0.5 kg ha⁻¹ (Amm. Molybdate as basal dose) with recommended dose of fertilizer as recorded seed yield of soybean 1625 & chickpea 952 kg ha⁻¹ with B: C ratio of 3.67. The yield differences of all the treatments were at par but significantly superior to control and farmers' practices. Control gave the lowest yield of 769 and 451 kg ha⁻¹ of soybean and chickpea, respectively with net returns of 28722 ha⁻¹ and B: C ratio 2.60.
 - ❖ The study on effectiveness and compatibility of different agro-chemicals on yield of Soybean – Chickpea cropping system in *Malwa* region was carried out at Indore. The

- treatment RDF (20:60:20:20 NPKS ha⁻¹) recorded highest seed yield of 1964 kg ha⁻¹, 1.37 kg ha⁻¹ mm⁻¹ RWUE, ` 35702 ha⁻¹ net return and 3.66 B:C ratio followed by 19 :19 : 19 NPK + Cypermethrin @ 500 ml ha⁻¹ at 30 & 45 DAS (1811 kg ha⁻¹, 1.27 kg ha⁻¹ mm⁻¹ RWUE, ` 33056 ha⁻¹ net return and 3.70 B:C ratio) and Basal 50 % RDF + sprays of 19 :19 :19 NPK at 30 DAS (1823 kg ha⁻¹, 1.28 kg ha⁻¹ mm⁻¹ RWUE, ` 32977 ha⁻¹ net return and 3.62 B:C ratio) as compared to control (1329 kg ha⁻¹, 0.93 kg ha⁻¹ mm⁻¹ RWUE, ` 22221 ha⁻¹ net return and 3.02 B:C ratio).
- ❖ In an experiment to study the effects of organic manures and fertilizers on cob productivity of sweet corn for high monetary returns under dryland *Vertisol* conditions of *Malwa* region revealed that FYM 12 t ha⁻¹ gave the highest green cob yield of 8827 kg ha⁻¹, RWUE of 5.90 kg ha⁻¹ mm⁻¹ with net income of ` 62338 ha⁻¹ and B:C ratio of 3.40 followed by Vermicompost 5t ha⁻¹ + 50% RDF (60: 30: 30 N P K kg ha⁻¹), RDF (120: 60: 60 N P K kg ha⁻¹) (green cob yield of 8519 kg ha⁻¹, RWUE of -5.77 kg ha⁻¹ mm⁻¹ with net income of ` 50288 ha⁻¹ and B: C ratio of 2.44) and (green cob yield of 8333 kg ha⁻¹, with net income of ` 58353 ha⁻¹ and B: C ratio of 2.44) , respectively. The least green cob yield of 5617 kg ha⁻¹, RWUE of 3.89 kg ha⁻¹ mm⁻¹ with net income of ` 36236 ha⁻¹ and B: C ratio of 2.82 were exhibited by control. Amongst the variety NK 6240 recorded maximum green cob yield of 12284 kg ha⁻¹ with net returns of ` 95059 ha⁻¹ and B: C ratio of 4.52
 - ❖ Among 03 varieties of Soybean viz., JS 335, JS 95-60 and JS 93-05 of soybean evaluated at farmers' field at Indore, JS-335 was superior with a maximum and significantly higher yield of 2029 kgha⁻¹, 1.39 kgha⁻¹ mm⁻¹ of RWUE, net income of ` 37725 ha⁻¹ and BC ratio of 3.90 at station trial and 1600 kg ha⁻¹, 1.10 kg ha⁻¹ mm⁻¹ of RWUE, net income of ` 27000 ha⁻¹ and BC ratio of 3.08 at on farm trial. Followed by the variety JS 95-60, recorded second highest yield of 1869 kg ha⁻¹, 1.28 kg ha⁻¹ mm⁻¹ of RWUE, net income of ` 33725 ha⁻¹ and BC ratio of 3.59 at station trial and 1580 kg ha⁻¹, 1.09 kg ha⁻¹ mm⁻¹ of RWUE, net income of ` 26500 ha⁻¹ and BC ratio of 3.04 at on farm trial. The year 2011, 1454.8 mm rainfall was received in 45 days during the crop season. There was no dry spell was observed during the crop duration
 - ❖ The 26 selections plus 6 advanced entries plus 5 check entries viz., JKM 189, JA 4, (Medium maturing group) and UPAS 120, ICPL 88039, JIA 65 (Early maturing group) of pigeonpea were evaluated at Indore, for dryland condition through farmer participation. The strain JA 4 08-14 was superior recorded highest yield of 2015 kgha⁻¹, RWUE of 1.37 kgha⁻¹mm, net income of ` 70394 ha⁻¹, and BC ratio of 6.41. The strain ICP 8863 08-38

recorded the 2nd highest yield of 1771 kg ha⁻¹, RWUE of 1.20 kg ha⁻¹ mm⁻¹ with net income of ` 61375 ha⁻¹ and B: C ratio of 5.72, followed by ICP 8863 08-40 gave the seed yield of 1755 kg ha⁻¹, RWUE of 1.19 kg ha⁻¹ mm⁻¹ with net returns of ` 58714 ha⁻¹ and BC ratio of 5.52 as against the check entry JKM 189 yielded 1510 kg ha⁻¹, RWUE of 1.03 kg ha⁻¹ mm⁻¹ with net income of ` 50177 ha⁻¹ and BC ratio of 4.86 The year 2011, was favourable for *Kharif* pulse and oilseed crops. The total rainfall of 1471 was received in 47 days during the crop season. The crop does not face any dry spell throughout the life span

- ❖ A study was carried out for effect of tillage and crop residue management on the performance of Soybean – Chickpea cropping sequence. There is a significant effect of tillage practices on the seed yield of Chickpea. Tillage by rotavator gave significantly higher grain yield of Chickpea than Zero tillage. Among crop residue management, the incorporation of crop residue recorded significantly higher yield as compared to burning of crop residue.
- ❖ Among different combinations of Agri-horti systems tested for medium deep *Vertisols* of *Malwa* plateau at Indore, the fruit yield of 4137 kg ha⁻¹ was recorded by Aonla (*Phyllanthus embelica*) followed by, Drum-stick (*Moringa poleifer*) 659 kg ha⁻¹ whereas, in Guava (*Pisidium guavajava*), Phalsa (*Greivias ubinaequalias*) and Ber (*Ziziphus spp.*) not recorded fruit yield. Amongst the crop components, Pigeonpea (sole) in combination with Aonla (*Phyllanthus embelica*) (1.66 B: C ratio) and Soybean + Pigeonpea intercrop in combination with Custard-apple (*Annona squamosa*) and Ber (*Ziziphus spp.*) (1.30 & 1.32) have recorded high B: C ratio in the study

15. AICRP on Operational Research Project, Indore:

During 2011-2012 i.e. second year in the new ORP area in another district other than Indore, to achieve the major objectives of the ORP, the ORP team working at College of Agriculture, Indore (M.P.), the research activities were continued as per the approved and modified technical programme in the village Gaddukhedi located in Dewas district for demonstrating the advanced/-improved package of practices emerged from the dryland centers for efficient rainfed farming. The information gathered through PRA exercise in first year (2010-11) to assess the strength and weakness of existing farming systems prevailing in the village was used for developing/modifying the technical programme for the next few years. The brief note was prepared and technical programme was finalized in consultation with the scientists of other ORP/CRIDA centers. During monsoon season, the ORP area recorded 1048 mm rainfall, which was well distributed, and thus no significant dry spell was observed.

Since runoff and associated soil losses thereby reduced fertility, non-availability of surface as well as sub-surface water, limiting moisture conditions has been the major problems of the region. Therefore, it was the felt need of most of the farmers that in view of erratic monsoon condition attempts should be made for the development of water bodies at suitable locations so that the stored water could be utilized during the stress period. For this purpose, a sunken pond of 2000 cu.m. Capacity was constructed through participatory mode in march 2011 in order to take the advantage of cemented outlet constructed by line department in Gaddukhedi in the vicinity of farmers fields. From ORP side, the advantage of this outlet was explored and through this sunken pond, the nearby open well gets recharged automatically in the monsoon season of 2011-12. This helped the farmers to bring an appreciable amount of cultivated area under additional irrigation. This technology is also being up scaled to adjoining areas with technical guidance from the ORP team.

Keeping the need and feedback from the farmers in view, identification of various improved varieties of different kharif and rabi crops was made and thus various varieties developed at different centers were procured for the testing and their wide scale adoption. Newly introduced JS 335, JS 9305 and JS 9560 variety of soybean have been introduced to replace the existing old varieties. Similarly in rabi season improved varieties of gram which are tolerant to wilt (Vishal, JG 412, JG 130, KAK 2 and JGK 2) have been provided to the farmers who were still growing 25 year old varieties. Since ORP provided breeder seeds through its programme, wide scale adoption is possible for these improved varieties. Due to use of balanced fertilizers and plant protection measures, the yield as well as net income per unit area is increased in the adopted village. The various technologies up scaled by the ORP team have become a source of inspiration to other farmers who are regularly contacting ORP team for providing technical guidance. More and more farmers are contacting the ORP team for providing reversible plough for deep tillage operations.

Based on the research work being carried out by the ORP team and lively interaction with the farmers of the area, two innovative ideas were developed by two farmers namely Mr. Laxman Singh Chouhan (Panod) and Pradeep Shidye (Barlai). These ideas were shared with the other farmers. These two farmers have been considered and awarded by CRIDA for their innovation.

On the spot guidance were also provided to the farmers to tackle weed, insects and pests problems in the fields. The field visits of line department personnel were also arranged from time to time to provide latest information on the schemes being mooted by the government which can be of much use to farmers. The scientists also delivered various

lectures and attended training programmes organized by KVKs from time to time. Based on the experience gathered in the farmer's field, various technical bulletins and leaflets have been published from time to time. The information to the farmers of the region regarding these improved technologies was also flashed through Doordarshan and Akashwani regularly.

Thus overall it can be concluded that for proper dissemination of dryland technologies, even in the new village ORP played a very important role, which works directly with the farmers to generate awareness among them to adopt such useful technologies. At the same time, the scientists of main center get proper feed back to refine the technologies to suit the farmers' conditions.

16. AICRP on Salt Affected Soil, Indore :

Survey of ground water quality of Itarsi, Hoshangabad, Babai and Shivni Malwa tehsils of Hoshangabad district indicated that only 4.3 % ground waters samples were having salinity/ sodicity problem. Long-term application of organic/ green manures at different soil ESP in sodic Vertisols revealed that incorporation of Dhaincha as green manure increased the mean yield of paddy and wheat by 48 and 53 % respectively over control. Application of gypsum @ 75 % GR registered 97, 45 and 85 % increase in seed yield of soybean, grain yield of wheat and seed cotton yield respectively over control at farmers field. Performance of soybean and wheat under partially reclaimed sodic soils with the use of spent wash was evaluated. The increase in seed yield of soybean and grain yield of wheat was 57 and 62 % due to the application of spent wash @ 5 lakh litre per ha over gypsum application @ 75 % GR respectively. Relative efficacy of distillery and sugar industry waste on reclamation and crop production was tested under sodic vertisols. The results revealed that application of lagoon sludge @ 5 t ha⁻¹ along with raw spent wash @ 2.5 lakh L ha⁻¹ gave maximum grain yield of paddy and wheat. The increment in the yield of paddy and wheat was 103 and 112 % due to the addition of lagoon sludge @ 5 t ha⁻¹ along with raw spent wash @ 2.5 lakh L ha⁻¹ over control. The study on different methods of irrigation and quality of water on performance of fruit trees in a sodic environment reveals that embedded pipe irrigation method (having pipe diameter 100 mm and length 40 cm) is observed markedly effective and promising in performance as compared to conventional check basin method in terms of saving of irrigation water and improvement in Bio-metric parameters. Assessing pre and post canal irrigation effect on soil, water and crops in Vertisols of Narmada Sagar Command reported pre and post monsoon water table fluctuation in 13 wells during 2005 was ranged from 2.50 to 5.1 m. Under multi-enterprises system the stored water could manage to deliver 2500 mm depth of

water for irrigating 1.28 ha area. The yields of cotton and paddy crops grown under raised and sunken bed farming system were 1083 and 1027 kg/ha respectively. Cotton yield obtained in sole crop farming system was 1333 kg/ha. Similarly, yields of tomato and brinjal crops under agro-horticulture farming system were 1736 and 3611 kg/ha.

17. AICRP on Integrated Farming Systems, Indore:

- ❖ Soybean+ maize – cauliflower / onion – greengram system may be profitable cropping systems under irrigated condition in this Malwa Plateau. Soybean + maize – sweet corn – greengram may also give higher monetary advantage than the predominant cropping system of this zone, i.e. Soybean – Wheat.
- ❖ The model soil test based fertilizer proves the highest yield of soybean – wheat cropping system in terms of wheat-equivalent yield with NMR and B:C ratio in the first year of experimentation at new site.
- ❖ The recommended dose of fertilizers produces the higher yields of maize (for cobs) – durum wheat cropping system and consequently, the returns and B:C ratio are higher. When the recommended dose of fertilizers was reduced to half and FYM was added to mitigate this reduction in terms of 50% equivalent nitrogen, a decrease in the wheat equivalent yield of 37% is observed in the first year of experimentation.
- ❖ The model soil test based fertilizer recorded higher yields (1953 and 2243 kg/ha of grain and straw, respectively) of soybean than other models under comparison. In the case of wheat, the model of recommended fertilizer and package of practices fetched the maximum harvest (5042 and 5250 kg/ha of grain and straw, respectively). The model soil test based fertilizer recorded the highest system yield in terms of wheat-equivalent yield (5006 kg/ha) with NMR and B:C ratio (2.89) in the first year of experimentation at new site.
- ❖ After ten years of experimentation (1999 to 2009) on different models in soybean- wheat system, an increase in grain yield of 6.19 % in terms of soybean equivalent yield was observed when fertilizers were applied on the basis of soil test in comparison with the model of recommended dose of fertilizer (RDF) and package of practices. On an average, the savings of nutrients were in the tune of 10 kg of P₂O₅ and 12 kg of K₂O/ annum in the system. Soil test based fertilization is necessary not only for savings of nutrient material

but for balanced nutrition to plants also. Integrated weed management also recorded 4.21 % more yield than RDF.

- ❖ The high yielding varieties of crops are highly responsive to chemical fertilizers however; fertilizers can be reduced to some extent by application of organic manures (FYM) without appreciable reduction in yield. After seven years of experimentation (2003 to 2009), a decrease in yield of 28.85% in term of maize equivalent yield of the system was observed when fertilization was done through only organic sources (equivalent to recommended nitrogen) in comparison with recommended dose of fertilizer. Further, when FYM was applied equivalent to half of the recommended nitrogen, the decrease in economic yield of the system was only 3.26%.

Nine crop sequences were tested for their productivity, monetary returns and economic viability. Soybean+ maize – cauliflower - greengram cropping systems produced the maximum returns (Rs 2,81,722 and 2,07,889 gross and net return) among all nine sequences tested. This was followed by Soybean + maize – onion - greengram. The predominant cropping system of the area, i.e. Soybean – Wheat ranked fourth in respect of B:C ratio. The inclusion of vegetable crops in the system enhances the returns.

18. AICRP on Pigeonpea, Khargone:

- ❖ IVT (M) on medium maturing Pigeon pea varieties revealed that GRG-822 (1835.967 kg/ha) followed by GJP-1003 (1703.823 kg/ha) and VKT-267 (1596.907 kg/ha) recorded significantly higher grain yield compared to other test entries and all checks.
- ❖ IVT (E) on early maturing Pigeon pea varieties revealed that PA 374 recorded significantly highest grain yield (1457.17 kg/ha) followed H 05-38 (1310.18 kg/ha) compared to checks.
- ❖ SVT on Pigeon pea varieties revealed that VKT 268 recorded significantly highest grain yield (1813.11 kg/ha) as compared to checks and other test entries.
- ❖ Variety RVKT-268 (M) included/promoted in IVT (M) coordinated trail of central Zone and South Zone.
- ❖ 101 fresh crosses were attempt using local germplasm during the year.
- ❖ 317 CMS based fresh crosses were attempt using local germplasm as restores during the year.
- ❖ RDF 100 % produced significantly high yield (1029.3kg/ha) compared to 50% RDF (909.4 kg/ha). Among bio-fertilizer, *Rhizobium* + PSB + PGPR gave significantly higher grain yield (1044.7 kg/ha) but at par with *Rhizobium* + PSB (992.5 kg/ha) compared to control. Application of FYM 5 t / ha showed significant increase in grain yield over without FYM. JKM 189 recorded significant higher grain yield (1099.0 kg/ha) followed

by TJT 501 (1081.8 kg/ha) over Asha (1023.3 kg/ha). Closer row spacing of 60 cm produced significant higher grain yield (1127.2 kg/ha) over wider row spacing of 90 cm. Among intercrop, soybean produced highest significant Pigeonpea grain equivalent yield compared to Maize intercrop in Pigeonpea. *Rhizobium* strains Viz., CPR 9 followed by RA 09-6 and AKPR 101 showed significantly higher grain yield, nodule number and dry weight of nodules per plant over un-inoculated control. These strains were found to produce yield of pigeonpea at par with 20 kg N/ ha application. These results indicated that these *Rhizobium* strains i.e. CPR 9, AKPR 101 and RA 09-6 having potential of saving at least 20 kg N/ha. JKM 189 recorded significantly higher grain yield compared to JKM 7 and TJT 501. Microbial Strains R3= RA 4 +PSB=PGPR followed by R2= GPR 3-8 + PSB + PGPR showed significantly high grain yield and dry matter yield. TJT 501, JKM 189 with Microbial Strains R3= RA 4 +PSB+PGPR showed significantly high grain yield and dry matter yield.

- ❖ Evaluation of Breeding lines against major diseases of Pigeonpea Data revealed that out of 42 lines of IVT entries of national nursery were screen in the Breeding trail. All entries were reported wilt resistance. Resistance entries also require further screening in wilt sick plot.
- ❖ The survey of the Research Station and farmer's field was conducted at flowering and pod formation stage. The wilt incidence was noted in the sole as well as in the intercrop of Pigeonpea with cotton and Soyabean. Medium duration varieties Asha, JKM -7, BSMR 853, Asha, TJT-501, JKM-189, Vargin, Nirmal Tur and other private Verities are common in sole crop, while local varieties are grown as an intercrop with cotton. Wilt was more in intercropping with cotton. The spread of medium duration resistant varieties have great scope in the region to reduce wilt incidence in the area. This year wilt incidence are low and also the yield level also low due to low temperature and high rain fall and more rainy days in the region and also pod fly and pod borer damage was very high due to continuous rains at the of flowering and pod formation stage.
- ❖ In IPM trail results showed that very low wilt infestation (.033%), minimum pod damage by pod borer (5.3 %) and by pod fly (17.4 %) was recorded in IPM strategy as against high value wilt infestation (6.8%), pod damage by pod borer (19.8 %) and by pod fly (24.7 %) was recorded in the farmer's practice. The higher grain yield (1490 kg/ha) and additional yield (602 kg/ha) was recorded in the IPM strategy.
- ❖ The minimum pod damage (5.3 %) by pod borer,(17.4 %) by pod fly and 0.33 % wilt infestation was recorded in IPM strategy as against high value of pod damage (19.8 %) by pod borer,(24.7 %) by pod fly and 6.8% wilt infestation in the farmer's practice . The higher grain yield (1490 kg/ha) and additional yield (602 kg/ha) was recorded in the IPM strategy.
- ❖ On the basis of overall results of screened out 24 IVT genotypes of medium maturing group, the infestation of pod borer ranged from 11.68 – 28.33 percent in SKNP 0926 and LRG 52, respectively. The infestation of pod fly ranged from 24.10 % in RPS 2007-106

and 38.80 % in Phule T 002-2. The grain yield was higher of CRG 822 (1835.97 kg/ha) and was lower of CRG 818 (978.40 kg/ha).

- ❖ Results based on over all factors studied among 11 advance genotypes, both the checks viz. JKM 189 and GULIYAL RED performed well with less damage and higher grain yield followed by WRG 79, SKNP 207, RVSA 81 and RVSA 34.
- ❖ On the basis of overall results of 12 entries of (SVT), JKM 189 x TKP 2005-2, TJT 501, JKM 189 x JSA 02-1 and JKM 7 x KWT -2 were showed comparatively tolerance to the pod borer complex and higher yielder. Genotype JKM 186 x Udaypura and JA 4 x ICP 15676 were highly susceptible to the pest.
- ❖ A survey on farmer's fields near by ZARS Khargone was conducted to find out the incidence of major insect pests of pigeon pea. On the basis of observation recorded in the field, two pests' viz. Pod borer and pod fly were found as a pest of economic importance. Among them pod fly was the most serious to damage the pod up to 45.55 %, where as the pod borer damage the pods up to 27.67 % only.

19. AICRP on Groundnut, Khargore:

- ❖ Six fresh cross have been affected in Kharif 2011-12 with view to create variability for earliness and high yield.
- ❖ In Initial Varietal Trial [SB]-I comprised 14 entries including 3 checks, the statistical differences for the yield were found significant, however the first 3 ranking entries were ISK-I-11-16 [1377kg/ha], ISK-I-11-7[1335kg/ha], and ISK-I-11-17 [1305 kg/ha], respectively with the CD and CV of 123.6 Kg/ha and 7.6% respectively
- ❖ In Initial Varietal Trial [SB]-II comprised 15 entries including 3 checks and conducted Over two years, the mean pod yield was 1176 Kg/ha. The highest pod yield was recorded on the entry ISK-II-10-6 [JL 776] i.e. 1558 Kg/ ha] followed by ISK-II-10-8 [AK327] 1507 Kg/ha] and ISK-II-10-3[RHRG 6083], 1501 Kg/ha with the CD and CV of 135 Kg/ha and 8.3 % respectively.
- ❖ About 22 cross combinations of different advance generations [F2-F9] are being studied and advanced.
Fifty-four germplasm accessions from NBPGR and 23 accessions from NRCG are being maintained.

