

# Annual Report

## 2012-2013



**Jawaharlal Nehru Krishi Vishwa Vidyalaya**  
**Jabalpur 482004 (M.P.), India**

# ANNUAL REPORT

**2012-2013**



**Jawaharlal Nehru Krishi Vishwa Vidyalaya  
Jabalpur 482004 (M.P.)**

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Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur 482 004 (M.P.)

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JNKVV, Jabalpur

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**Prof. Vijay Singh Tomar**  
Vice Chancellor



जिड्ड उडो नरुषड्ड फुतडुडुडु  
षडुडो फु, ईडुडुडु, िथू ४८२ ००४ ( . )  
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## FOREWORD

The Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur is playing a key role in making available the suitable package of practices, technology and advisories to the farmers of the State. The progress made in agricultural production by the farmers of Madhya Pradesh is reflected in the conferment of the Krishi Karman Award to the State twice.

The university is continuously making efforts to boost the agricultural production to meet the requirement of growing population. Development of high yielding varieties, conservation and propagation of medicinal & aromatic plants, production & distribution of bio-fertilizers, development of suitable plant production and protection packages, effect of climate change on agriculture, etc. are some of the frontier issues that have been taken on priority by the scientists of the university. Different research stations and Krishi Vigyan Kendra are catering to the agricultural needs of the farming community in