20. AICRP on Maize, Jhabua

- ❖ Sixty late maturing entries were tested in IET, out of these, genotype BIO 237 gave significantly highest yield (7361 kg/ha), over all the varieties followed by Laxmi (6791 kg/ha) and Orbit (6783 kg/ha) during 2011.
- ❖ A trial was conducted at different NPK level for the performance of pre release germplasm of maize during 2011 for full season, medium maturity and early maturity. Maximum yield was observed in 250:95:95 kg NPK level, 200:80:80 kg NPK level and 200:80:80 kg NPK level in full season, medium maturity and early maturity germplasms, respectively while the germplasm X8B562 gave highest yield of 7871kg/ha, KMH 3426 gave highest yield of 7107 kg/ha and BIO 9637 gave 7071 kg/ha yield full season, medium maturity and early maturity germplasms, respectively.

21. AICRP on Medicinal & Aromatic Plants, Mandsaur

- ❖ Out of 120 germplasm of ashwagandha line tested for higher dry root yield, seed yield and quality root characters the following entries viz; MWS-215, MWS-90-137, RAS-11, MWS-216, RAS-10, MWS-336, MWS-305, MWS-330, MWS-221, MWS-222, MWS-223, MWS-226, MWS-301, MWS-306, RAS-35, RAS-41, and RAS-42 are found superior for dry root yield. And entries MWS-305, MWS-215, MWS-221, MWS-307, MWS-214, MWS-216, MWS-306, RAS-42, MWS-222, MWS-213, MWS-125, MWS-135 and MWS-217 are found superior for highest seed yield. This line must be tested in multilocation at trial for crop improvement work.
- ❖ Out of 235 lines of opium 36 lines viz; MOP-278, MOP-539, MOP-570, MOP-579, MOP-1078, MOP-587, MOP-581, JA-16, MOP-541, MOP-539, MOP-511, MOP-542, MOP-1055, MOP-1077, MOP-1079, MOP-1081, MOP-1084, MOP-1085, MOP-379, MOP-585, UO-17682, MOP-506, MOP-1057, IC-42, Posta-149, NBRI-6, MOP-572, MOP-533, MOP-510, IC-19, MOP-532, MOP-536, UOP-67, ND-40, UOP-87 and ND-42 are identified and purified as per morphological character. These lines must be tested in station and multiplication trials and utilize for crop hybridization and improvement work.
- ❖ Among the 235 genotype of opium Poppy the entries found superior for latex and seed yield are as follows:
 - ❖ Latex yield: Ranges from 23 kg/ha (UOP-41) to 100 kg/ha (UOP-70) superior entries for higher latex yield are identified as followed UOP-70, NC-57955, IC-18, ND-36, NC-57913, JA-16, MOP-518, MOP-519, MOP-528, MOP-535, MOP-1071, MOP-1088, MOP-1090, IC-95, NOP-204, NC-57259, ND-35, UOP-290 and Mandakani recorded more than 70 kg/ha latex yield.
 - ❖ Seed Yield: Seed Yield kg/ha ranges from 111 kg (UOP-60) to 1619 kg (UOP-27) MOP-8, UO-1985, UO-149, UOP-60, UOP-27, MOP-8, UO-1985, UO-1495, ND-03-02, Shyama, MOP-1071, MOP-1069, UO-285, NBPGR-2, MOP-1086, NBPGR-5, ND-37, ND-44, MOP-508, MOP-517, MOP-519, MOP-528, MOP-1054, MOP-1088, MOP-1089, MOP-1091, UO-177-185, UOP-28, UOP-12, UO-177-2, IC-30, IC-44, NC-57923, NC-57960, NBRI-8, ND-7, ND-9, ND-11, ND-12, ND-16, ND-39 and ND-47 are found superior for higher seed yield (more than 1200 kg/ha).
- ❖ Out of eighty lines of Isabgol tested and evaluated, the entry MIB-1004, RI-88, RI-129, MIB-201, RI-3, Selection-10, Sel-51, RI-1, RI-4, RI-89, RI-9708, Udaipur-1, MIB-1001 and MIB-1005 are identified superior entries and must be utilized for crop improvement work.
- ❖ Among the 24 lines of Safed Musli tested during the year 2011-12 fasciculated root yield ranges from 1333 kg/ha (MCB-417) to maximum 3333 kg/ha (MCB-412). The superior genotypes for fasciculated root yield and sapoganine content identified are MCB-412, followed by MCB-422, MCB-424 and RVSM-414.
- ❖ Safed musli line MCB-412 was found superior in fresh fasciculated root yield to the existing variety during the 2009-10, 2010-11 and 2011-12 at Mandsaur centre. This line may be tested in multilocation trail.
- ❖ Chandrasur entries MLS-1, MLS-7, MLS-11, MLS-8 and MLS-6 were found superior for seed yield and these may be tested in multiloctional trail.

- ❖ Out of 21 germplasm of Tulsi, tested MOB-1, MOB-2, MOB-5, MOB-8, MOB-10, and MOB-11 are identified superior and high yielding genotypes.

22. AICRP on grapes, Mandsaur:

This is a newly sanctioned project in which different varieties of grapes viz-11 varieties of colored seedless, 19 table varieties, 16 wine varieties and 5 juice varieties were grafted on three rootstocks viz-110-R, dogridge and salt greek to see their performance. Preliminary studies indicate that, all the varieties of grapes performed well on “**Dogridge root stock**” followed by salt greek.

23. National Agriculture Innovative Project:

New Kadaknath production technology facilitated for livelihood security of tribal farmers

Kadaknath, a local high value poultry bird of district Jhabua, was mainly reared in traditional back yard poultry farming. High market price, slow growth on natural feeding and more than 50 % mortality before maturity are major factors which affect the survival, growth and productivity of this breed. Consequently, population of this bird was declining rapidly resulting to threat of extinction and genetic erosion. The interventions were therefore made in the NAIP project such as construction of low cost poultry shed, trainings on advanced technologies of poultry production, optimum feed and balance diet, vaccination for protection from diseases and exploring the marketing avenues. Ten poultry shades were established in Jhayda cluster for 10 beneficiaries and 100 chicks were provided to each beneficiary along with vaccination, optimum feeding and trainings for proper rearing of chicks. This resulted in



faster growth and reduction of mortality from 50 to 10 %. A group of Shri Kadaknath Murgi palan producer has also been formed and now these Kadaknath growers are earning Rs. 80-90 thousand/ shade / year. Looking to this success, about 107 additional poultry shades have been constructed and growers adopted rearing of birds in the shades under improved technology.

After large scale adoption of the new rearing technology the availability of chicks became another constraint in fast multiplication for boosting income and livelihood security of tribal farmers of the district. A Kadaknath hatchery unit is under



establishment at KVK Jhabua to overcome the problem. One more effort has also been made to enhance the availability of chicks through natural hatching of Kadaknath eggs by *desi* bird.



After observing the success of this hatching, 34 selected beneficiaries were given two hens and one cock of Kadaknath breed to individual beneficiaries. In this way a total of 792 Kadaknath chicks were developed. The two way production of Kadaknath chicks through hatchery and natural hatching along with their

rearing under improved technology is encouraging tribal farmers for rearing of this bird. It is helping in boosting up the financial status of the tribal in the district of Jhabua.



Enhancement in income from vegetables and spices cultivation

Mono-cropping is invogue with maize, black gram and wheat in tribal districts of Dhar and Jhabua. An attempt was therefore made under NAIP project to introduce and



test the feasibility of vegetable cultivation in Advi, Dhar and Godabadi, Jhabua for raising the income of tribal farmers. Vegetables namely, tomato, brinjal, okra, cucurbits and spices like onion, coriander and chili were promoted as crop diversification under improved production technologies. The interventions made were improved varieties, improved production and protection technologies, nursery management, trainings to farmers and guidance for better marketing. Now 108 farmers of project area are earning about 45 to 60 thousands/ acre / farmer/ year. Tribal farmers are convinced with these new interventions and adoption is very fast in the project districts.

Promotion of fodder crops among tribal

In Dhar district, fodder cultivation was not practiced. Cows and buffalos survive on grazing and eating the straw / crop residues. Hence, fodder crops like berseem (*Trifolium alexandrinum*) and oat (*Avena sativa* L.) were introduced under NAIP project in Kukshi, Dhar. Both the crops were introduced in the area where, farmers were not aware about fodder production and their utilization for animal nutrition, health and higher milk yield. Three farmers willingly accepted to grow the fodder crops in Khargone cluster of Dhar. Green fodder production was about 600-900 q/ha in berseem and 500-550 q/ha in oat during rabi season of 2011-12.

Popularization of stall feeding

Traditionally, open feeding of dry or green forages was in practice in district Dhar which resulted in wastage of forages and deterioration of its quality. Mangers, an improved animal feeding technology were therefore constructed in each village for small and large ruminants. The feeding of dry fodder (dry cotton leaf + wheat



Maize + Barseem

straw) in mangers was promoted in three villages namely, Khargone, Undly and Anjanial malhar under NAIP project. The animals fed in mangers were cows, buffaloes



Lucerne+Papaya

and goat. The approximate saving of dry matter with use of manger was 0.60, 0.83 and 0.06kg/day/ milk for dry desi cow, buffalo and goat, respectively. Considering the price of Rs 300/- per quintal of dry roughage, the savings of total dry matter in three villages was approximately Rs 2400/- per day.

Promotion of vegetables and spices

Introduction and promotion of vegetables and spices was identified as one of the high impact intervention for generating income and additional employment. 108 beneficiaries were selected for this intervention. The average income of farmers due to the improved cultivation of chili, tomato, onion, garlic and coriander has been ranged from Rs. 26000 to 57000 from one beegha (0.2 ha.)

Productivity enhancement in major crops

The seed yield of maize, soybean, cotton and wheat has been increased from 1870, 1245, 890 and 1875 to 2675, 1790, 1275 and 2780 kg/ha, respectively due to project interventions. This reflects an overall increase in grain yield by 43 percent.

Natural hatching of *Kadaknath*

Succeeded in natural hatching of local high value poultry race *Kadaknath* eggs by *desi* bird and rearing of newly borne chicks in the mosquito net. Under this technology, 792 *Kadaknath* chicks were reared and farmers are getting Rs. 175-200 from one *kadaknath* bird of two months old instead of getting Rs. 60-100 from *desi* bird.

Introduction of summer vegetables and spices

Summer cultivation of vegetables and spices viz., coriander, chilli, tomato, sponge guard, cowpea, and kakdi hybrids were introduced in Advi and Mafipura village of Dhar and Golawadi cluster of Jhabua. The Dhar farmers cultivated coriander and produced 96 q of green leaves/ha and sold @ Rs 2500/q with the net profit of **Rs 2.00** lakhs/ha.

Constitution of seed society

Breeder seed of wheat variety GW 366 provided to farmers for seed production with target of 300 q production. During kharif season, seed of soybean (JS 95-60) and maize (JVM 421) was also produced by farmers of Golabadi cluster.

Introduction of agri-horti farming system

Aonla, Guava, Papaya based agri-horti forming system were successful established with nearly cent per cent survival.

24. Integrated Agro-met Advisory Services Morena, Khargone, Sehore, Indore and Jhabua

The Integrated Agro-met Advisory Services project is running at ZARS, Sehore, Morena, Indore, Khargone and Jhabua of the university with the help of India Meteorological Department, New Delhi. The major activities of this project are: to issue weather based Agro-Advisory on every Tuesday & Friday on the basis of weather forecast received from India Meteorological Department New Delhi for the next 5 days. The weather parameters which are included in the forecast are rainfall, maximum & minimum temperature, relative humidity, wind speed, wind direction and cloud cover etc.

Advantages of Agro-Advisory

- Agro advisory services are very useful to the farmers viz. land preparation for sowing, advanced / timely sowing, inter culture operations, fertilizer and irrigation management, contingent crop planning, mitigation of apparent weather situation, timely plant protection viz. pest, disease and weed control and harvesting, threshing, storing and post harvest operations and marketing of agricultural produce.

Dissemination of Agro Advisory Bulletin:

- Agromet Advisory Bulletin is prepared for all the districts of their zone on every Tuesday & Friday and disseminated to the farmers through print & electronic media, Doordarshan, all concern KVK's, Deputy Director of Agriculture, State Band of India (Agril. Development branches), NFSM, NHM, ATMA, Ministry of Agril, Seed corporation, Mandi board, E- pathshala, NGO,s and telephonic contact to the farmers etc.
- Agromet bulletin is uploaded in of Agrimet Pune (Head Office) website - imdagrmet.gov.in regularly.

Extreme weather events, Sehore

- Forecast for heavy rainfall on 22 June 2012 and received 81.5 mm in one day. Advised to the farmers for providing adequate drainage in their field.
- Second week of January, 2012 experienced sudden drop in temperature due to which gram and vegetable crops affected.

Economic Impacts:

- In Kharif season – farmer were advised to provide adequate drainage in their field and need based pesticide spray for the management of insect and pest gave the benefit of Rs.- 5900/ha.
- In rabi season - As per the forecast of sudden drop of temp. farmer have taken care of gram, and potato crop & benefitted by Rs.- 7050/ha. and Rs. 20250 /ha. respectively.

Weather Condition, Morena: Standard Meteorological weeks average of important Met. Parameters observed at Agromet. Observatory ZARS, Morena during 2011 -2012 are

given in following table.1 the total rainfall received during monsoon was 657.9 mm in 41 rainy days, which was at par with normal rainfall. The average maximum temperature ranged from 16.4 °C during first standard week of January to 46.6 °C during 21st SMW of 2011. Though the daily maximum temperature ranged from 16.4 to 46.6°C during the year. The extremes of average minimum temperature varied from 3.6 to 30.7 °C during 1st and 25th SMW respectively. The daily minimum temperature ranged between (-) 0.5 to 36.0 °C during the year 2011-2012. The weekly average of maximum and minimum relative humidity ranged from 41.0 to 92.0 and 25.2 to 81.0 percent respectively. The weekly average wind speed ranged from 0.8 to 7.6 km per hours. The sunshine hour's data for monsoon season were also not available. The wind direction varied greatly and there was no specific wind trend during the year. The weekly average pan evaporation ranged from 2.0 to 15.9 mm per day.

Impact of monsoon 2011-12 on Kharif and Rabi Crops in Morena: The weekly average data of maximum and minimum temperatures, sunshine hours, relative humidity, Rainfall (total) and number of rainy days are presented in table -1. During 2011-12 the onset of south west monsoon was in 25th SMW (Last June) which was normal date. The total rainfall received during the month of June, July, August and September was 17.8, 183.2, 258.2, and 128.0, respectively. The total rainfall 587.2 mm was received during the southwest monsoon period as against the normal 701 mm. The timely onset of monsoon followed by continuous rainfall, in general sowing of Kharif crops delayed. Due to unfavorable distribution of rainfall during SWM season, the yield of Kharif crops were not much affected. Early withdrawal of monsoon and deficit rainfall in the later half of the season affected the available soil moisture in root zone. Consequently, the germination of Rabi crops in general and mustard and Toria in particular was affected to a great extent. Due to moisture stress in root zone, the Rabi crops could be sown only under irrigated conditions. The relative humidity was also lower. The weather conditions, however, were not congenial for insects/pets and therefore, most of the crops were free from their infestations. However, toria crop was affected by the painted bug at the time of its germination to the great extent. The control measures were communicated to the farmers through IAAS, bulletins.

Weather condition of Khargone: During the monsoon season 2011-12 the rain received was recorded 855.7 mm up to the month of September 2011 with 41 rainy days. There was normal variation in temperature and relative humidity. There was normal plant growth in all major Kharif crops viz., Cotton, Maize, Sorghum, Pigeonpea, Mungbean, Urdbean, Groundnut and Soybean. Heavy rains in July and August affected the crops temporary in proper drained soil, whereas it was affected seriously in poor drained soil. During Rabi season, there was normal variation in temperature and relative humidity. There was not cloudy weather so crop growth was excellent.

Economic Impact of Agro-met Advisory service in Khargone: The agro-advisory service has been in operation at Khargone centre since September 2006. However agro-advisory service is now being considered as one of the most popular service among the farmers community and also given wide coverage by news papers, TV and All India Radios. Farmers of this locality have started use of it in the decision of their daily important farming

operations like sowing of seeds, monitoring of insect-pest, spraying of insecticides and weedicides, application of protective irrigations, picking of pods of mungbean, harvesting, sun drying of harvested crops etc. They have also used this service in sowing of Rabi crops viz., gram and wheat. Advance information on forthcoming weather condition would be useful in developing effective prevention methods against pest incidence.

Applicability of agro-advisory service is certainly depending on its accuracy and continuity without break and fast communications so as to reach in time to users. Thus all the organizations engaged in Agro-met Advisory service should have coordination, dedication for the benefit of the farmers.

Economic impact of Agro-met Advisory service in Jhabua: The integrated agro-advisory services have been started during 2006 year in Jhabua centre funded by India Meteorological Department, Ministry of Earth Sciences, Government of India, New Delhi. This service is now being considered as one of the most popular services and now it is given wide coverage by media. It is satisfying to see that farmers are now becoming aware of the importance of weather related information which they use in their day – to – day decision for farm operation. Although it is difficult to make an objective assessment of net economic gain from this particular service however, it can be safely assumed that by making use of this service farmers are being benefited directly or indirectly as the bulletins issued by this center is quite comprehensive and covers all aspects of farming e.g. crop production, vegetable production, plant protection, animal and poultry production. Some specific instances when farmers have directly benefited from this service are being discussed below.

1. Onset of Monsoon: Onset of monsoon and subsequent rainfall is of utmost importance for the success of rainfed agriculture of the state. Therefore, importance of reliable and timely information on onset of monsoon cannot be over emphasized. During the last monsoon season onset of monsoon was one week late and farmers were advised accordingly. After onset, there as long gape in rains (26 June to 06 July 2011), which affected the sowing time and vegetative growth of the crop. After that time to time rains were received. During the sowing time of the crop long dry spell and according to dry condition those farmers sown their crop during the time of monsoon coming were conserved soil moisture, life saving irrigation and other agronomical practices as per recommendation and secured there crops and good production was taken. The monsoon was gone on 20 September 2011 to Jhabua district. Therefore the late varieties of crops affected due to the moisture stress and agromet advisory given according advise to the farmers to given irrigation due to the dough/ grain filling stage of the crop. All this information played an important role in scheduling farm operations. The bulletins also contained the contingent plans prepared by this research station for delayed sowing because incessant rains delayed the sowing and also crop failure due to long dry spel of rainfall. Based on the weather conditions suitable crops and varieties were advised to the farmers. Timely advised was provided to farmers to control semi looper and girdle beetle in soybean, shoot borer in maize and to control boll worm and sucking pest in cotton.

2. Winter Rains and Prospects of Rabi Crops: Winter rains have serious consequences for crop production in this region. In general, winter rains are beneficial for the rabi crops as the most of area is rainfed. However, it also increases the chances of insect-pest and diseases attack in rabi crops. In this season winter rains was not received and farmers were advised to take appropriate steps to make best use of available water sources and preventive measures for occurrence of insect-pest and diseases and also to protect crops against frost condition.

3. Animal and Poultry Production: Farmers were advised from time to time to take preventive measures for animal diseases. Vaccination for important animal diseases was also advised to protect the animals from diseases. Poultry production is also very sensitive to weather conditions and loss of production was minimized by taking appropriate measures.

The economic impact was estimated in contract farmers field are given below:

- Contract farmers have adopted the instructions from advisory (10.06.11 to 05.07.2011) and sown their crops when sufficient moisture was in field due to rainfall and crops germination was good and crops were not affected by moisture stress condition and re-sowing condition.
- Contact farmers have adopted the instructions from advisory (29.07 and 2.08.2011) and timely controlled the attack of stem borer in maize. Use of Phorat 10G @ 2-3 granules per foliage. He has got 10.2% more yield of maize. Expenditure on use of Phorat Rs. 760/- and got increased return of Rs. 2096/ ha.
- Contact farmers have adopted the instructions from advisory (29.07 and 2.08.2011) and timely controlled the attack of semi-looper / tobacco caterpillar in soybean use Trizophos 40 E.C. @ 2.0 ml/l twice at 15 days interval. He has got 11.5% more yield of soybean. Expenditure on use of Trizophos Rs. 1600/- and got increased return of Rs. 3092/ ha.
- Contact farmers have adopted the instructions from advisory (26.08.2011) and timely controlled the attack of sucking pest i.e. jassid, aphid, white fly in cotton by spraying thiomithoxam @ 0.3 g/l twice at 15 days interval. He has got 10.3% more yield of cotton. Expenditure on two sprays was Rs. 2500/- and got increased return of Rs. 3804/ ha.
- Contact farmers have adopted the instructions from advisory (06.09.2011) and timely control the attack of tobacco caterpillar in urd by use of Trizophos 40 E.C. @ 2.0 ml/l twice at 15 days interval. He has got 10.6% more yield of soybean. Expenditure on spray was Rs. 1700/- and got increased return of Rs. 2960/ ha.

Contact farmers have adopted the instructions from advisory (20.12.2011) and timely control the attack of heliothis in gram by use of quinolphos 25 EC @ 1.5 l/ha twice at 15 days interval. He has got 11.3% more yield of gram. Expenditure on spray was Rs. 1800/- and got increased return of Rs. 2404/ ha.

25. Other projects:

There are following other projects are also in operation, to solve the location specific problems of the farmers.

S.No.	Projctcs	Number
1.	Number of “Plan Projects”	07
2.	Number of “Non Plan Projects”	12
3.	Number of “Tribal Sub plan Projects”	13

➤ **ACHIEVEMENTS:**

1. New varieties developed and released:

The following varieties of wheat and chickpea were released and notified for general cultivation by Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops, which has appeared in the gazette of India, No. 408 dated 16.03.2012.

<p>Name of variety Pedigree Salient characters Average yield Recommended ecology Notification no.</p>	<p>Wheat - RVW 4106 CHIBIA x PRL 11 x CM 65531 It matures in 105-110 days. It is resistant to black and brown rusts. 5035 kg/ha Recommended for late sown irrigated conditions of M.P. SO 456(E) 16.03.12</p>	
<p>Name of variety Pedigree Salient characters Average yield Recommended ecology Notification no.</p>	<p>Chickpea - RVKG 101 ICCV 2 x BG 256 Large seeded variety having average seed size of 40.6 g/100 seed. It is also early in maturity (109 days) 1500-1800 kg/ha Recommended for timely sown irrigated <i>kabuli</i> growing areas of M.P. SO 456 (E) 16.03.12</p>	
<p>Name of variety Pedigree Salient characters Average yield Recommended ecology Notification no.</p>	<p>Chickpea - RVG 201 PG 5 x Bheema It is an early maturing (101 days) and large seeded <i>desi</i> chickpea variety, which showed resistance to <i>Fusarium</i> wilt, moderately resistant to dry root rot and tolerant to <i>Helicoverpa armigera</i> 2000-2500 kg/ha Recommended for timely sown rainfed conditions in sequential cropping system SO 456(E) 16.03.12</p>	

2. Technologies generated:

A. Production technologies

Chickpea:

- **Seed treatment with micro nutrient:** Application of ammonium molybdate @ 1.0 g/kg seed as seed treatment along with *Rhizobium* +PSB which was found effective and remunerative giving an additional yield and a net return of Rs. 7098/ha over control.

Hence, this technology was recommended wherever soil is deficient in molybdenum for obtaining higher yields of chickpea. This technology has got wide popularity among the farmers of the state particularly in soybean – chickpea cropping system.

- **Biofertilizer application:** Application of *Rhizobium* + PSB as seed treatment along with Ammonium molybdate @1g/kg seed gave 26.7% higher chickpea yield under multi location trials in research farms and 25 to 34.8% higher yield at farmer's fields in M.P
- **New strain of *Rhizobium*:** New *Rhizobium* strain RVSGRS 114 found to produce 15.9% higher yield and enhance uptake of N by 20 kg/ha over control in chickpea.
- **Chickpea based cropping system:** Cultivation of soybean in *kharif* followed by wheat (I year) - chickpea (II year) was identified as best cropping system in medium black vertisols. Application of RDF (20:17:20:20 NPKS kg/ha) recorded significantly higher seed yield (2149 kg/ ha) as compared to vermi compost @ 2 t/ ha + biofertilizer (1867 kg/ ha). Thus, soybean followed by wheat (I year) and chickpea (II year) cropping system with RDF in chickpea is recommended for general cultivation.



Black gram:

- **Integrated weed management:** Pre-emergence application of pendimethalin 30 EC + imazethapyr 2 EC @ 0.75 kg/ha found effective in reducing the intensity of monocot and dicot weeds and recorded significantly superior seed yield of 1222 kg/ha over control (600 kg/ha) in black gram.

Sesame

- **Integrated weed management:** In sesame, application of pre and post emergence weedicides effectively reduced the population and dry weight of weeds over weedy check. The lowest weed density and weed dry weight was observed in the weed free treatment i.e. two hand weeding at 15 and 30 days after sowing followed by quizalofop ethyl @ 0.05 kg/ha as early post emergence application with one hand weeding at 30 days after sowing. Application of trifluralin @ 0.75 kg/ha as PPI and pendimethalin @ 0.75 kg/ha as PE with one hand weeding at 30 DAS in both reduces the weed intensity effectively. Maximum net return of Rs. 15079 /ha was noted in weed free situation with B:C ratio of 2.13 followed by quizalofop ethyl 0.05 kg/ha POE (Rs 10273 /ha net return and 2.15 BCR) and quizalofop ethyl 0.05 kg/ha POE + one hand weeding (Rs. 11734/ ha net return and 2.02 BCR).

Sorghum

- **Integrated weed management:** Application of pendimethalin @ 0.50 kg a.i./ ha with one hand weeding at 30 DAS and application of atrazine @ 0.25 kg + pendimethalin @ 0.50 kg a.i. as pre-emergence + 2,4D 0.50 kg a.i./ha as post emergence were found effective weed management practices for sorghum.

Soybean

- **Integrated weed and nutrient management in soybean-wheat:** IWM +RDF recorded highest yield in soybean crop while, IPNM gave maximum yield in wheat. Highest wheat equivalent yield was noted in IPNM (Rs 4866 kg/ha). The net monetary return (Rs 36545) and benefit cost ratio (2.21) were observed highest in IWM + RDF in comparison to other tested four modules.
- **Irrigation scheduling and zinc application in soybean- mustard cropping sequence:** The highest seed yield of soybean (18.17 q/ha), production efficiency (20.19kg/ha/day), net returns (Rs. 41917kg/ha/day) and B: C ratio (4.17) was registered with the 100% RDF. The mean response due to 100% RDF was 27.86% and 16.29% in seed yield over 50% and 75% RDF, respectively while in mustard the maximum WUE (122.6 kg/ha-cm), production efficiency (16.19 kg/ ha/ day), seed yield (21.05q/ha) net returns (Rs. 51085/ha) and B:C ratio (4.82) was recorded under irrigation applied at 40 and 70 DAS along.

Wheat

- **Nutrient management:** Fertilizers response in irrigated and rainfed wheat varied considerably. In irrigated conditions, GW 173 recorded the highest grain yield of 5600 kg/ha at 150:60:40 kg NPK /ha while, HI 1531 (2990 kg/ha), HW 2004 (2940 kg/ha), HI 1500 (3037 kg/ha) and MP 3288 (2982 kg/ha) showed optimum yield at 60:30 kg NP/ha under rainfed conditions.

Cotton

- **Effect of mulching** Mulching of green weeds biomass @ 6 t/ ha at 35 DAS was found suitable and recorded 20.9% higher yields than no mulch. Green weed biomass as mulch also noted significantly 17.7% higher moisture content over no mulch crop in cotton.

Cluster bean

- **Irrigation and fertilizer management in cluster bean-wheat cropping sequence:** The highest seed yield (23.73q/ha), production efficiency (17.08kg/ha/day) net returns (Rs. 26350/ha) and B: C ratio (3.20) of cluster bean (Guar) was obtained with the application of 50% RDF + 5 tonnes FYM + 2.5 tonnes vermi compost/ha while, irrigation applied at CRI, tillering, booting and milk stage produced significantly higher grain yield of wheat (4374 kg/ha) and production efficiency (34.90 kg/ ha/ day) in wheat. However maximum WUE (144.2 kg/ha-cm) was recorded with 3 irrigations applied at CRI, booting and milk stage.

Pigeonpea

- **Maintenance of CMS and restorer lines:** Twenty CMS lines namely, GT 33 A, GT 288 A, GT 289 A, ICPA 2039, ICPA 2042, ICPA 2043, ICPA 2046, ICPA 2047, ICPA 2048, ICPA 2050, ICPA 2052, ICPA 2078, ICPA 2079, ICPA 2086, ICPA 2089, ICPA 2092, ICPA 2098, JPA 1, JPA 2, JPA 3 and twenty restorers namely ICPR 3462, ICPR 3464, ICPR 2740, ICPR 3477, ICPR 3491, ICPR 3461, ICPR 3462, ICPR 3471, ICPR 3473,

ICPR 3341, ICPR 3472, ICPR 3340, ICPR 3359, ICPR 3394, ICPR 3497, ICPR 3933, ICPR 3381, ICPR 2438, ICPR 3337, ICPR 2751 are being maintained at AICRP on Pigeonpea, Sehore. The CMS lines are being used to develop new hybrids as well as to transfer MS cytoplasm to better agronomic base. The fertility restorers are being maintained to test their fertility restoring availability with presently available CMS lines.

Lentil

- **Identification of heat tolerant lentil genotypes:** Two hundred eighty nine lentil accessions were tested for identification of heat tolerant lines under DAC-ICARDA-ICAR research programme. Accession IG 5080 followed by IG 3327 produced maximum number of total pods and filled pods per plant and recorded the highest yield of 11.75 g/plant. The high yielding genotypes viz., IG 3221, IG 3120 and IG 3196 were also early in maturity (103 days). The ratio of filled pods to total number of pods per plant was in between 0.83 to 0.95 in these heat tolerant genotypes.
- **Large seeded lentil exotic germplasm identified:** Among 289 heat tolerant germplasms tested under DAC-ICARDA-ICAR programme, the ICARDA germplasm 45113 and 45101 exhibited extra large seed (4.95 and 4.57 g/100 seed). Similarly 45101 and 45107 matures about eight days earlier than recommended variety GL 3. The promising germplasm were identified for early maturity (IG 5127, 4195, 4709, 5072, 5073, 5099 and 5091), large seed size (IG 4242, 45107, 4078, 45112, 4247, 45117, 4060 and 4253) and high yield (IG 3831, 5115, 4059, 3882, 5093, 4693, 45198, 45102 and 42216). The germplasm IG 45107, 45101, 5080, 3327, 5090 and 5127 have been crossed with adopted variety JL 3 in order to generate the recombinant for earliness, large seed size and high yield.

Dryland Agriculture

- **Catchments–Storage Command Relationship for enhancing water productivity in micro –watershed:** The study on Catchments – Storage Command Relationship for enhancing water productivity in micro –watershed revealed that the net return of Rs. 6650ha⁻¹ (B: C ratio 1.27) per ha was recorded by sweet corn-green cobs, followed by Tomato Rs.55370ha⁻¹ with B: C ratio 2.23 planted after sweet corn. Whereas, soybean recorded net return of Rs.22017ha⁻¹ (2.69 B: C ratio) in *Kharif*. Similarly, in *Rabi*, potato crop gained Rs. (-) 25383ha⁻¹ net return. The net return of Rs.17807ha⁻¹ was recorded by Chickpea with B: C ratio of 2.62 grown after soybean. The vegetables viz., Bottle gourd (30 plants), sponge gourd (12 plants), bitter gourd (40 plants) and Sem (*Dolicus lablab*) (10 plants) were planted on the bunds of farm tank whose perimeter is of 160 m and the income thus, generated was of Rs.5661.
- **Effects of rainfall on resource losses and crop productivity:** Study on the effects of rainfall on resource losses and crop productivity of soil with the objective to assess the effects of runoff, soil and nutrient losses with rainfall pattern on erosive index at Indore revealed that the Kinetic energy of rainfall is highest in the month of July (294.64 m t ha⁻¹ cm⁻¹), followed by August (292.23 m t ha⁻¹ cm⁻¹) and September (269.74 m t ha⁻¹ cm⁻¹). July seems to be the most erosive month as it has recorded highest Erosion Index of 24.20 followed by the month of August (20.84) for Indore.

- Evaluation of cropping system in delayed sowing under Rainfed Semi Arid condition in Vertisols:** Among different intercropping systems evaluated in delayed sowing conditions shows that maximum and significantly higher Moong equivalent yield of 1208 kg ha⁻¹, RWUE of 0.66 kg ha⁻¹mm⁻¹ with a net income of Rs.28611ha⁻¹ and B: C ratio of 2.75 were attained by Sunflower with 20% higher seed rate, followed by Sunflower with normal seed rate gave a Moong equivalent yield of 1107 kg ha⁻¹, RWUE of 0.53 kg ha⁻¹mm⁻¹ with a net income of Rs.21707ha⁻¹ and B: C ratio of 2.17. The *Sesamum* with 20% higher seed rate system gave the lowest Moong equivalent yield of 272 kg ha⁻¹, RWUE of 0.34 kg ha⁻¹ mm⁻¹ with net income of Rs. 11898 ha⁻¹ and B C ratio of 1.40 in the season.
- Evaluation of non-traditional crops in changing weather conditions in rainfed Vertisols of Malwa Plateau of western M.P.:** In an experiment on contingent crop planning, seven *Kharif* / late *Kharif* crops viz., Sweet corn (for green cob, variety-Sugar Queen), Corn (for seed variety-NK 6240), Clusterbean or *Guar* (H - 563), Soybean (JS 93-05), Mothbean (Local), Horsegram or *Kulthi* (Local) were planted to identify the suitable and remunerative *Kharif* crop as an alternative of soybean at Indore. The maximum net returns of Rs. 57244ha⁻¹ was recorded by Maize variety NK 6240 with B:C ratio 5.40, followed by Sweet Corn (Sugar queen) grown for green cob with net return of Rs.30956ha⁻¹ and B: C ratio of 3.38
- Long Term Manurial Trial in Vertisols:** In a permanent manurial trial of soybean – Chickpea cropping sequence with 9 treatments of N and P at Indore, FYM @ 6 tha⁻¹+ 20 kg N + 13 kg P₂O₅ ha⁻¹ was superior with maximum soybean yield 1992 kg ha⁻¹, RWUE of 1.40 kg ha⁻¹mm⁻¹, net income of Rs.36241 ha⁻¹ and B: C ratio of 2.75 in the *Kharif* season and 1372 kg ha⁻¹ of yield, RWUE of 0.96 kg ha⁻¹mm⁻¹, net returns of Rs.44594 ha⁻¹ with B: C ratio of 5.34 from Chickpea in the *Rabi* season. In both *Kharif* and *Rabi* seasons, the control gave lowest yield, RWUE, net returns and B: C ratio of both the crops in the sequence.
- Studies on effect of organics, chemical and integrated nutrient management on the soil and crop quality:** Resource Conservation and Improving Soil Quality by low- till and organic farming strategies for *Malwa* region at Indore were studied in an experiment and the treatment comprising application of organics along with 50% RDF gave the highest seed yield (1519kg ha⁻¹) followed by 100% organics application (1403 kg ha⁻¹), RDF (1368 kg ha⁻¹), these treatments were at par with each other and gave significantly higher yield as compared to control where no fertilizer was applied. Economic analysis revealed that there was a significant difference in the net return and B: C ratio due to different treatments.
- Studies for efficient management of micronutrient application for soybean-chickpea sequence crops:** In a study on efficient management of micronutrient application revealed that among Mo, Zn, B, Fe (applied in soil and sprayed as foliar), data revealed that application of two spray of Mo (Foliar) @ 0.1% with recommended dose of fertilizer (T3) gave highest seed yield during both the seasons (Soybean 1675 kg ha⁻¹ and Chickpea 982 kg ha⁻¹) and total net return of Rs.69364ha⁻¹ with B: C ratio of 3.89, followed by treatment Mo (Soil Application) 0.5 kg ha⁻¹ (Amm. Molybdate as basal dose) with recommended dose of fertilizer as recorded seed yield of soybean 1625 & chickpea 952

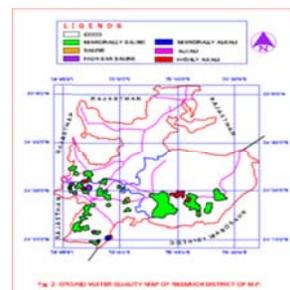
kg ha⁻¹ with B:C ratio of 3.67. The yield differences of all the treatments were at par but significantly superior to control and farmers' practices. Control gave the lowest yield of 769 and 451 kg ha⁻¹ of soybean and chickpea, respectively with net returns of Rs.28722ha⁻¹ and B:C ratio 2.60.

- **Study on effectiveness and compatibility of different agro-chemicals on yield of Soybean – Chickpea cropping system in Malwa region:** The study on effectiveness and compatibility of different agro-chemicals on yield of Soybean – Chickpea cropping system in *Malwa* region was carried out at Indore. The treatment RDF (20:60:20:20 NPKS ha⁻¹) recorded highest seed yield of 1964 kg ha⁻¹, 1.37 kg ha⁻¹ mm⁻¹ RWUE, Rs. 35702 ha⁻¹ net return and 3.66 B:C ratio followed by 19:19:19 NPK + Cypermethrin @500 ml ha⁻¹ at 30 & 45 DAS (1811 kg ha⁻¹, 1.27 kg ha⁻¹ mm⁻¹ RWUE, Rs. 33056 ha⁻¹ net return and 3.70 B:C ratio) and Basal 50 % RDF + sprays of 19:19:19 NPK at 30 DAS (1823 kg ha⁻¹, 1.28 kg ha⁻¹ mm⁻¹ RWUE, Rs. 32977 ha⁻¹ net return and 3.62 B:C ratio) as compared to control (1329 kg ha⁻¹, 0.93 kg ha⁻¹ mm⁻¹ RWUE, Rs. 22221 ha⁻¹ net return and 3.02 B:C ratio)
- **Effect of organic and inorganic fertilizer on productivity of sweet corn cob productivity under dry land conditions in Vertisols:** In an experiment to study the effects of organic manures and fertilizers on cob productivity of sweet corn for high monetary returns under dryland *Vertisol* conditions of *Malwa* region revealed that FYM 12 t ha⁻¹ gave the highest green cob yield of 8827 kg ha⁻¹, RWUE of 5.90 kg ha⁻¹ mm⁻¹ with net income of Rs.62338ha⁻¹ and B:C ratio of 3.40 followed by Vermicompost 5 t ha⁻¹ + 50% RDF (60: 30: 30 N P K kg ha⁻¹),RDF (60: 30: 30 N P K kg ha⁻¹) (green cob yield of 8519 kg ha⁻¹, RWUE of 5.77 kg ha⁻¹ mm⁻¹ with net income of Rs.50288 ha⁻¹ and B:C ratio of 2.44) and (green cob yield of 8333 kg ha⁻¹, with net income of Rs.58353 ha⁻¹ and B:C ratio of 2.44) , respectively. The least green cob yield of 5617 kg ha⁻¹, RWUE of 3.89 kg ha⁻¹ mm⁻¹ with net income of Rs.36236ha⁻¹ and B:C ratio of 2.82 was

Salt Affected Soil and Water Management

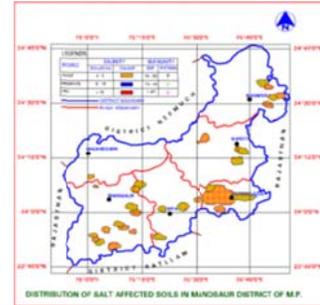
- **Drip fertigation with marginally saline water in horticultural crops:** Drip fertigation with marginally saline well water is feasible and economically viable for cost intensive cultivation of horticultural crops in *Vertisols* under sub-tropic semi-arid climate. Drip fertigation with marginally saline water (EC value 0.92 and 1.15 dS/m) showed salt accumulation in irrigated area around drippers as number of irrigation applied progresses. The salt accumulation can be duly taken care of by simply practicing one surface irrigation after a period of 75-90 days or may be by Monsoon rain in natural course.
- **Survey and characterization of underground irrigation water:**

A ground water survey of the Neemuch district was conducted by Salt Affected Soils Project, College of Agriculture, Indore during 2010-11. Four hundred five ground water samples were collected from different villages of the district. Out of these 405 samples, 294 (72.6 %), 98 (24.2 %), 02 (0.5 %), 03 (0.7 %), 02 (0.5 %) and 06 (1.5 %) belongs to category 'A', 'B₁', 'B₂', 'B₃', 'C₁' and C₃' respectively. A ground water quality map was generated by



the use of water quality data obtained from the laboratory analysis, ground truth and geographical situation of the sampling sites. The map was prepared with the help of remote sensing and GIS soft ware (ERDAS IMAGINE 8.7) belongs to category.

- Characterization and delineation of typical profiles of salt affected soils:** A salt affected soils map was prepared using data of soil analysis, features identified showing salinity/ sodicity problem on digital satellite data of Resourcesat-1 LISS-III through visual interpretation of the digital image using Remote Sensing Software (ERDAS IMAGINE 8.7) and ground truth. Geographical position of the identified points was recorded using RS software and soil samples were also collected from identified points with the help of GPS for ground truthing. During the traversing of the area, soil samples were also collected from locations other than identified one, showing salinity/ alkalinity problem and there GPS points were recorded. On the basis of degree of salinity and alkalinity, the soils were classified and map of the district was generated. According to salinity and alkalinity hazards, the soil was classified in to three different categories of salinity (slight (EC_e 4-8 dS/m), moderate (EC_e 8-15 dS/m) and high ($EC_e > 15$ dS/m) and alkalinity (slight (ESP 15-25), moderate (ESP 25-40) and high, (ESP > 40)). Most of the salt affected area come under the category of slightly saline and highly alkali (7854 ha) followed by slightly saline and moderately alkali (7006 ha) and slightly saline and slightly alkali (577 ha). The total area of salt affected soils in Mandsaur district is 15437 ha.



- Efficient use of rainwater for high returns:** Study on cultivating crop utilizing stored runoff water during winter season indicate that highest net return of Rs 86358 /ha was obtained through cultivation of potato with productivity of 16420 kg /ha, followed by Rs 35423 /ha from tomato with productivity of 10053 kg/ha and Rs 19782 /ha from chickpea with productivity of 1399 kg/ha. The maximum B: C ratio of 2.92 was also obtained with Potato crop.



- Rainwater harvesting:** About 40-60 % of the rain water lost as runoff during high intensity rain fall. With a view to collect this runoff water in the water harvesting tank at suitable site, a pond (40m x 23m x 4.3m)) was excavated at farmers field with farmers' participation in Nignoti (District –Indore) village adopted under NICRA project . The pond have the capacity to store about 3000 cubic meter water which can be utilized for life saving irrigation to *Kharif* and *Rabi* crops.

- Relative efficacy of distillery and sugar industry waste on reclamation and crop production in sodic vertisols:** Six treatments (T₂ - Gypsum @ 75 % GR, T₃ - Raw Spent Wash (RSW) @ 5 lakh L/ha, T₄ - Lagoon Sludge (LS) @ 10 t/ha, T₅ - Press Mud (PM) @ 5 t/ha, T₆ - Lagoon Sludge (LS) 5 t/ha + Raw Spent Wash (RSW) @ 2.5 lakh L/ha and T₇ - Press Mud (PM) @ 2.5 t/ha + Raw Spent Wash (RSW) @ 2.5 lakh L/ha) and one control were tested to know the efficacy of distillery and sugar industry waste on reclamation and production in sodic vertisols. In rice (cv CSR 30) – wheat (cv HI 1077) cropping sequence, the kharif season study indicates significant increase in tillers per hill, plant height, panicle length, grain and stover yield of rice due to application of amendments over control. Application of LS 5 t/ha + RSW @ 2.5 lakh L/ha significantly increased the plant height, grain and stover yield of paddy as compared to gypsum @ 75 % GR as well as LS @ 10 t/ha and PM @ 5 t/ha application. Highest number of tillers per hill (28.4), plant height (127.1 cm), length of panicle (23.4 cm), grain (2.44 t/ha) and stover (7.33 t/ha) yield was recorded in case of LS 5 t/ha + RSW @ 2.5 lakh L/ha application. While in rabi season, the grain and straw yield of wheat increased significantly due to application of amendments over control. Application of LS 5 t/ha + RSW @ 2.5 lakh L/ha was found significantly advantageous as compared to gypsum @ 75 % GR as well as LS @ 10 t/ha and PM @ 5 t/ha application with highest grain (3.77 t/ha) and straw (4.17 t/ha) yields.
- Performance of soybean and wheat under partially reclaimed Sodic Vertisols:** An experiment was conducted at SRF, Barwaha with nine treatments viz. Control, FYM @ 5 t ha⁻¹, Vermi-compost @ 5 t ha⁻¹, GR @ 75 %, GR @ 75 % + FYM @ 5 t ha⁻¹, GR @ 75 % + Vermi-compost @ 5 t ha⁻¹, Spent wash @ 2.5 cm (2.5 lakh L ha⁻¹), Spent wash @ 5 cm (5 lakh L ha⁻¹) and Spent wash @ 10 cm (10 lakh L ha⁻¹) for three years. The soybean and wheat crops were raised under same plot after three years, without any treatment. Recommended doses of nutrients were given as per the recommendations for sodic soils. The highest grain yield (3.55 t/ha) and straw (4.07 t/ha) of wheat was recorded in 10.0 cm spent wash level but it was statistically at par with 5.0 cm. The application of 5.0 cm spent wash enhanced the grain and straw yield by 63 and 62 per cent, respectively over gypsum treated plots.
- In *Kharif*, 2011, the pre-monsoon showers of 63.2 mm in five days during 22, 23 and 24 SMW and the monsoon rains commenced in 25th SMW which was normal scheduled period and remains continued till 37th SMW. During this period 1493.8 mm rains received in 48 days. The monsoon terminated in the second week of September. The total rainfall of 1584.4 mm in 56 days was recorded during the year 2011-12 *i.e.*, 14 SMW (2-8 April 2011) to 13 SMW (26 March - 1 April 2012). Four events of occurrence of frost were observed that are on 14th, 15th, 22nd January and 9th February 2012.
- Ground water Survey:** A ground water survey of the Itarasi, Hoshangabad, Babai and Shivni Malwa tehsils of Hoshangabad district was conducted by Salt Affected Soils Project, College of Agriculture, Indore during 2011-12. Three hundred seventy two ground water samples were collected from different villages of the district. Out of these 372 samples, 356 (95.7 %) belongs to good quality (A), 13 (3.49 %) belong to marginally saline (B₁), 01 (0.27 %) belongs to high SAR saline (B₃), 02 (0.54 %) belongs to marginally alkali (C₁) categories.

B. Protection technologies:

a. Disease management

Chickpea

- **New *Fusarium* wilt resistant genotypes:** Desi chickpea genotypes namely, IPC 2005-79, JG 923974, IC 552241, GJG 0920, IPC 09-160, IPCK 09-85, Phule 0302-7, JG 14 and IPC 2006-84 were identified as resistant to *Fusarium* wilt in sick plots. Similarly, RVSSG 11, CSJK 54 and IPC 06-143 have been identified as resistant source of *Fusarium* wilt in *kabuli* chickpea.
- **Disease management:** Seed Treatment with *Trichoderma harzianum* + Vitavax Power (4:1) were found effective in reducing wilt and root rot diseases of chickpea.

Pearl millet

- **Disease resistant hybrids:** Under artificial inoculation, none of the tested genotype of pearl millet was found free from the smut but MH 1740, MH 1755 and 1756 showed least incidence of 1%. The genotypes MH 1754, 1727, 1721, 1762, 1737, 1746, 1733, 1720, 1716, 1717, 1708 and 1703 exhibited less than 5% incidence of smut.

Mustard

- **Disease management:** For the control of white rust and sclerotinia rot of mustard, the seed treatment with Metalaxyl @ 6 g/kg seed found effective against white rust while, seed treatment with carbendazim @ 1 g/kg seed followed by spraying of carbendazim @ 0.5 g/l of water at 50 DAS was quite effective against Sclerotinia rot. The incidence of Alternaria blight and white rust be control by the seed treatment with Metalaxyl (Apron 35 SD) 6 g/kg seed and 1st foliar spray of Mancozeb @ 2.5 g/l of water at 50 DAS and 2nd spray of Ridomil MZ 72 @ 2 g/l of water at 65 DAS.

Opium poppy

- **Biological management of downy mildew of opium poppy:** *Trichoderma viride* multiplied on maize for 10 days applied as seed dresser @ 10g/kg on opium seed and soil application @ 1:25 kg before sowing (seed row) reduces the downy mildew infection up to 7.37% as compared to 13.81% in untreated plot. Significant differences were also observed on latex, seed and husk yield in the treated plot.

Pigeonpea

- **Wild sources of resistant for *Phytophthora* blight:** Four wild species namely *Cajanus albicans*, *Cajanus platycarpus*, *Cajanus scarabaeoides* and *Rhyncosia bracteata* were evaluated for testing their resistant against *Phytophthora* blight of pigeonpea in sick plot along with susceptible check ICPL 87119. The incidence of *Phytophthora* blight was ranged between 0.0 to 66.08%. *Cajanus platycarpus* was found immune to the *Phytophthora* blight while, *Rhyncosia bracteata* showed resistance with 7.14% incidence. *Cajanus albicans* and *Cajanus platycarpus* showed moderate degree of resistance against it. Thus, these can be used as wild source of resistant against *Phytophthora* blight in pigeonpea.

b. Insect Pests management

Soybean

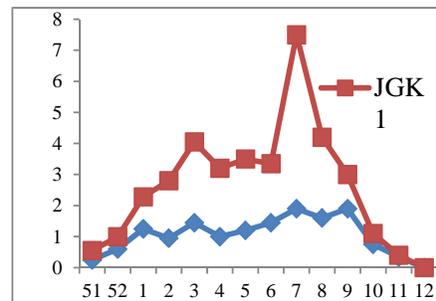
- **Newer insecticide:** Metaflumizone 22% SC @ 600 ml/ha and Flubendamide 48 SC @ 600 ml/ha were found effective against lepidopterous defoliations like green and grey semi loopers in soybean.
- **Stem fly resistant genotypes:** Soybean genotypes, DSb 16 and MACS 1140 were identified as source of resistance against stem fly, *Melangromyza sojae* while, MACS 1039, MACS 1140, MACS 1281 and NRC 80 were found resistance against major pest complex of soybean.

Sorghum

- **Shoot pest tolerant genotypes:** Sorghum entries were tested for tolerance to shoot pests in timely and late sown conditions. The entries 1035, 1018, 1019, 1016, 1039, 1065, 1037, 2024, 2010, 2047, 3008, 3007, 3005, 3023, 3025, 4045, 3043, 3051, 3002, 4017, 2205, 4049, 4003 and 4045 showed moderate tolerance against shoot pests in timely sown condition whereas; 1007, 1065, 1067, 2048, 2042, 2047, 2045, 3004, 3024, 4012, 4003, 4008, 4020, 2205 and 4070 showed moderate tolerance against shoot pests in late sown condition. Among ICRISAT entries, IS18579, IS1104, IS5604, and ICSB486 found better for their reaction to shoot fly.
- **Integrated pest management:** The level of shoot fly incidence was 24 to 80% in late sown crop. While, stem borer infestation observed at moderate level i.e., 15-39 percent. Seed treatment with thiomethxam70 WP followed by spray of lambdacyhalothrin 5% EC found the best management of sorghum pests.

Chickpea

- **Susceptibility index of storage pest:** In *desi* chickpea, mean susceptibility index of stored grain pest was low (1.48) and developmental period was high (40.77) as compared to *kabuli* chickpea in which high mean susceptibility index was 4.47 and development period was 30.80.
- **Incidence of *Heliothis armigera*:** The *Kabuli* varieties are more susceptible to pod borer in comparison to *desi* varieties of chickpea. Seasonal incidence of *Heliothis armigera* on chickpea was highest in 7th standard week in *kabuli* variety (8) as compare to *deshi* chickpea (2). The lowest incidence was observed in the 12th standard week in both *kabuli* and *deshi* chickpea varieties.



Mustard

- **Biological control of aphid :** Application of predator *Coccinella septempunctata* @ 5000 beetles/ha minimize the aphid population in mustard and gave higher seed yield. The

other bio-agent *Verticillium lacanii* followed by Neem oil @ 2% also reduce the aphid population below ETL.

3. Research and Extension Gaps:

Chickpea

- ❖ Development of multiple disease resistant varieties for dry root and collar rots are increasing due to soybean – chickpea cropping system.
- ❖ Managing a-biotic stresses like drought and temperature through resistant/tolerant genotypes.
- ❖ Incorporation of stable wilt resistance in Kabuli/Gulabi/Green seeded chickpea.
- ❖ Refinement and standardization of technologies for double cropping system.
- ❖ Standardization of IPNM, IDM, IPM techniques.
- ❖ Forecasting module for *H. armigera*.
- ❖ Replacement of old varieties with newly developed chickpea varieties for rain-fed/irrigated conditions and for late sown conditions.
- ❖ Promotion of use of seed cum fertilizer drill for separate placement of both inputs in field.
- ❖ Development of irrigation resources /facilities
- ❖ Districts with low productivity needs special attention and programme Ujjain, Dhar, Burhanpur, , Guna, Jhabua, ,Khargone, ,Barwani, Ratlam, Mandsaur, and Ashoknagar.
- ❖ Special attention for timely management of gram pod borer (*Helicoverpa*) through available IPM technology.
- ❖ Effective transfer of available production technology urgently needed.
- ❖ Provision of bonus on minimum support price to make Gram competitive to wheat.

Pigeonpea

- ❖ There is a huge gap in research farm productivity, frontline demonstration yield and realized yield in farmer's field. The extension of technology is poor. The knowledge dissemination to farmer's level is very slow because of very low numbers of extension workers. Developmental projects need to be strengthened and extension activities should be elevated.

MULLaRP

- ❖ **Bridging the yield gaps:** Considerable extension gaps exist in realized yield of MULLaRP crops in different districts of Madhya Pradesh.
- ❖ **Harvest the benefits of available potential technologies:** Considerable extension gaps exist in yield recorded at research farm, demonstrations, highest productivity recorded in districts and state average productivity. There is need to bridge this gap through vigorous extension efforts.
- ❖ **Timely supply of critical inputs:** The consumption of critical inputs like seed, fertilizer, bio fertilizer, fungicides and insecticides are very low in MULLaRP crops grown in MP. There is a need to encourage the farmers by extension efforts and timely availability of inputs for their using to harvest the optimum potential harvest.

- ❖ **Area expansion:** Although the area of lentil and fieldpea are increasing but mungbean and uridbean are in hearse position. The varieties available in these crops showed better resistance to YMV in comparison to soybean, the dominating kharif crop, hence the loose area of mung and urid bean can be recovered from soybean by popularizing the recently release varieties of mungbean and uridbean.
- ❖ **Efficient extension:** Being minor pulse crop, the attention extension personal not up to the expectation. The farmers are not aware of the benefits of available technologies. Thus efficient extension activities are warranted for MULLaRP crops.

Safflower

- ❖ Non-traditional crop and lack of marketing:
- ❖ Lack of farmer driven seed multiplication cum distribution Programme:
- ❖ Non-adoption of full package of practices:
- ❖ Non-availability of aphid resistant line/variety:
- ❖ Non-establishment of market for safflower petal:

Sorghum

- ❖ There is gap between the yield of farmer's field and yield of research field.
- ❖ Farmers are prefer to grow soybean on the cost of other crops of the zone viz sorghum etc.
- ❖ High yielding varieties are susceptible to lodging and shoot pests.
- ❖ Farmers are not adopting recommended /improved production technology.
- ❖ Farmers are always preferred to go for chemical pest control as first resort of IPM components.

Cotton

- ❖ 50 FLDs during 2011-12 were conducted with improved production technology at district Jhabua. The improved technology gave on an average 18-40% more yield as compared to farmers' practices.
- ❖ Although since last six years, FLD's on cotton being taken on various aspects like improved technology, IPM, INM and demonstration of implements the farmers have been benefited largely. The cost of seed, insecticides and implements is still not within the reach of poor farmers. These technologies are being spread through the cooperation of Deptt. of Agriculture, NGO's and KVK's. The hindrances are there in the form of movability because of non availability of the vehicle at proper time and also shortage of staff at Deptt. level.

Grape

- ❖ There are no use of application of growth regulator particularly GA3 at the berry development stage of the crops.
- ❖ There is lack of awareness in proper insect pests and diseases management.
- ❖ Lack of knowledge about integrated nutrient management.
- ❖ There is no scheduled for water management.
- ❖ There is no exposure of grape growers.
- ❖ Lack of awareness about time and method of training and pruning of the crop.
- ❖ There is no adoption of post harvest technologies.

Salt Affected Soil

- ❖ Developed technologies for the reclamation of salt affected soil is not being disseminated due to high cost of ameliorating agents (gypsum) particularly in sodic black clay soil as these soils having high CEC which is responsible for high gypsum requirement. Farmer's having such land are financially poor and hence they do not in position to bear the expenses to be incurred on reclamation of such land.

Integrated Farming system

- ❖ The results obtained in the research plots at station do not reach to the field level owing to the lack of communication and knowledge. Further, unavailability of improved implements makes the condition difficult to adopt in the large area.

➤ Future thrusts:

- ❖ Breeding for early maturity, high yield and sustainability with resistance against biotic and abiotic stresses in crops.
- ❖ Safeguarding the available biodiversity and strengthening the application of biotechnological tools and products.
- ❖ Maintenance breeding of seed chain crop varieties, production of nucleus seed, breeder seed, hybrid seed and quality planting materials.
- ❖ Collection, evaluation, characterization, documentation and conservation of spices diversity and their utilization.
- ❖ Strengthening of research on conservation agriculture to protect soil, water and environment pollution.
- ❖ Standardization of integrated crop production and protection techniques for changing/emerging cropping systems involving horticultural and medicinal crops.
- ❖ Standardization and promotion of integrated farming approach for better livelihood security.
- ❖ Molecular characterization and development of crop specific new strains of *Rhizobium* & PSB and promotion of PGPR.
- ❖ Soil health management and bio-farming.
- ❖ Development of forecasting modules for incidence of diseases and pests in changing climatic scenario.
- ❖ Host plant resistance-mechanism and sources, molecular identification of races/variants of major diseases and pests of crops and standardization of IPM techniques
- ❖ Development of pre and post harvest technologies for value addition.
- ❖ Standardization and promotion of collective marketing, and linkage.
- ❖ Preparation of location specific agro-met advisory bulletins.
- ❖ To strengthen the dissemination system of bulletins so as to reach more number of farmers.
- ❖ To develop a portal this enables dissemination of major advisories through sms.
- ❖ To develop a meteorological data base.
- ❖ To study trends in rainfall & temperature of the Zone.
- ❖ Installation of five rain gauges in the Villages.
- ❖ To receive feedback from users.

Transfer of Technology

- ❖ Thirty front line demonstrations were conducted out of these ten on package technology, ten on newly released varieties of pigeonpea, and five each on IPM technology and Rhizobium culture seed treatment in Khargone districts of Madhya Pradesh by AICRP on pigeonpea centre Khargone during the kharif season 2011-12. Front line demonstrations on Package technology showed 28.04 % increase in grain yield of pigeonpea over farmer's practices. High yielding wilt resistant varieties: JKM 7, JKM 189, TJT 501 and ICP 8863 were demonstrated in varieties FLD. New varieties in FLD demonstrated that improved varieties showed 25.88 % increase in grain yield over local varieties. IPM FLD demonstrated that IPM practices showed 19.46 % increase in grain yield of pigeonpea over local practices. FLD on Culture treatment demonstrated that culture seed treatment practices showed 6.76 % increase in grain yield of pigeonpea over local practices.
- ❖ Thirty (30) FLD's on Guar [(five at Gwalior, sixteen at Shivpuri, four at Sheopur and five at Guna Districts of (M.P.)] were successfully carried out on response of recommended package of practices v/s farmer's practices on guar production. The promising and early maturing variety of Guar HG-563 was used in both conditions.
- ❖ On the basis of four districts average results indicated that higher seed yield (1762kg/ha) and net monetary return (Rs.76449/-ha) of Guar was obtained under recommended package of practices, which was 42.10% higher seed yield as compared to farmer's practices. But farmer's practices obtained (1240kg/ha) seed yield and net monetary return (Rs.54003/-ha) of Guar only.
- ❖ The results indicated that recommended package of practices producing more grain yield (1799kg/ha) and net monetary return (Rs.78353/-ha) of Guar under agro climatic conditions of Shivpuri than Gwalior, Sheopur and Guna districts of (M.P.).
- ❖ Results indicated that recommended package of practices gave 45.67, 40.76, 39.28 and 34.93 per cent more seed yield of Guar over farmer's practices in Shivpuri, Sheopur, Guna and Gwalior districts respectively.
- ❖ In all the 10 demonstrations safflower was grown as a second crop after the harvest of soybean crop Variety JS-335, JS-93-05 and JS-9560. The demonstrations were mostly whole package. Safflower variety JSI-97 was grown. All the demonstration in rained condition average yield of safflower was 1287 kg/ha and other crop gram gave the lower grain yield 730 kg/ha. The total return, net return and B.C ratio followed the trend similar to grain yield. The safflower crop gave an average total return of Rs. 36749/ha and B.C. ratio 2.74 compared to other crop chickpea gave the total return Rs 23355/ha and B.C. ratio of 1.82.

- ❖ In Kharif, 2011-12 a total of 120 sorghum demonstrations covering an area of 48 hectare were conducted on improved technology over farmer's practices in Jhabua Shajapur, Khargone and Badwani districts of Madhya Pradesh under Tribal Sub Plan.
- ❖ Over all on mean basis improved practices recorded 47.52% and 35.48 % higher grain and fodder yield over farmer's practices.
- ❖ Conduction of trials on various themes on farmers' fields to enhancing the adoption of dryland technologies viz., judiciously using the harvested rain and runoff water, improved varieties of crops, namely, soybean, sweet cron, maize chickpea *etc.*, planting fruit plants or vegetables on the bunds of farm tanks, use of mulches for *in situ* moisture conservation, integrated nutrient management, strategies of low tillage and *in situ* moisture conservation measures *etc.*
- ❖ Documentation of ITKs like; spraying of mixture of kerosene oil and insecticides for controlling insects pests in soybean, 'Dora' operation for *in situ* moisture conservation and 'Bherni boni' (Broadcasting of maize seeds in soybean fields).
- ❖ Radio and T V talks; 32 TV talks and 17 radio talks on various aspects of dryland technologies were recorded and broad casted time to time.
- ❖ 7 (5 days) and one special (2 days) trainings, awareness programme on 'Climate change and Agriculture' and 'World Water Day – 2012: Water and Food Security' were organized.
- ❖ Review meeting of Sixth QRT for Central and Western region (AICRPDA, AICRPAM and NPCC) and Interactive meeting for *Malwa* Plateau region of M.P.
- ❖ *Kissan Sangoshti'*, field visists, and spot guidance to the farmers.
- ❖ The weekly action plan for the farmers of the region.
- ❖ 05 research papers in the national research journals, 08 bulletins/ book chapters and 05 reports have been published by the scientists of the project.

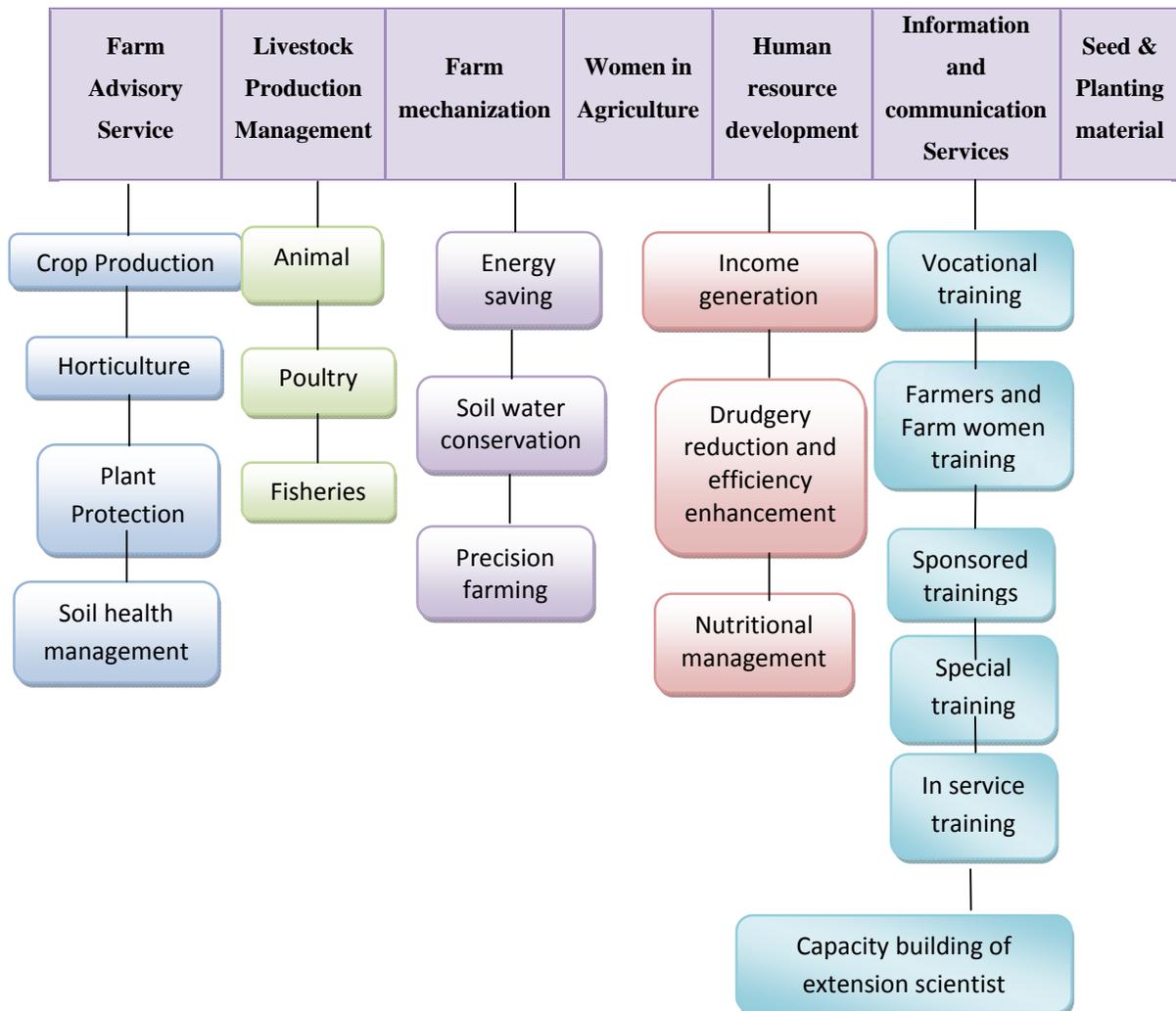
IV. EXTENSION ACTIVITIES:

In order to cater the emerging needs of the farming community, the Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, (RVSKVV) Gwalior was established by the Govt. of Madhya Pradesh in August 2008 having an area jurisdiction of 25 districts of the state. Out of 11 agro-climatic zones of the state, six fall in the area of jurisdiction of RVSKVV, Gwalior. Under these six agro-climatic zones, ICAR has established 24 Krishi Vigyan Kendras (KVKs) out of which, 19 are run by university and 5 by NGOs/ICAR which are functioning under the guidance of Directorate of Extension Services of the University. The Directorate of Extension is committed to serve the farmers through its well organized network which play a vital role in dissemination and transfer of latest technology in agriculture, livestock production and allied fields.

The KVKs are assessing the technological needs of the districts and revalidating the technology for adoption. Systematic work through on farm testing, field demonstrations, on and off campus trainings to farmers and farm women, in-service training to extension workers and vocational training for rural youth are regular activities of the KVKs. Thus, they contribute in minimizing the technological gap between production achieved of various crops by the farming community and production potential of the technologies. The motto of the university is to reach the un-reached through its extension system. The main objectives are:

1. Transfer of technology and its assessment, application, refinement and feedback for the researcher.
2. Up gradation of knowledge and skill of extension functionaries as well as farming community.
3. Development and dissemination of technology through print and electronic media for mass communication.
4. Catering the needs of farming communities through single window system.
5. Linkage with line departments, concerned institutions and NGOs.
6. Reviewing the activities of KVKs and technological backstopping of KVK scientists and help in formulating action plan.
7. Popularization of low draft improved agricultural implements.

1. Services Provided:



2. On Farm Tasting (OFTs)

Total number of technology assessed and on farm trial conducted during 2011-12.

Total number of technology assessed	382
Total number of on farm trial conducted	2490

On Farm Testing for technology assessment and refinement by different KVKs were made under following thematic areas:

Thematic Areas (Crops)	Thematic Areas (Livestock)
Natural Resource Management, Soil Health Management, Cropping Systems, Integrated Farming Systems, Varietal Evaluation, Integrated Pest Management, Integrated Disease Management, Integrated Nutrient Management, Weed Management, Value Addition, Seed Production, Vermicompost, Water Management, Improved Implement, Nursery Management, Income Generation, Drudgery Reduction, Nutritional Kitchen Gardening, Mushroom Cultivation, Kisan Mobile Advisory Service, FIGs, SHGs.	Breed improvement, Health Management, Nutrition Management, Poultry Production, Fisheries.

A total of 382 technologies were assessed on farmer's field at different locations by the 24 KVKs. Thus, the average number of OFTs per KVK was found to be 16. The OFT comprises different thematic areas on crops/ enterprises and livestock. On crops/ enterprises 294 and on livestock/poultry/fisheries 28 OFTs were conducted. The details are given below in table.

Table: Thematic Area wise on farm testing (OFT) on crops/enterprises/Livestock:

S.No.	Thematic Area	No. of OFT's		
		RVSKVV KVKs	KVKs of NGOs/ ICAR	Total
1.	Varietal Evaluation (VE)	79	13	92
2.	Integrated Pest Management (IPM)	32	9	41
3.	Integrated Disease Management (IDM)	21	3	24
4.	Integrated Nutrient Management (INM)	51	11	62
5.	Integrated Crop Management (ICM)	15	5	20
6.	Value addition	7	0	7
7.	Drudgery Reduction (DR)	15	3	18
8.	Integrated Natural Resource Management (INRM)	13	2	15

9.	Live stock	11	11	22
10.	Integrated Weed Management(IWM)	23	1	24
11.	Post Harvest Management (PHM)	2	2	4
12.	Women in Agriculture	2	2	4
13.	Improved implement	12	6	18
14.	Income Generation	8	1	9
15.	Information and Communication Technology	2	1	3
16.	Water Conservation	2	0	2
17.	Vegetable Crops	1	1	2
18.	SHGs	3	1	4
19.	Farmer interest group	3	2	5
20.	Fisheries	3	0	3
21.	Poultry	2	1	3
	Total	307	75	382

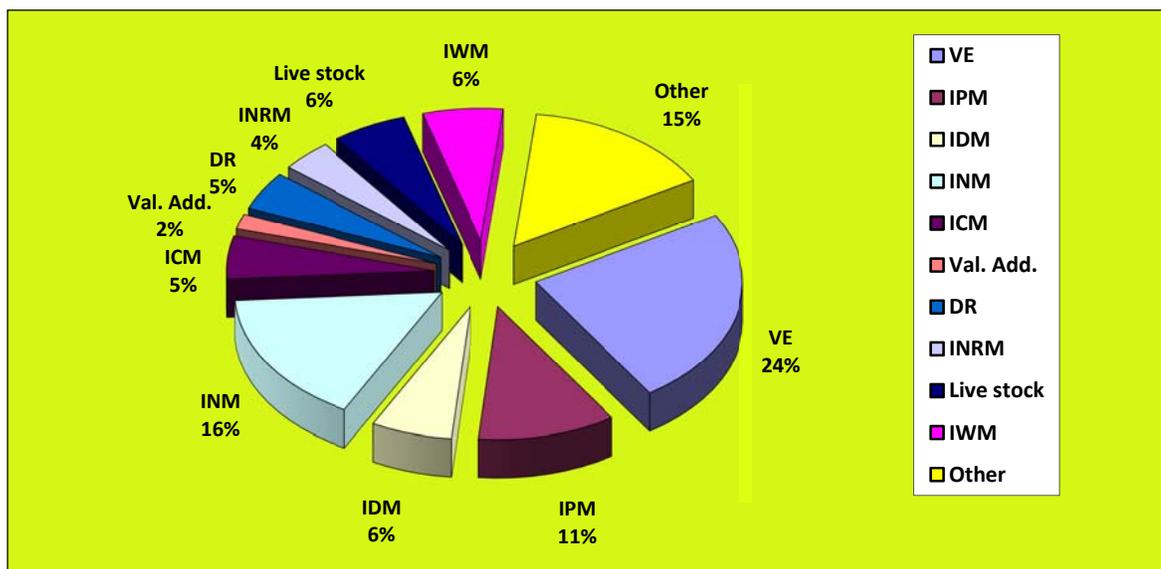


Table: KVK wise number of beneficiaries and technologies assessed:

Name of KVK	No. of Technology Assessed	No. of Beneficiaries
Ashoknagar	12	60
Badwani	15	85
Bhind (Lahar)	13	132
Datia	18	90

Dewas	21	162
Dhar	16	95
Guna (Aron)	20	100
Gwalior	20	130
Jhabua	18	95
Khandwa	20	88
Khargone	15	267
Mandsaur	24	156
Morena	16	97
Neemuch	12	65
Rajgarh	21	105
Shajapur	10	62
Sheopur (Baroda)	12	60
Shivpuri	17	85
Ujjain	7	35
Total	307	1969
NGOs / ICAR		
Bhopal	10	77
Burhanpur	14	84
Indore	13	86
Ratlam	19	165
Sehore	19	109
Total	75	521
G. Total	382	2490

3. Front Line Demonstration (FLDs)

During the reporting year, a total of **7290** FLDs covering an area of **1454.70** ha were conducted at different locations. The FLDs were conducted on oilseeds (802), pulses (1095), cereals (1010), horticulture (563), livestock (113) and other important areas (3634). The details are given in **figure and table**. KVK- wise area/unit and number of beneficiaries under FLDs of different crops/enterprises are shown in Table.

Table : Crop wise Front line demonstrations (FLDs) laidout during 2011-12:

S. No.	Crops/Enterprises	Area (ha)/ No.			No. of FLDs/ Beneficiaries		
		RVSKVV KVKs	ICAR/ NGO KVKs	Total	RVSKVV KVKs	ICAR/ NGO KVKs	Total
1.	Oil seeds	252.3	59.2	311.5	660	142	802
2.	Pulses	368.4	63.8	432.2	944	151	1095
3.	Cereals	294.1	89.75	383.85	783	227	1010
4.	Horticulture	86.75	16	102.75	492	71	563
5.	Income generation	30	-	30	30	-	30
6.	Cotton	16	12	28	40	30	70
7.	Live stock	32	5	37	52	61	113
8.	Fisheries	1.6	-	1.6	4	-	4
9.	Drudgery Reduction	50	12	62	130	22	152
10.	Farm Machinery/ Implements	12.5	18.5	31	45	23	68
11.	KMS	-	-	-	3250	-	3250
12.	Malnutrition	14	0.2	14.2	45	10	55
13.	Vermicompost	2	-	2	5	-	5
	Total	1159.65	276.45	1436.1	6480	737	7217

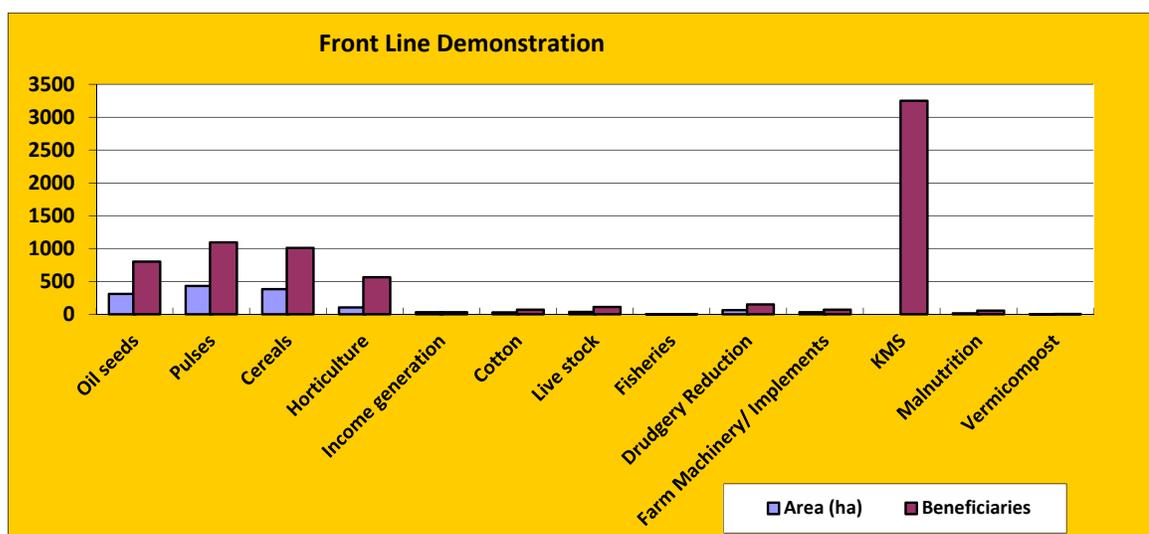


Figure : Area and beneficiaries under FLDs organised on different crops/enterprises

Table : KVK wise details of Front Line Demonstrations (FLDs) laid on Farmers Field:

Name of KVK	Oilseeds		Pulses		Cereals		Horticulture		Drudgery Reduction		Fishries		Cotton		Live stock		Income Generation		Vermicompost		KMA		Mal Nutr.		Farm Mach.		Total		
	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)/No.	No.	Area (ha)	No.	Area (ha)	No.	Unit	No.	Area (ha)	No.	Area (ha)	No.	No.	No.	B	Area (ha)	No.	Area (ha)	No.		
Ashoknagar	23	50	20	34	10	10	-	-	7	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	119
Badwani	14	34	22	54	-	-	10.1	90	20	20	-	-	-	-	5	5	-	-	-	-	-	-	-	7	10	78.1	213		
Bhind (Lahar)	13.4	46	14.4	46	12	65	3	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42.8	187		
Datia	12	35	14	40	16	54	8	40	10	10	-	-	-	-	-	-	-	-	-	-	-	1	5	-	-	61	184		
Dewas	12.4	31	32	80	18.4	46	2.95	41	2	25	1.6	4	-	-	22	22	-	-	-	-	-	2	10	-	-	93.35	259		
Dhar	7	17	12	29	2	5	4	15	3	10	-	-	2	5	-	-	-	-	-	2000	-	-	-	-	-	30	2081		
Guna (Aron)	5	20	14	40	6	15	6	30	-	-	-	-	-	-	2	10	-	-	2	5	-	-	-	-	-	35	120		
Gwalior	19	49	18.4	45	14	42	4	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	55.4	171		
Jhabua	14.4	36	52	134	121.2	303	5	30	-	-	-	-	-	-	2	10	-	-	-	-	-	1	20	-	-	195.6	533		
Khandwa	9	22	9.6	24	8	20	2.2	14	1	5	-	-	14	35	-	-	-	-	-	-	-	-	-	-	-	43.8	120		
Khargone	6	15	16	42	-	-	3.5	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25.5	72		
Mandsaur	18.4	51	13	36	2.4	12	12	60	2	10	-	-	-	-	-	-	-	-	-	-	-	10	10	4.5	30	62.3	209		
Morena	14	36	24	61	4	10	-	-	1	10	-	-	-	-	-	-	30	30	-	-	1250	-	-	-	-	73	1397		
Neemuch	15	36	20	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	84		
Rajgarh	7	20	6	15	12	30	8	28	3	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36	103		
Shajapur	5	12	24	75	5	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5	35	117		
Sheopur (Baroda)	13	34	12	29	7.6	19	2	9	-	-	-	-	-	-	1	5	-	-	-	-	-	-	-	-	-	35.6	96		

Name of KVK	Oilseeds		Pulses		Cereals		Horticulture		Drudgery Reduction		Fishries		Cotton		Live stock		Income Generation		Vermicompost		KMA	Mal Nutr.			Farm Mach.		Total	
	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)/No.	No.	Area (ha)	No.	Area (ha)	No.	Unit	No.	Area (ha)	No.	Area (ha)	No.	No.	No.	B	Area (ha)	No.	Area (ha)	No.	
Shivpuri	14.5	34	24	60	16.5	39	4	10	1	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	148
Ujjain	30.2	82	21	52	39	88	12	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102.2	267	
Bhopal	6.8	17	11.8	27	8.1	19	5.6	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32.3	105	
Burhanpur	11	27	15	37	34	52	5	5	10	10	-	-	12	30	-	-	-	-	-	-	-	-	-	-	-	87	161	
Indore	20	43	10	17	6	25	2	5	-	-	-	-	-	-	3	31	-	-	-	-	-	-	-	-	18.5	23	59.5	144
Ratlam	10	26	10	26	32.25	106	-	-	-	-	-	-	-	-	2	30	-	-	-	-	-	-	-	-	-	54.25	188	
Sehore	11.4	29	17	44	9.4	25	3.4	19	2	12	-	-	-	-	-	-	-	-	-	-	2	10	-	-	43.2	139		
Total	311.5	802	432.2	1095	383.85	1010	102.75	563	62	152	1.6	4	28	70	37	113	30	30	2	5	3250	14.2	55	31	68	1436.1	7217	

4. Trainings

Training has been considered as an important key component for imparting the new skills. Hence, as per need of the farmers and the specific areas, a total of **2326** trainings were organised for the farmers, rural youth, farm women and extension functionaries for updating the knowledge and imparting new skills to the participants. The beneficiaries under farmers and farm women training were **43910**, under in-service **4237**, under vocational **3155** and under sponsored category **7955**. The details are given in **fig.** and **table**.

Table : Training Programmes organized during 2011-12.

S.No.	Type of training	No. of training			No. of beneficiaries		
		RVSKVV KVKs	NGO/ICAR KVKs	Total	RVSKVV KVKs	NGO/ICAR KVKs	Total
1.	Farmers and farm women	1432	343	1775	35721	8189	43910
2.	In service	152	27	179	3443	794	4237
3.	Vocational	107	40	147	2457	695	3155
4.	Sponsored	125	100	225	6218	1737	7955
Total		1816	510	2326	47839	11418	59257

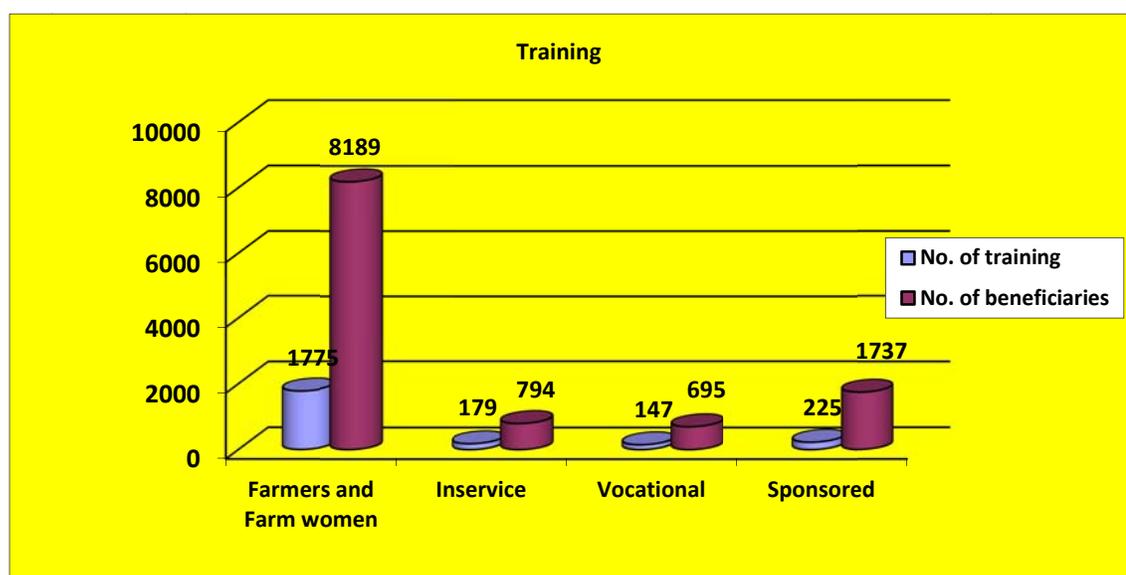


Figure: Training Programmes Organized

Table: KVK wise details of the training programmes organized:

S.No.	Name of KVK	Farmer & farm Women		In Service		Sponsored		Vocational	
		No.	No of Benef.	No.	No of Benef.	No.	No of Benef.	No.	No of Benef.
1.	Ashoknagar	71	1866	6	139	-	-	7	188
2.	Badwani	75	1892	6	200	1	72	9	180
3.	Bhind (Lahar)	49	1143	4	84	9	398	1	26
4.	Datia	63	1625	7	128	3	263	9	222
5.	Dewas	85	1734	4	106	-	-	6	136
6.	Dhar	66	1656	8	159	-	-	5	83
7.	Guna (Aron)	136	2911	22	488	16	441	14	285
8.	Gwalior	77	1879	10	211	30	944	12	312
9.	Jhabua	91	2694	15	419	22	1586	7	154
10.	Khandwa	88	2089	9	190	-	-	-	-
11.	Khargone	59	1534	6	155	5	750	3	73
12.	Mandsaur	70	1777	7	163	-	-	3	59
13.	Morena	59	1593	6	199	14	691	6	221
14.	Neemuch	66	1656	8	159	5	248	5	83
15.	Rajgarh	75	2248	5	109	10	440	4	98
16.	Shajapur	75	2197	8	186	-	-	9	200
17.	Sheopur	68	1499	6	110	3	156	1	10
18.	Shivpuri	70	1518	5	94	-	-	3	47
19.	Ujjain	89	2210	10	144	7	229	3	80
	Total	1432	35721	152	3443	125	6218	107	2457
20.	Bhopal	34	927	4	270	22	599	8	231
21.	Burhanpur	78	1698	3	110	6	325	10	151
22.	Indore	72	1736	4	88	20	627	10	175
23.	Ratlam	78	1700	6	109	9	91	6	71
24.	Sehore	81	2128	10	217	43	95	6	70
	Total	343	8189	27	794	100	1737	40	698
	G. Total	1775	43910	179	4237	225	7955	147	3155

5. Other Extension Activities:

In order to create awareness among the farmers, a large number of other extension activities were also organized at the KVK centres/ farmers field as well as at the headquarter. These activities included organization of goshies, exhibitions, kisan melas, field days, radio talks, development of extension literature/technical reports and newsletters etc. During the period under report, the staff of 24 KVKs organized a total of **14258** extension activities covering **282956** farmers/beneficiaries (Tables). Details of some important extension activities are given in fig. and Table. Number of activities and beneficiaries under each activity in different KVKs are shown in Tables.

Table :Details of Other Extension Activities Organized

S.No.	Name of Activities	RVSKVV KVKs	NGO/ ICAR KVKs	Total
1.	Farmers Visit to KVK (FV)	2977	2481	5458
2.	Scientist Visit to Farmers Fields (SVF)	1471	3921	1863
3.	Diagnostic Visit (DV)	384	215	599
4.	Film Show (FS)	342	206	548
5.	Radio Talk/ T.V. Programmes (RT)	335	116	451
6.	Kisan Gosthies (KG)	159	17	176
7.	Field Day (FD)	181	45	226
8.	Exhibition (Exh)	100	13	113
9.	Kisan Mela (Ki. Me.)	41	1	42
10.	Soil Health Camp (SHC)	26	4	30
11.	Animal Health Camp (AHC)	25	13	38
12.	Ex-trainees Sammelan (ETS)	40	11	51
	Total	6081	3514	9595

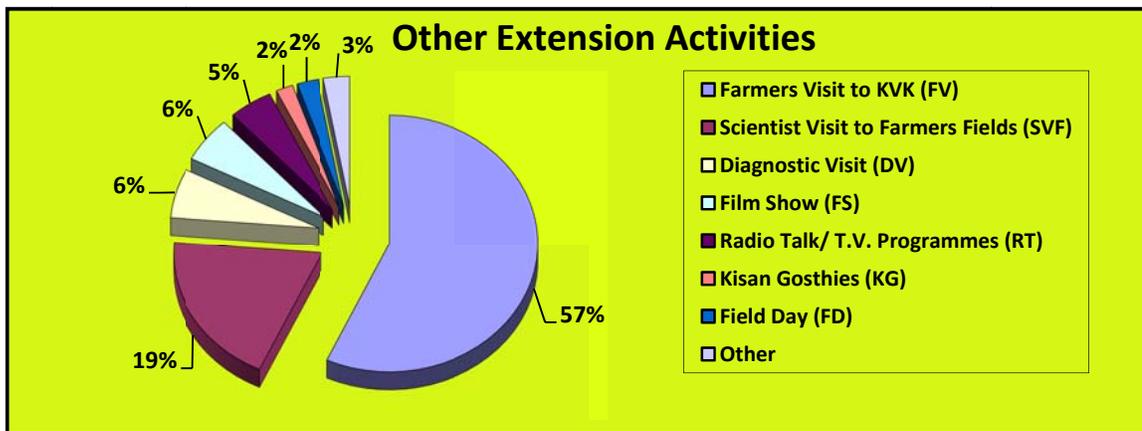


Figure: Details of Other Extension Activities

Table : Summary details of other extension activities organized

S.No	Type of Activity	Number of Programmes		Total	No. of / Benef.		Total
		RVSKVV KVKs	NGO/ICAR KVKs		RVSKV V KVKs	NGO/ICAR KVKs	
1	2	3	4	5	6	7	8
1.	Field day	181	45	226	6216	1972	8188
2.	Kisan Mela	41	1	42	36208	2045	38253
3.	Kisan Gosthi	159	17	176	11329	1020	12349
4.	Exhibition	100	13	113	31573	3238	34811
5.	Film Show	342	206	548	10663	3157	13820
6.	Method Demonstration	39	13	52	1046	325	1371
7.	Farmers Seminar	14	5	19	1067	332	1399
8.	Workshop	19	7	26	701	190	891

9.	Group meeting	50	21	71	1188	428	1616
10.	Lecture Delivered as Resource Person	1561	260	1821	27458	9151	36609
11.	News Paper coverage	676	223	899	16000	0	16000
12.	Radio talk	229	53	282	11500	0	11500
13.	T.V. talk	106	63	169	5000	0	5000
14.	Popular Article	155	7	162	2500	0	2500
15.	Extension literature	128	61	189	25416	1976	27392
16.	Advisory Services	665	10	675	2550	33	2583
17.	Scientist Visit to farmers Field	1471	392	1863	12643	2463	15106
18.	Farmer Visit to KVK	2977	2481	5458	20672	7793	28465
19.	Diagnostic Visit	384	215	599	3333	1641	4974
20.	Exposure visit	40	5	45	1466	70	1536
21.	Ex-trainee Sammelan	40	11	51	1313	419	1732
22.	Soil Health Camp	26	4	30	1158	128	1286
23.	Agri Mobile Clinic	126	0	126	1707	0	1707
24.	Soil Test Campaigns	34	318	352	1552	564	2116
25.	Farm Science club company meet	13	1	14	609	15	624
26.	SHG's conveners meet	72	29	101	936	545	1481
27.	Mahila Mandals conveners meet	17	3	20	346	22	368
28.	Celebration of important day	41	19	60	1739	1337	3076
29.	Animal Health Camp	25	13	38	1605	835	2440
30.	Technological Week	4	2	6	1518	327	1845
31.	Human Health Camp	1	-	1	118	-	118
32.	Interface with farmers & Scientists	1	-	1	53	-	53
33.	Nutrition Week	1	-	1	55	-	55
34.	Awareness on parthenium eradication	5	2	1	745	756	1501
35.	Electronic Media & CD	15	-	15	191	-	191
	Total	9758	4500	14258	242174	40782	282956

Table : KVK wise details of other Extension activities organized

S.No.	KVK	No. of Activities	No. of Benef.
1.	Ashoknagar	165	1264
2.	Badwani	238	2391
3.	Bhind (Lahar)	346	11576
4.	Datia	378	26567
5.	Dewas	1353	8080
6.	Dhar	188	2774
7.	Guna (Aron)	225	7092
8.	Gwalior	515	27344
9.	Jhabua	570	15073
10.	Khandwa	297	4317
11.	Khargone	209	5303
12.	Mandsour	832	41024
13.	Morena	989	12158
14.	Neemach	300	8153
15.	Rajgarh	337	7334
16.	Shajapur	948	3588
17.	Sheopur (Baroda)	254	2396
18.	Shivpuri	955	5536
19.	Ujjain	659	50204
20.	Bhopal	271	5700
21.	Burhanpur	767	5133
22.	Indore	597	6463
23.	Ratlam	1249	12564
24.	Sehore	1616	10922
	Total	14258	282956

6. Farmers Fair/ Kisan Diwas:



**Field day on Lentil FLD
(KVK Ashoknagar)**



**Water Conservation day
(KVK Neemuch)**



**Field day on Mustard FLD
(KVK Datia)**



**Sadbhawana day
(KVK Datia)**



**World Environment Day
(KVK Neemuch)**



Womer Equality Day



Farmer workshop at KVK Ujjain



Farmer Fair at KVK Neemuch



Farmer Fair on Cotton at KVK Khandwa



Technology Week at KVK Gwalior



Farmer Fair at KVK Jhabua



Farmer Fair at KVK Shajapur

7. Extension Activities other than KVKs

Name of Project	Crop	Technology Demonstrated	No. of FLDs	Yield kg./ha		Increase (%)
				FP	FLD	
AICRP on Weed Control, Gwalior	Arhar	Imazethapyr @ 100 g/ha EPOE, Quizalofop E. @ 90 g/ha (POE)	10	1383	1707	23.42
	Pearl millet	Atrazine @ 0.5 kg/ha, 2,4-D @ 0.5 kg/ha	10	1747	2481	42.01
	Sesamum	Trifluralin @ 1.0 kg/ha, Pendimethalin @ 1.5 kg/ha	6	480	650	35.42
	Wheat	Codinafop @ 60 g/ha + 2,4-D @ 0.5 g/ha	8	4669	5088	8.24
AICRP on Pearl millet, CoA. Gwalior	Pearlmillet	GHB-744	-	24	32	33.33
	Pearlmillet	JBV-3	-	22.7	29.9	31.71
AICRP on Arid Legumes, CoA, Gwalior	Guar	Full Package	30	1240	1762	24.1
AICRP on Sorghum, Indore	Sorghum	Improved practices	120	1620	2097	15.38
AICRP on Safflower, Indore	Safflower	Full package	10	730	1287	93.1
AICRP on Pigeon pea, Sehore	Pigeon pea	TJT501	6	14	928	30
	Pigeon pea	JKM 189	5	960	1240	29.76
	Pigeon pea	Full Package	9	916	1240	35.8
Pigeon pea demonstration under IFAD	Pigeon pea	TJT 501	-	1340	1620	20.9
	Pigeon pea	RVICPH	-	1380	1930	39.85
	Pigeon pea	JKM 189	-	1260	1735	37.7
	Pigeon pea	Production Technology	-	1370	1680	22.62
	-	Protection Technology	-	1575	1825	10.28
AICRP on pigeon pea, Khargone	Pigeon pea	Integrated Farming Systems (Full Package)	10	9.49	12.15	28.04
	Pigeon pea	Varietal Evaluation	10	9.23	11.62	25.88
	Pigeon pea	Integrated Pest Management	5	9.54	11.4	19.97
	Pigeon pea	Integrated Nutrient Management (Culture Management)	5	9.76	10.42	6.76
AICRP on Rapeseed Mustard ZARS, Morena	Mustard	Variety RVM-1	4	1550	1775	16.59
	Mustard	Sulphur Component	4	2337	2637	12.8
	Mustard	IPM	4	2101	2337	11.23
	Mustard	Inter culture/ Weeding	4	2425	1975	22.8

Front Line Demonstrations (FLDs)

Name of Project	Crop	Technology Demonstrated	No. of FLDs	Yield kg./ha		Increase (%)
				FP	FLD	
AICRP on water Management	Pearl millet	RDF and rainwater management	10	2000	3140	36.30
	Pearl millet	Balance of use of nutrient and rain water conservation	10	1950	2180	34.56
	Mustard	Irrigation practices WUE (kg/ha-cm) FP= 95, 176.66	9	1710	2650	35.47
	Mustard	Balance nutrient and irrigation WUE (kg/ha-cm)	10	1750	2670	34.45
	Wheat	RDF and irrigation practices WUE (kg/ha-cm) FP= 82, IP= 174.57	10	4100	6110	32.89
	Wheat	Irrigation on practices WUE (kg/ ha cm) FP= 85, IP= 170.78	9	4240	5960	2885

Training Programmes

Name of Project / Scheme	Title of Training	No. of Training	No. of beneficiary
MPWSRP, Indore	Utility and constructional details of water conservation structures	1	25
MPWSRP, Indore	Methods of agricultural extension and participation in water management	1	23
MPWSRP, Indore	Improved techniques for fruits, vegetable and nursery management	1	24
MPWSRP, Indore	Engineering methods for improved irrigation systems	1	25
MPWSRP, Indore	Strategies for tackling effect of climate change on agriculture	1	20
MPWSRP, Indore	Utility of programme on Gender strengthening and development in agriculture	1	25
AICRP on Pigeon	Hybrid Pigeon pea production	12	753

Name of Project / Scheme	Title of Training	No. of Training	No. of beneficiary
pea under RKVY	Technology		
AICRP on Pigeon pea under TSP	Farmers awareness and training programme on Pigeon pea technology	1	149
MPWSRP	Improved water productivity through improved potato cultivation	2	105
MPWSRP	Water Management and Crop production technique in Chambal command area	1	46
AICRP on Safflower, Indore	Safflower day	1	81
AICRP on Safflower, Indore	Safflower production technology	1	65

Extension Activities

Name of Project/ Scheme	Name of Activity	No. of Activities conducted	No. of Participants
AICRP on Weed Control, Gwalior	Parthenium awareness week	7(16 th to 23 th Aug, 2011)	553
AICRP on Weed Control, Gwalior	Krishak sangosthi at Birgama Village, Teh. – Bhitwar, Distt. – Gwalior	7 (11 th Oct, 2011)	115
AICRP on ORP, Indore	Capacity building of farmers, programme planning	25	250
AICRP on ORP, Indore	Technical guidance	150	200
AICRP on ORP, Indore	Imparting trainings	12	200
AICRP on ORP, Indore	Consultancy services	1	5
AICRP on Pigeon pea Khargone	FLD	30	30
AICRP on Pigeon pea Khargone	Trainings	13	902
AICRP on Safflower, Indore	Monitoring	2	20
AICRP on Safflower, Indore	Scientist visit	4	21

Other activities

Name of Project	Activity	No.
AICRP on weed control, CoA, Gwalior	Best paper award	3
AICRP on weed control, CoA, Gwalior	Distinguished visit	6
AICRP on arid legume, CoA, Gwalior	Best paper award	2
AICRP on arid legume, CoA, Gwalior	Distinguished Visit	5
AICRP on Pigeon pea, Khargone	Farmer visit	22 groups

Literature developed / published

Name of Project	Type of publication	Title	Author's Name	No. of copies published
AICRP Weed Control, Gwalior	Bulletin	Weed management technology	Tomar, S. S., Yadav, K. S. and Arora, Asha	500
AICRP Weed Control, Gwalior	Folder (Hindi)	Weed management in Rabi crops	Tomar, S. S. and Yadav, K. S.	1000
AICRP Weed Control, Gwalior	Folder (Hindi)	Weed management in kharif crops	Yadav, K. S. and Tomar, S. S.	1000
AICRP Arid Legumes, CoA, Gwalior	Folder (Hindi)	Production technology of Cluster bean	Rawat, G. S.	1000
AICRP Arid Legumes, CoA, Gwalior	Folder (Hindi)	Production technology of moth bean	Rawat, G. S.	1000
AICRP Arid Legumes, CoA, Gwalior	Folder (Hindi)	Production technology of cowpea	Rawat, G. S.	1000
AICRP Arid Legumes, CoA, Gwalior	Folder (Hindi)	Production technology of Horse gram	Rawat, G. S.	1000
AICRP on Sorghum, CoA, Indore	Folder	Jowar ki Vipul utpadan taknik	AICRP, Sorghum CoA, Indore	2000
MPWSRP, Morena	Training bulletin	Improved water productivity through improved potato cultivation	Kisore, E. and Bhadauria, S. K. S.	200
MPWSRP, Morena	Training bulletin	Water management and crop production techniques in Chambal command area	Kisore, E. and Bhadauria, S. K. S.	100
AICRP on Pigeon pea, Khargone	Booklet	Phasal utpadan main jawik kheta ki unnat taknik vartman ke avshyakta	Jain, R. C., Jain, Y. K., Verma, S., Sikarwar, R. S., and Mittoliya, V.	2000
AICRP on Pigeon pea, Khargone	Folder	Beej Utpadan ma Jaivik adano evam urvarko dwara samnvit poudh posham evam mahatv	Jain, R. C., Jain, Y. K., Verma, S., Sikarwar, R. S., and Mittoliya, V.	2000
AICRP on Pigeon pea, Khargone	Folder	Mrida namuna ektrit karane ki vidhi ek avshyakta	Jain, R. C., & Verma, S.	500
AICRP on Pigeon pea, Khargone	Folder	Bhoomi ke utpadan kshmeta badane ma jaiv urvarko ka mahatav	Jain, R. C.	500

8. Production and supply of technological inputs

In order to help farmers to seek timely availability of quality seeds/planting materials, each KVK with industrious efforts produced quality seeds/planting materials. In all, **9617.45** q. of seeds of improved varieties and **579589** numbers of seedlings/saplings of planting materials were developed as shown below (Table):

Table : Production and supply of seed and seedling/sapling by different Krishi Vigyan Kendras during 2011-12:

S.No.	KVK	Crop/ Variety	Quantity (qtls)	Planting Materials	
				Crop/Variety	No.
1	2	3	4	5	6
1.	Ashok Nagar	Soybean (JS 93-05) Gram (JG- 16)	83.0 30.0	- -	- -
2.	Badwani	Gram (JG-130) Soybean (JS- 95-60)	86.0 106.0	- -	- -
3.	Bhind (Lahar)	Wheat (MP4010)	12.68	-	-
4.	Datia	-	-	Chilli (Kashi Anmol) Tomato (Kashi Vishesh)	15000 148000
5.	Dewas	Maize (1VM - 421) Black Gram (JU - 86) Soybean (JS- 95-60) Pigeon Pea (TJT-501) Onion (ADR)	0.5 60.0 3.9 1.2 0.5	- - - - -	- - - - -
6.	Dhar	Soybean (JS 93-05) Gram (JAKI - 9218)	246.7 119.5	Durenta	10000
7.	Guna (Aron)	Wheat (GW-322) Chick pea (JG - 16) Green Gram (TM-37) Mustard (Pusa Jai Kisan) Soybean (JS 95-60)	158.0 44.0 2.0 6.0 175.0	Mango (Amrapali) Guava (G-27) Aonla (NA-7) Lemon (Kagzi) Jack fruit (Desi)	50 150 80 60 25
8.	Gwalior	Green Gram (TJM-3) Gram (JG-16) Okra (VRO-6) Fenugreek (RMT-1) Fenugreek (RMT-143) Fenugreek (RMT-303) Fenugreek (RMT-305) Fenugreek (RMT-351) Fenugreek (RMT-361) Marigold (Pusa Narangi) Marigold (Pusa Basanti) Bottle Gourd (NR) Sponge Gourd (NR) Potato (K. Chipsona-1) Potato (Jawahar)	22.04 62.49 3.0 1.64 0.44 0.44 0.54 0.55 0.58 0.52 0.15 0.10 0.07 0.98 0.90	Brinjal Tomato Chilli Cauliflower Cabbage Onion (Kharif) Marigold Papaya Drum Stick	8586 9260 2620 2586 1944 21400 11214 50 242

S.No.	KVK	Crop/ Variety	Quantity (qtls)	Planting Materials	
				Crop/Variety	No.
1	2	3	4	5	6
		Potato (K-Khyati)	0.94		
		Potato (K- Chipsona-3)	0.90		
		Potato (K-166)	0.83		
		Potato (K-Anand)	0.87		
		Potato (K-Pukharaj)	1.00		
		Potato (K-Chipsona-4)	0.30		
		Potato (K-Surya)	0.72		
		Potato (K-Lavkar)	0.70		
		Potato (K-Pushkar)	1.00		
		Potato (K-chandramukhi)	0.88		
		Potato (K-Lalima)	0.90		
		Potato (K-Chipshona-2)	0.85		
		Potato (K-Sinduri)	0.73		
		Potato (K-Kanchan)	0.48		
		Potato (K-Arun)	0.80		
		Potato (K-Ashok)	0.75		
		Potato (K-Himsona)	0.28		
		Potato (K-Frysona)	0.07		
9.	Jhabua	Maize (JVM - 421)	39.90	-	-
		Wheat (GW-322)	170.0		
		Wheat (HI-1418)	15.0		
		Pigeon Pea (TJT 501)	7.29		
		Black Gram (JU-86)	2.85		
		Gram (JG - 130)	29.30		
		Soybean (JS -335)	79.69		
10.	Khandwa	Soybean (JS 95-60)	75.0	-	-
11.	Khargone	Wheat (GW -322)	400	-	-
		Pigeon Pea (TJT -501)	2.15		
		Soybean (JS - 335)	180		
		Groundnut (JGN - 3,23)	24		
12.	Mandsaur	Black gram (T-9)	15.70	-	-
		Black gram (JU-86)	1.18		
		Gram (JG-6)	40.15		
		Soybean (JS - 95-60)	108.1		
		Mustard (Pusa Tarak)	3.5		
		Chandrasoor (MC-1)	5.0		
13.	Morena	Wheat (MP-1203, 4010)	416.0	-	-
		Gram (JG-130,16)	153.0		
		Pea (AP-3)	8.0		
		Moong (TJM-3)	10.0		
		Soybean (JS93-05, JS-335)	135.0		
		Mustard (JM-2, JM-3)	1.38		
14.	Neemuch	Soybean (JS 93-05)	118.0	-	-
15.	Rajgarh	Wheat (MP - 4010)	130.00	Bamboo (Katanga	25000
		Soybean (JS 95-60)	40.00	Madhu Kamini,	

S.No.	KVK	Crop/ Variety	Quantity (qtls)	Planting Materials	
				Crop/Variety	No.
1	2	3	4	5	6
		Wheat (GW-366)	160.00	Chandni, Cliandra, Ashok Sudarshan)	500
16.	Shajapur	Soybean (JS - 93-05) Gram (JAKI-9218) Wheat (GW-366)	307.00 120.00 250.00	-	-
17.	Sheopur	Soybean (JS - 335) Chick pea (JAKI-9218) Wheat (GW-322, GW-273, GW-366)	125.00 65.00 42.35	-	-
18.	Shivpuri	Groundnut (JGN-3) Soybean (JS 95-60) Chickpea (JAKI 9218) Green Gram (TM-37)	5.0 195.0 37.0 1.5	-	-
19.	Ujjain	Gram (JG - 130) (JG -11) (JG - 3) Soybean (JS 95-60) (JS - 335) (JS - 93-05) Jowar (CSH - 18) Maize (HQMP - 1) Marigold (Pusa Narangi) Marigold (Pusa Arpita)	136.17 79.02 49.00 1231.00 896.52 735.0 0.42 0.35 1.0 1.0	-	-
20.	Bhopal	Paddy (Kranti) (Pusa Basmati) Maize (JM - 216) (HPQM - 1) Wheat (HI-1544) Gram (JG-63) Pigeon pea (TJT-501) Soybean (JS 335) (JS 95-60) (JS 93-05)	34.85 5.2 43.25 39.5 500.0 150.00 11.40 68.95 70.95 10.3	Mango (Dasheri) (Amrapali) Guava (W - 49) Karonda(Red Tinged Other fruits Forest/Medicinal plants Vegetables & Flowers Ornamentals	200 150 500 3200 550 532 282000 890
21.	Burhanpur	Wheat (Kudrat-17) Gram (JG-130) Soybean (JS 95-60)	3.0 5.0 20.0	-	-
22.	Indore	Wheat (HI-1544, HI-1418, DL788-8) Soybean (JS 95-60) Gram (JG130, JG-412) Garlic (JG-323, G50)	300 10 20 1.5	Brinjal Durenta Cucurbits	800 100 300

S.No.	KVK	Crop/ Variety	Quantity (qtls)	Planting Materials	
				Crop/Variety	No.
1	2	3	4	5	6
23.	Ratlam	Soybean (JS -335)	10.0	Mango (Desi)	200
		(JS 95-60)	10.0	Guava (Allahabadi)	700
		Mustard (Pusa Agrani)	2.60	Safeda)	
		(Pusa Tarak)	0.60	Sitaphal	2000
		Gram Kabuli (PKV-4)	1.50	(Balangari)	
		(ICPK 2004-29)	1.70	Lemon (Kagji)	2500
		Gram (JG-16)	0.5	Lemon)	
		(JAKI – 9218)	0.5	Aonla (Desi)	500
24.	Sehore	Garlic (G-282)	9.0	Jack fruit (Local)	600
				Karonda (Local)	2300
				Imli (Desi)	1600
				Forest Plant	23200
		Soybean (JS 95-60)	48.6	-	-
		(JS 93-05)	70.2		
		(Pusa 9712)	2.28		
		(JS 95-60)	50.00		
(JS 93-05)	50.00				
Pigeon pea (JKM -189)	4.98				
(JA-4)	0.51				
(ICPL-87119)	0.70				
(JKM-189)	2.34				
Gram (JG-130)	24.80				
(JG-322)	33.0				
(JG-16)	3.00				
(JG-322)	56.40				
(Dhawal)	1.80				
(PKV-4)	5.80				
(ICPK-2004-29)	6.00				
(KAK-2)	5.30				
Wheat (MP-1202)	22.05				
(Sujata)	9.45				
		Total	9617.45		579589.00



Seed Production Programme at KVK Farm

9. Soil Water and Plant Analysis

During the year under report, KVKs under RVSKVV jurisdiction analyzed 77310 soil/water samples collected from 1524 villages benefiting 71829 farmers. Details are given below (Table):

Table : Details of Soil Water and Plant Analysis:

S. No.	KVK	Category	No. of Samples	No. of Farmers	No. of villages
1.	Ashoknagar	Soil	112	112	12
2.	Badwani	Soil	75	72	4
3.	Bhind (Lahar)	Soil	275	245	9
4.	Datia	Soil	260	260	4
5.	Guna (Aron)	Soil	10270	5763	205
6.	Gwalior	Soil	8521	8521	90
		Water	10	10	3
7.	Jhabua	Soil	10702	10702	71
		Water	11	7	3
8.	Khandwa	Soil	9000	9000	42
9.	Khargone	Soil	10205	10205	104
		Water	10	10	10
10.	Morena	Soil	9316	9316	109
11.	Rajgarh	Soil	8000	8000	600
		Water	75	75	10
12.	Sheopur(Baroda)	Soil	43	43	4
13.	Ujjain	Soil	8000	8000	152
14.	Bhopal	Soil	1656	893	27
15.	Burhanpur	Soil	110	110	2
16.	Indore	Soil	310	310	17
17.	Ratlam	Soil	265	171	42
		Water	4	4	4
	Total		77310	71829	1524



Soil Health Card Distribution



Soil sample collection

Soil Testing for Soil Health Improvement

10. Kisan Mobile Advisory Services:

Introduction of Information and Communication Technology (ICT) in the field of agriculture has brought many changes in traditional methods of extension. It enables the dissemination of requisite information at the right time to the right people. This revolution in ICT has made access to the information easy and cost effective to the rural masses in general and farming community in particular.

Kisan Mobile Advisory (KMA) is one among the several methods of ICTs working successfully for dissemination of latest information in Madhya Pradesh. KMS is best on the linear model of communication, which involve four major component of communication process viz. Sender, Message, Channel and Receiver. Mobile phones, Short Message Service (SMS) are important tools and can be used by the KVK specialist. The extension functionary is the user of the information while farmers are implementer at field level. In consultation with the Directorate of Extension Service sand Zonal Project Directorate (Zone VII), Thematic area/Category-wise contents of the messages are prepared by the KVKs and messages are delivered to farmers well in time under KVK-KMA programme/project. The KVK-KMA uses the feature of SMS of mobile phone for information network of KVK Subject Matter Specialist (information generator), extension functionary (information user) and farming community (implementer).

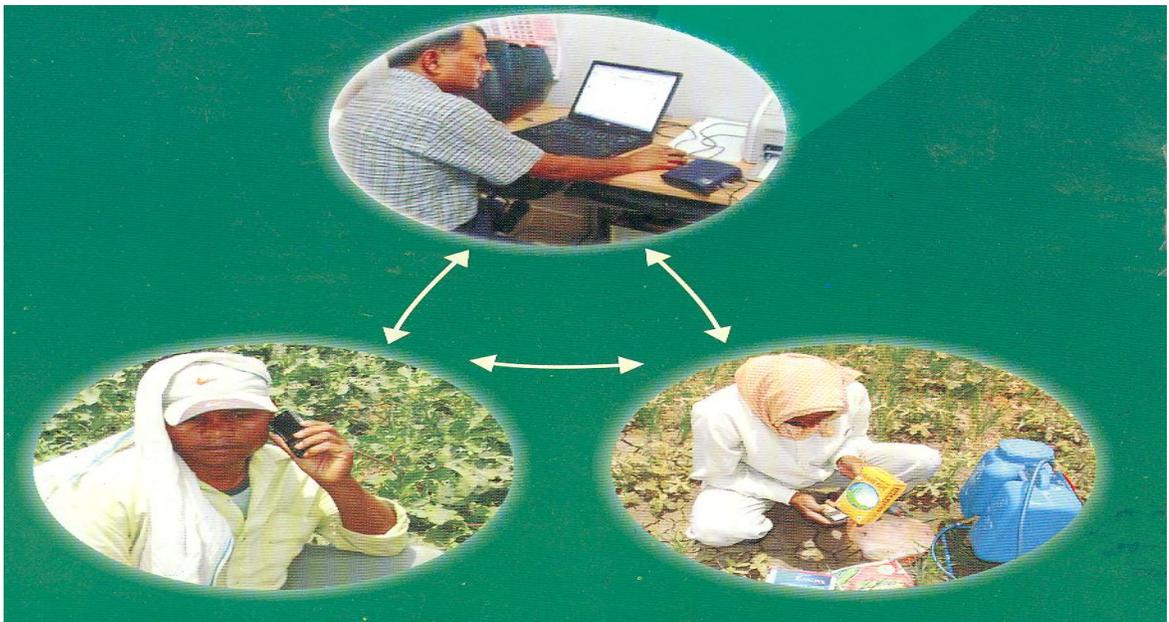
In RVSKVV, Gwalior all the KVKs are E-linked under KVK-KMA programme and are making the use of this service for agricultural development.

The Kisan Mobile Advisory Service status of KVK- KMA in given below in table:

Table: Kisan Mobile Advisory status of KVKs (KVK-KMA):

S.No.	Name of KVK	No. Message sent	No. of Beneficiaries
1.	Ashoknagar	84	1095
2.	Badwani	62	1014
3.	Bhind (lahar)	32	275
4.	Datia	54	1012
5.	Dewas	25	769
6.	Dhar	88	1000
7.	Guna (Aron)	106	1178
8.	Gwalior	92	1088
9.	Jhabua	94	1009
10.	Khandwa	80	1112
11.	Khargone	102	2002
12.	Mandsaur	76	1005
13.	Morena	63	500
14.	Neemuch	104	1165
15.	Rajgarh	58	725
16.	Shajapur	52	1280
17.	Sheopur	78	1000
18.	Shivpuri	82	952
19.	Ujjain	70	1000
20.	Bhopal	70	150
21.	Burhanpur	55	1000
22.	Indore	50	332
23.	Ratlam	426	1108
24.	Sehore	35	2316

Glimpses of Kisan Mobile Advisory Services



11. Scientific Advisory Committee of KVKs

Each Krishi Vigyan Kendra has a Scientific Advisory Committee (SAC) which reviews the performance of last season and approves the Action plan of next season. The committee also provides guidance for identification and prioritization of the programmes to meet out the needs of farmers of the respective districts. The composition of SAC is as follows:

❖ Vice-chancellor of RVSKVV, Gwalior	-	Chairman
❖ Director Extension Services, RVSKVV, Gwalior	-	Member
❖ Zonal Project Director , Zone-VII, ICAR, Jabalpur	-	Member
❖ Representative of ICAR Institute located in the district or nearby area	-	Member
❖ Associate Director Research of Zonal Agriculture Research Station in which KVK is located	-	Member
❖ District Officers of the line departments viz Agriculture, Horticulture, Animal Husbandry, Soil Conservation, Social/Agro-Forestry, Sericulture Fisheries, Irrigation, Social Welfare, Small scale Industries etc.	-	Member
❖ Lead Bank Manager of the district	-	Member
❖ Farm Radio Officers of the AIR in which KVK is located	-	Member
❖ Representative of Doordarshan Centre in which KVK is located	-	Member
❖ Two representatives of the farmers one small and one big nominated by the Vice-chancellor	-	Member
❖ Two representatives of farm women nominated by the Vice-chancellor	-	Member
❖ Programme Coordinator of the KVK	-	Member
		Secretary

Table : Details of SAC meetings organized by KVKs during 2011-12

S.No.	Name of KVK	Pre Kharif	Pre Rabi
		Date	Date
1.	Ashoknagar	10-06-2011	22-10-2011
2.	Badwani	26-05-2011	19-10-2011
3.	Bhind (Lahar)	13-06-2011	13-10-2011
4.	Datia	11-06-2011	11-02-2011
5.	Dewas	14-06-2011	16-11-2011
6.	Dhar	27-06-2011	31-10-2011
7.	Guna (Aron)	09-06-2011	21-10-2011
8.	Gwalior	02-06-2011	14-10-2011
9.	Jhabua	27-05-2011	02-11-2011
10.	Khandwa	24-05-2011	17-10-2011
11.	Khargone	25-05-2011	18-10-2011
12.	Mandsaur	07-06-2011	16-11-2011
13.	Morena	21-06-2011	02-10-2011
14.	Neemuch	06-06-2011	14-11-2011
15.	Rajgarh	03-06-2011	03-10-2011
16.	Shajapur	04-06-2011	17-11-2011
17.	Sheopur (Baroda)	30-05-2011	08-11-2011
18.	Shivpuri	31-05-2011	09-11-2011
19.	Ujjain	11-06-2011	18-11-2011
20.	Burhanpur	-	20-10-2011
21.	Indore	-	01-11-2011
22.	Ratlam	20-07-2011	15-11-2011
23.	Sehore	02-06-2011	14-10-2011

A View of SAC Meeting



12. KVK News Letters Published:

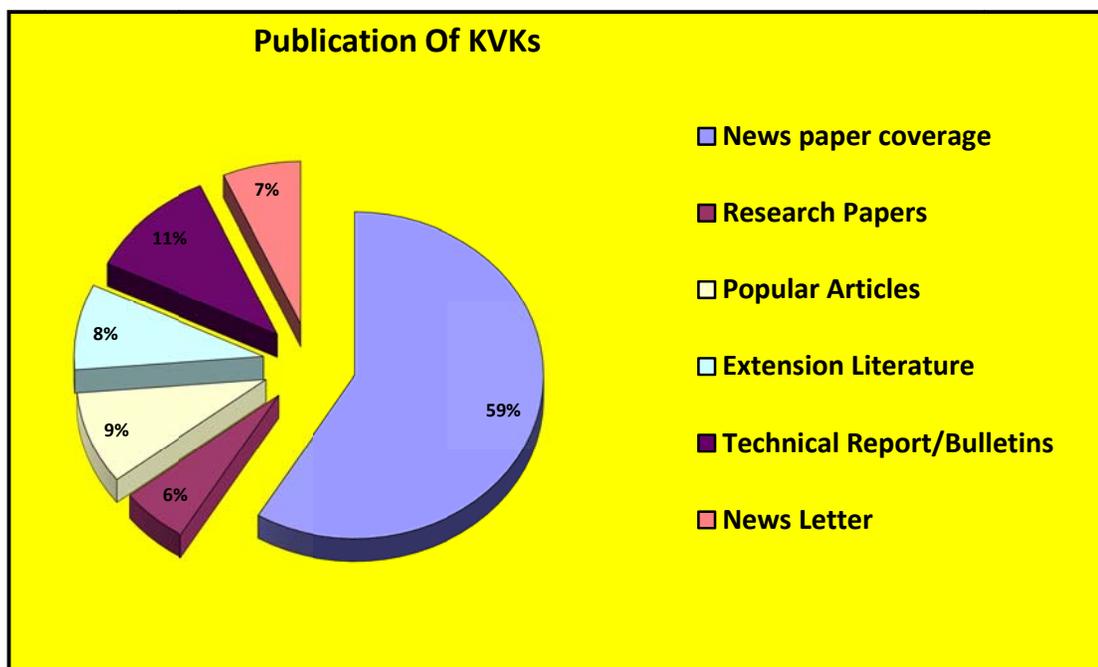
The News letter issued quarterly in a year is used to highlight and propagate the latest news, techniques and methods available in agriculture and its allied sectors for the benefit of farmers in district free of cost. It includes last month's activities and planning for next three months of the kvk.



13. Publications:

Table : Publications of KVKs

S.No.	Type of Publication	No.		Total No.
		RVSKVV KVKs	NGO/ICAR KVKs	
1.	News paper coverage	628	233	851
2.	Research Papers	75	10	85
3.	Popular Articles	127	7	134
4.	Extension Literature	98	26	124
5.	Technical Report/Bulletins	131	31	162
6.	News letters	76	20	96



14. Activities of Directorate of Extension other than KVK's other than KVK's

(i) Training Programmes organized

No. of Trainings	No. of Beneficiaries
6	182

S. No.	Date	Theme	Venue	No. of Participants
1.	June 21-22, 2011	Integrated Weed Management for Sustainable Agriculture	DES, RVSKVV, Gwalior	42 KVK Scientist & Officer of DFWAD
2.	August 17-18, 2011	Crop Intensification for Enhancing Resource use Efficiency	DES, RVSKVV, Gwalior	32 KVK Scientist & Officer of DFWAD
3.	August 19, 2011	Process documentation	DES, RVSKVV, Gwalior	27 KVK Scientist & Officer of DFWAD
4.	November 5-12, cont.	Contract Farming : A Farmer Industry Symbiosis	CoA, Gwalior	25 Assistant Directors Agriculture
5.	December 8-9, 2011	Post harvest technology	DES, RVSKVV, Gwalior	43 KVK Scientist & Officer of DFWAD
6.	February 8-9, 2012	Conservation Agriculture	DES, RVSKVV, Gwalior	34 KVK Scientist & Officer of DFWAD



Training on “Process Documentation”



Model Training on “Contract Farming : A Farmer Industry Symbiosis”



Training on “Crop Intensification for Enhancing Resource use Efficiency”



Training on “Post Harvest Technology”



Training on “Integrated Weed Management for Sustainable Agriculture”



Training on “Conservation Agriculture”

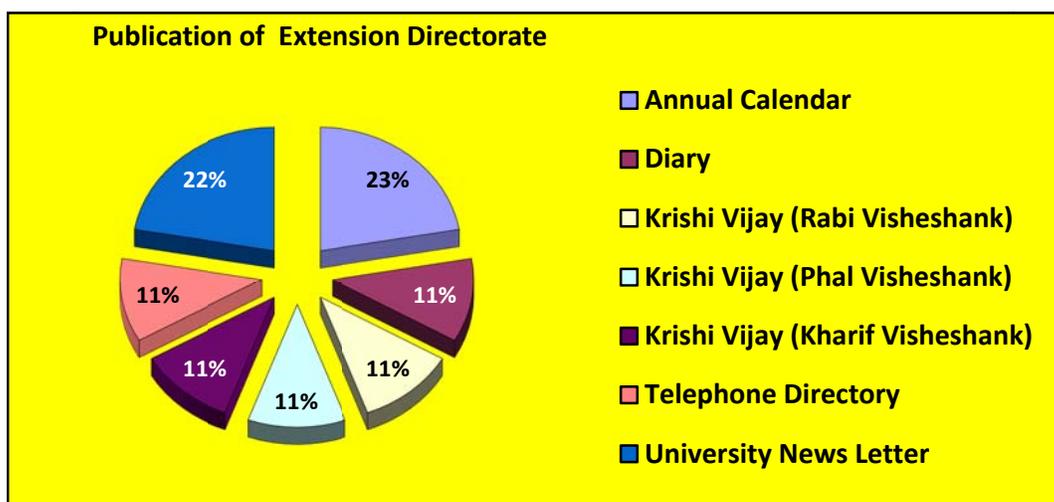
(ii). Workshops/ meetings organized

S. No.	Date	Theme	Venue	Participants
1.	April 4-5, 2011	Pre QRT	DES, RVSKVV, Gwalior	PCs/ Scientist of KVKs
2.	April 24-25, 2011	QRT	DES, RVSKVV, Gwalior	PCs/ Scientist of KVKs
3.	May 6-8, 2011	Zonal Workshop	DES, RVSKVV, Gwalior	PCs/ Scientist of KVKs
4.	December 25, 2011	Workshop of KVKs for finalization of Nomination for Zonal award	DES, RVSKVV, Gwalior	PCs/ Scientist of KVKs
5.	January 25, 2012	Travel Workshop of KVKs on Agro technology Park and finalization of project proposal on centre of excellence	DES, RVSKVV, Gwalior	PCs/ Scientist of KVKs
6.	February 5, 2012	Review meeting of KVKs on Rain water harvesting structure	DES, RVSKVV, Gwalior	PCs/ Scientist of KVKs
7.	February 7-8, 2012	KVKs Annual action plan workshop 2012-13	DES, RVSKVV, Gwalior	PCs/ Scientist of KVKs



(iii) Publications

S. No.	Type of publication	No.
1	Annual Calendar	1000
2	Diary	500
3	Krishi Vijay (Rabi Visheshank)	500
4	Krishi Vijay (Phal Visheshank)	500
5	Krishi Vijay (Kharif Visheshank)	500
6	Telephone Directory	500
7	University News letter	1000
8	Extension High Lights (Annual Report 2010-11)	50
9	Tikau Kheti Ke Liye Samekit Kharpatwar Prabandhan (Technical Booklet)	25
10	Pyaz Utpadan ki Vagyanik Kheti (Technical Booklet)	25



15. Distinguished Visitors



Dr. Ramkrishan Kushmaria Ji Hon'ble Minister FWAD, Govt of M. P. at KVK Shivpuri on Dec. 18, 2011



Dr Koji Suji, Scientist, Japan knowing about the importance of medicinal plants at KVK, Khargone on Aug. 05, 2011



Dr. K.D. Kokate, DDG (Ext.), at exhibition of RVSKVV in National conference of KVKs at Jabalpur



Professor P. K. Chhonkar, ICAR Emeritus Scientist, IARI, New Delhi at KVK Gwalior



Display of achievements of KVK Datia in-front of Joint Parliamentary Committee, Government of India through Exhibition dated on Feb. 29, 2012.



Visit of DDG (Extn.Edn.)-ICAR-New Delhi at KVK Ujjain on March 01, 2012

V. ACTIVITIES OF SEED PRODUCTION FARM:

1. SEED PRODUCTION

The Seed productions are organized with the help of 26 farms of the university (table 1) which are spread over 23 districts of Madhya Pradesh. Maintenance breeding of recommended crop varieties, nucleus and breeder seed production is carried out in the systematic manner. Hybrid seed production has been taken in Pigeon pea, maize, sorghum and pearl millet during 2011-12. Besides, Rajvijay seed and planting materials are also produced as per requirement of the state and as well as the country.

Table: Seed and planting material producing units.

S.No.	Production units	Nucleus seed	Breeder	Hybrid seed	Rajvijay seed	Planting material
1.	Gwalior	✓	✓	✓	✓	✓
2.	Indore	✓	✓	✓	✓	✓
3.	Sehore	✓	✓	✓	✓	✓
4.	Khandwa		✓	✓	✓	✓
5.	Mandsaur				✓	
6.	Morena				✓	
7.	Khargone	✓	✓	✓	✓	
8.	Jhabua		✓	✓	✓	
9.	Etkhedi (Bhopal)		✓		✓	✓
10.	Ujjain		✓	✓	✓	
11.	Bagwai (Gwalior)		✓		✓	
12.	Jaora (Ratlam)		✓		✓	
13.	Ashoknagar		✓		✓	
14.	Datiya		✓		✓	
15.	Sheopur		✓		✓	
16.	Aron (Guna)		✓		✓	
17.	Shivpuri		✓		✓	
18.	Rajgarh		✓		✓	✓
19.	Shajapur		✓		✓	
20.	Dhar		✓		✓	
21.	Devas		✓		✓	
22.	Badwani		✓		✓	
23.	Neemuch		✓		✓	
24.	Patan (Mandsaur)		✓		✓	
25.	Bhind		✓		✓	
26.	Lahar (Bhind)				✓	

LAND

The total area of twenty six farms is 1095.53 hectares. Out of which, 703.35 hectares is under cultivation. Among the cultivated area, 13.39 and 35.15% is irrigated and partially irrigated, respectively. Rest of the cultivated area is under rainfed farming. The area under plantation crop is about 95.86 ha. Similarly, area under fallow and pasture land is 75.92 ha. The area occupied by road and buildings is 220.40 ha.

A. Nucleus seed production

The quantity of nucleus seed produced in different crops during 2011-12

Crop	Variety	Production (q)
Soybean	JS 95-60, JS 335, JS 93-05, JS 90-41 JS 97-52 and RVS 2004-1	321.30
Pigeonpea	JA 4, JKM 189 and TJT 501	0.92
Green gram	TJM 3 and JM 721	7.20
Black gram	RBU 38	1.20
Groundnut	JGN 3 and JGN 23	1.50
Sorghum	JJ 938 and JJ 1041	0.18
Pearl millet	JBV 2 and JBV 3	0.11
Maize	JVM 416	0.10
Chickpea	JG 11, JG 16, JG 130, JAKI 9218, JG 6, and JKG 3	199.85
Wheat	MP 1203, MP 4010, Lok 1, GW 366, GW 322 and Sujata	148.35
Pea	Arkel and AP 3	2.40
Lentil	JL 3	0.45
Mustard	JM 3, JM 4 and Rohini	1.19
Toria	JT 1	0.04
Total		684.79

B. Breeder seed production

The quantity of breeder seed produced in different crops during 2011-12

Crop	Variety	Indent (q)	Quantity (q)
Soybean	JS 93-05, JS 95-60, JS 335 and JS 90-41	6300.00	3607.70
Pigeonpea	JA 4, JKM 189 and TJT 501	-	45.60

Green gram	TJM 3	-	27.40
Black gram	RBU 38 and T 9	-	35.00
Paddy	Kranti	-	900.00
Pearl millet	JBV 3	-	0.75
Groundnut	JGN 3 and JGN 23	-	8.00
Sorghum	JJ 938	-	3.00
Chickpea	JG 16, JAKI 9218, JG 11, JG 130, JG 6, JG 226 and JGK 3	1669.50	2633.33
Wheat	GW 366, MP 4010, GW 322, MP 1203, LOK 1, HD 2932, MP 4106 and Sujata	405.00	4300.92
Maize	JVM 421	-	16.72
Lentil	JL 3	-	3.50
Pea	AP 3	-	4.5
Safflower	JSI 97 and JSF 1	-	0.65
Mustard	Rohini, JM 2 and JM 3	-	45.46
Toria	JT 1	-	0.25
	Total		11632.75

C. Hybrid seed production

Hybrid seed production programme was taken in maize, pearl millet, sorghum and pigeonpea. The quantities of hybrid seed produced are given below:

Crops	Varieties	Seed quantity produce (Kg)
		2011-12
Maize	HQPM 1	417
Pigeonpea	ICPH 2671	305
Pearl millet	HHB 67	27
Sorghum	CSH 18	142

D. Production of planting materials/saplings:

Planting material of Bamboo [Katanga (104000)], Mango [Langra. Chausa, Mallika, Amrapali, Safeda, Alphanso, Dashehri (9150)], Mango Deshi [15000], Lime [Kagzi, Vikram and Seed less (5050)], Custard Apple [Astha Selection (2600)], Jack fruit [local (3023)], Aonla [NA-7 (2650)], Aonla Deshi [10000], Karonda [local (5800)], Guava [L 49, G 27(9150)], Turmeric [local (100)], Jamun [Local (4900)] and ornamental plants, Ratrani (100), Ashok (100), Chandni (50), Suderson (50), Cliendra (50), Bougainvillea (1000), Golden duranta (5000), Red duranta (1000), Rose (100) were produced at different research centres.

VI. EVENTS ORGANIZED:

1. Eight days national training programme on “Present Status of Contract Farming: A Farmer in Industry Symbiosis” for extension personnel of state department on dated from 05-11-2011 to 12-11-2011 was organized by the department of Agricultural Economics & Farm Management, College of Agriculture, RVSKVV, Gwalior.
2. Soil Health card distribution to the farmers of Banwar village Bhitwar, Gwalior.
3. Launching & inauguration ceremony of the newly sanctioned project under NICRA “Identification of efficient integrated modules for sustainable management of ravines (Chambal) and carbon sequestration for climate resilience in Madhya Pradesh
4. Board Meeting of the Vishwa Vidyalaya was held in College on 05-01-2011.
5. Death anniversary of Late Bhagvantrao Mandloi Ex. Chief Minister MP Govt. was organised in the College on 03.11.2011.

VII. PUBLICATIONS:

1. बढोलिया, ए.के. (2011): ऐसे बढेगा मटर उत्पादन, कृषक जगत 65 (2): 6. 26 सितंबर –2 अक्टूबर–2011
2. बढोलिया, ए.के. (2011): आया मौसम गाजर का. कृषक जगत 65 (7): 6. 31 अक्टूबर – 06 नवम्बर 2011
3. बढोलिया, ए.के. (2011): उन्नत तरीके से करें मटर की खेती. कृषक दूत 12 (26): 5. 22 नवम्बर – नवम्बर, 2011
4. बढोलिया, ए.के. (2012): ना रोग लगे ना फल गिरें, भरपूर आम मिलें, कृषक जगत 65 (22): 6. 13 फरवरी – 19 फरवरी, 2012
5. बढोलिया, ए.के., तोमर, के.एस. एवं लेखी, राजेश (2012): बिना बीज का अमरुद – अमरुद के पुष्पण उपचार. कृषक जगत 66 (24): 6. 27 फरवरी – 4 मार्च, 2012
6. बढोलिया, ए.के., एवं नगाइच, के.एन. (2012): हल्दी एवं अदरक की प्रसंस्करण विधियां. कृषक जगत 66 (31): 6. 26 मार्च – 1 अप्रैल, 2012
7. तोमर, एस.एस. एवं यादव, के.एस. (2011) रबी फसलों में खरपतवार प्रबंधन, रा.वि.सिं.कृ.वि.वि. कृषि महाविद्यालय, ग्वालियर
8. यादव, के.एस. एवं तोमर, एस.एस. (2011) खरीफ फसलों में खरपतवार प्रबंधन तकनीक, रा.वि.सिं.कृ.वि.वि. कृषि महाविद्यालय, ग्वालियर
9. Rajput, B.S., Lekhi, R. and Samadhiya, R.K. (2011). Effect of bio-fertilizers on potato tuber yield under varying fertility levels. Adv. Res. J. Crop Improv. 2(2): 244-246
10. Rajput, B.S., Lekhi, R. and Samadhiya, R.K. (2012). Effect of plant growth regulators on Potato tuber yield under varying fertility levels. Internat. J. agric. Sci., 8(1); 259-261
11. Sharma Pawan, M.M.Patel and V.B. Singh (2011) Entrepreneurial Orientation of Garlic Growers. *Indian J Extn Edun*,47 (1&2): 107-112
12. Jaiswal Aparna and M.M.Patel (2012) Entrepreneurial Behaviour of Rural Women *Indian Res.J Ext.Edu*. 12(1): 55 – 59

13. Badodiya, S.K.; Yadav, M.K.; Daipuria, O.P. and Chauhan S.V.S. (2011) Impact of training programmes on adoption of Organic farming. *Indian Res. J. Ext. Edu.* **11**(2):42-46
14. Badodiya, S.K.; Daipuria, O.P. Jaulkar, A.M. and Raghuwanshi, J.S. (2011). A study on factors affecting adoption behavior of farmers about improved mustard production technology. *Bhartiya Krishi Anusandhan Patrika* 26 (3&4):114-118
15. Badodiya, S.K. and Chaudhary, P.C. (2011) Effectiveness of farm telecast in seeking agricultural information by the farmers. *Journal of Community Mobilization and Sustainable Development.* 6(2), 125-127
16. A.K. Singh & R.K. Pandya (2011). Bajra KI Vipul utpadan Takniqe Kam Lagat adhik utpadan published.
17. A.K. Singh (2011) Pearl millet Hybrid Seed production Technologies and farmers involvement, Published by Directorate of Research, RVSKVV,
18. Singh, Reeti, Singh, U.C. and Singh, Reetam. 2012. Modern Mushroom Cultivation. Agrobios Publication, Jodhpur, Rajasthan (In Hindi, Under Publication)
19. Arora Asha (2011). Leaching Behavior of Pendimethelin in Sandy Clay Loam Soil of Madhya Pradesh . Sent for Publication. Indian J Weed Sci.
20. Arora Asha and S. S. Tomar (2011). Effect of soil solarization on weed seed bank in soil. Sent for Publication. Indian J Weed Sci.
21. Dube, SK, Arora Asha and Gurjar (2011).Effect of Quizalofop and Chlorimuron ethyl with *Bradyrhizobium japonicum* on terminal fertility of soil under Soybean in Inceptisols. Sent for Publication. Indian Soybean Journal.
22. Trivedi, S.K. and Pachori Raman (2011) Effect of levels and sources of sulphur on yield, quality and uptake by mustard (*Brassica juncea*). *Prrogressive Agriculture* 12 (1) : 69-73
23. Priyadarshani A. Khambalkar, P.S. Tomar and S.K. Verma (2012). Long-term effects of integrated nutrient Management on productivity and soil fertility in peralmillet (*Pennisetum glaucum*) – mustard (*Brassica juncea*) cropping sequence. *Indian Journal of Agronomy* 57(3): 222-228.
24. Pachori, Raman Kumar and Trivedi, S.K. (2011) Status of available micronutrient cations in soils of Shivpuri district, Madhya Pradesh. *Ann. Pl. Soil Res.* 13 (2) : 166-168.
25. Akhilesh Singh, G.S. Rajput, A.K. Bajpai and R.B. Singh (2012) Performance evaluation of a minor irrigation project. *IWRA (India) Journal.* Vol. 1 No. 1 Jan. 12.
26. Shashi S. Yadav, B.N. Swami, R.L. Shyampura and J.D. Gii (2011) Distribution of DTPA – extractable micronutrients in arid soils of western Rajasthan progressive Agriculture 2011, P 270-271.
27. Braj Kishor Rajput, Radha Krishna Sharma, S.K. Trivedi and D.S. Bhadauria – Status of DTPA extractable micronutrient cations under mustard growing area of northern Madhya Pradesh. 76th Annual convention: November 16-19, 2011, National seminar on developments in soil science 2011. (Abstracts of the 76th Annual convention)
28. Radha Krishna Sharma, S.K. Trivedi, Braj Kishor Rajput and Ankit Sharma – Sulphur Status and Their relationship with soil properties of Gird region of northern Madhya

- Pradesh. 76th Annual convention: November 16-19, 2011, National seminar on developments in soil science 2011. (Abstracts of the 76th Annual convention)
29. Khandwe Nanda, Ansar Nadaf and Sandeep Sharma (2011) Comparative efficacy of new and recommended insecticides against soybean defoliators and stem borers *JNKVV RES J* **45**(2): 162-167 (2011).
 30. Vyas M D , Rupendra Khandwe (2012). Effect of integrated nutrient management on system productivity of soybean –wheat cropping system in vindhyan platue of Madhya Pradesh. *Journal of Oil Seed Research* .**29**(1) 41-44.
 31. Parmar Dinesh and S.R. Ramgiry (2011) Identification of Major yield traits in advance breeding lines in Soybean (*Glycine max* (L.) Merrill.)
 32. Parmar Dinesh and S.R. Ramgiry (2011) Stability Analysis for Growth and Yield Attributes in Soybean (*Glycine max* (L.) Merrill.)
 33. Naruka,I.S., Singh, P.P., and Rathore, S.S.(2011). Suitability and adaptability of fenugreek (*Trigonella foenum-graecu*) genotypes under Malwa Plateau of Madhya Pradesh. *Journal of Medicinal and Aromatic Plant Sciences* **33** (3): 359-361.
 34. Jhankare, A., Tripathi, M. K., Tiwari, G., Pandey, G.N., Tiwari S. and Baghel, B.S.(2011). Plantlet regeneration from embryogenic cell suspension culture in ashwagandha (*Withania somnifera* (L.) Dunal.) *Indian J Plant Physiol* 16(2) NS: 174-178 .NAAS No.: I₀₅₅ & rating: 5.5
 35. Jhankare, A., Tiwari, G., Tripathi, M. K., Tiwari S. and Baghel, B.S (2011). Plant regeneration from mature cotyledon, embryo and hypocotyl explants of *Withania somnifera* (L.) Dunal *Journal of Agricultural Technology*. 7(4): 1021-1033. ISSN: 1686-9141, CAB full text Journal No. 238 & TCI impact.
 36. Jhankare, A., Tripathi, M. K., Tiwari, G., Pandey, G.N., Patel, R.P., Tiwari S. and Baghel, B.S.(2011) Development of resistant lines against leaf blight disease of [*Withania somnifera* (L.) Dunal.] caused by *Aternaria alternata* through *in vitro* selection. *Plant Cell Biotech. Mol. Biol.* 12(1-4): 21-30. ISSN: 1817-3721, SJR Indicator
 37. Tiwari S., Tripathi M. K. and Kumar, S.(2011) Improvement of soybean through plant tissue culture and genetic transformation: a review. *JNKVV Res. J.*45 (1):1-18. ISSN: 00213721). NAAS No.: J₀₀₁ & rating: 1.6 in 2012.
 38. D. Bele., Tripathi, M. K., Tiwari, G., Tiwari S. and Baghel, B.S.(2012) Microcloning of sandalwood (*Santalum album* Linn.) from cultured leaf discs. *Journal of Agricultural Technology*. 8(2): 571-583. ISSN: 1686-9141, CAB full text Journal No. 238 & TCI impact factor: 0.378 in 2010.
 39. M. Vibhute., Tripathi, M. K., Tiwari, R., Tiwari S. and Baghel, B.S.(2012) Interspecific morphogenic ability differences in citrus. *Journal of Agricultural Technology*. 8(2): 625-638. ISSN: 1686-9141, CAB full text Journal No. 238 & TCI impact factor: 0.378 in 2010.
 40. Bairwa S. K., Tripathi, M. K., Kushwah S.S., Tiwari S. and Baghel, B.S. (2012) Somatic embryogenesis and plantlet regeneration from embryogenic suspension culture in muskmelon (*Cucumis melo* L) *Indian journal of Horticulture* 69 (2): (in press) NAAS No.: I₀₄₆ & rating: 6.7 in 2012.

41. Verma, K.S., Kushwaha, S.S. and Uikey, V. (2011) Seed production of onion and post harvest nutrients status of soil as influenced with planting time and nutrient levels. *The Asian J. Hort.*, 6(1):231-235.
42. Verma, K.S., Kushwaha, S.S. and Singh O.P. (2011) Effect of time of planting and nutrient levels on seed quality of onion *Seed Research*, 39(1):34-40.
43. Kushwaha, S.S., Dwivedi, Y.C. and Jain, P.K. (2011) Effect of time of planting on growth, yield and economics of sweet potato under rainfed conditions. *Journal of Root Crops*, 37(2):189-191.
44. Kushwaha, S.S., Singh, O.P. and B.S. Gupta (2011) Evaluation of Potato-based crop sequences for crop diversification in Malwa region of Madhya Pradesh. *Journal of Horticulture Sciences*, 6(2):166-168

Research Papers Presented in Seminar / Symposia:

1. Singh P.P., Naruka I.S., and Kushwah S.S. (2011) Genetic variability for seed yield and its component characters in fenugreek (*Trigonella foenum graecum* L.). National symposium on Vegetable Biodiversity, Indian Society for Vegetable Science, April 4-5, 2011 JNKVV, Jabalpur.
2. Kushwah S.S., Verma K.S., Singh P.P. and Naruka I.S. (2011). Variability in growth and yield attributes among local collections of spine gourd (*Momordica dioica*). National symposium on Vegetable Biodiversity, Indian Society for Vegetable Science, April 4-5, 2011 JNKVV, Jabalpur.
3. Naruka I.S., Singh P.P., Barde Megha and Rathore S.S. (2012). Effect of Spacing and nitrogen levels on growth, yield and quality of Ajowan (*Trachyspermum ammi* L. sprague). National seminar on "Harnessing seed spices for better Socio economic well Being", NRCSS, Ajmer, 6-7 January, 2012.
4. Seyie, A., Naruka I.S., Singh P.P., Kushwah S.S. (2012). Nutrient management and cultivars effect on growth, yield and quality of ginger (*Zingiber officinale* R.). National seminar on Technologies for improving productivity of spices and plantation crops, Central Agricultural Research Institute Port Blair, 27-28 February, 2012.

Abstract in Seminar / Symposia:

1. Kushwaha, S.S., Verma, K.S. Singh, P.P. and Naruka, I.S. (2011). Variability in growth and yield attributes among local collections of spine gourd (*Momordica dioica*) Abstract published in National Symposium on Vegetable Biodiversity" organized by ISVS & IIVR, Varanasi and JNKVV, Jabalpur from 4-5 April, 2011 at JNKVV, Jabalpur. p.p. 21-22
2. Singh, P.P., Naruka, I.S. and Kushwaha, S.S. (2011). Genetic variability for seed yield and its component characters in fenugreek (*Trigonella foenum graecum* L.) Abstract published in National Symposium on Vegetable Biodiversity" organized by ISVS & IIVR, Varanasi and JNKVV, Jabalpur from 4-5 April, 2011 at JNKVV, Jabalpur. pp. 1-2.
3. Patel, R.P., Kushwaha, S.S. and Pandey, G.N. (2011). Powdery mildew (*Oidiopsis taurica* Brown) recorded on bell pepper (*Capsicum annum* var. *grossum*) under

naturally ventilated polyhouse in Mandsaur district, Malwa region of Madhya Pradesh. Abstract published in National Symposium on Vegetable Biodiversity” organized by ISVS & IIVR, Varanasi and JNKVV, Jabalpur from 4-5 April, 2011 at JNKVV, Jabalpur.p.p. 89-90.

4. Seyie, Azeze, Naruka, I.S., Singh, P.P. and Kushwaha, S.S. (2012). Nutrient management and cultivars effect on growth, yield and quality of ginger (*Zingiber officinale* R.) .In: Souvenir cum Abstract book of National seminar on Technologies for improving productivity of spices and plantation crops” organized by Central Agricultural Research Institute, Port Blair from 27-28 February 2012. pp 117-118.

Popular articles:

S.No	Title	Author	Year	Magazine/Journal
1.	Kakoda ki Unnat Kheti	S.S.Kushwaha and Krapal Singh Verma	2011	Phal Phool, Vol. 32(3):7-10
2.	Meethe gurhon se bhara kadwa karela	S.S.Kushwaha and Krapal Singh Verma	2011	Phal Phool, Vol. 32(5):20-28, 28
3.	Swad aur poustikta bhari pharas ki phalli	S.S.Kushwaha, Krapal Singh Verma and Ashish Kumar Daheriya	2011	Phal Phool, Vol. 33(3):3-7, 9
4.	Pyaj Sahaje Gunwata nikhare bharpur dam payen	R.P.Patel., R.N.Kanpure	2012	Bhumi nirman
5.	Lahsun de arthik sakun	I.S.Naruka, P.P.Singh, and R.P.Patel	2011	-
6.	Napha deti Aphim ke kheti	G.N.Pandey, R.P.Patel and G.S.Chundawat	2012	Bhumi Nirman
7.	Isabgol ki unnat kheti	R.P.Patel, G.N.Pandey and G.S.Chundawat	2012	Bhumi Nirman

VIII. HUMAN RESOURCE DEVELOPMENT:

42 scientists participated in different training programmes organized by ICAR and other Institute.

IX. VISITS ABROAD:

1. Dr. Ashok Saxena visited ICARDA, Aleppo, Syria to attend the specialized training programme on “Legume Crop Improvement” from 16.04.11 to 6.5.2011.
2. Dr. S.R. Ramgiry visited Brazil under Japan International Co-operation Agency for 15 days, 14-28 January 2012 to study soybean status in Brazil.
3. Dr. H.B.S. Bhadoriya, Professor visited Germany in 11.11.12 to 17.11.12
4. Dr.M.S.Parihar Associated Professor (Horticulture) as member of team from university visit ed Netherland for enhancing the Post graduate Studies of Horticultural crops between Netherland and RVSKVV, Gwalior from 1-7Sept. 2012.

X. DISTINGUISHED VISITORS

a. College of Agriculture, Gwalior

1. Dr. M.P. Thakur Dean, College of Agriculture, IG KVV, Raipur
2. Dr. Akhter Mabib Dean, PG Aligarh Muslim University Aligarh
3. Dr. Arvind Kumar, DDG (Edu.) ICAR, New Delhi,
4. Dr. N.N. Angiras, Professor & Head, HPKV, Palampur,
5. Dr. A.K. Somani, Director, CPRS, Gwalior
6. Dr. Jasti Prasad, Sr. Scientist, CRID Hydrabad.
7. Dr. S.K. Dubey – I/c SWC&TC, Agra.
8. Dr. V. K. Gupta, Dean, COA, Rajasthan.

b. College of Agriculture, Sehore

1. Dr. M.C. Saxena, Senior Advisor to DG, ICARDA, Aleppo, Syria
2. Dr. A. Sarkar, Coordinator, ICARDA South Asia and China Program.
3. Dr. V.S. Tomar, Vice Chancellor, RVSKVV, Gwalior
4. Dr. H.S. Yadav, DRS, RVSKVV, Gwalior
5. Dr. R. Vijay Kumar, Manager (Seeds) visited from 5-8 December, 2012 for monitoring of pigeonpea hybrid (RVICPH 2671) seed production in Madhya Pradesh.
6. Dr. RavindraBabu, Principal Scientist (S.K.Nagar, Gujrat) and Dr. Patel, Entomologist (S.K.Nagar, Gujrat) visited for monitoring of AICRP Pigeonpea program.

c. College of Agriculture, Khandwa

1. Honorable Vice Chancellor Dr. V.S. Tomar and Director Research Services Dr. H.S. Yadav, Visited Khandwa Campus on 22-06-2011.
2. Dean Faculty of Agriculture Dr. Y.M. Kool, visited Khandwa Campus on 10-02-2012.

d. College of Horticulture, Mandasaur

1. Honorable Vice Chancellor Dr. V.S. Tomar and Director Research Services Dr. H.S. Yadav Visited Mandasaur on June 2011 and August 2011 for Review Meeting & Monitoring of AICRP-STF (Grape).
2. Dr.H.P.Singh, DDG (Hort.), ICAR, New Delhi, visited Mandasaur on Aug.-2011 for Monitoring of AICRP-STF (Grape).
3. Dr.A.K. Mishra, Project Coordinator, AICRP-STF, Lucknow, visited on March-2012, for Monitoring of AICRP-STF (Grape).
4. Dr. S. Edison, Trivendrum, Former Director, CTCRI, Member of QRT, AICRP-M&AP, March -2012, for Monitoring of AICRP-M&AP.
5. Dr. S. K. Pareek, Retd.Pr. Scientist, NBPGR, New Delhi. March -2012, for Monitoring of AICRP-M&AP.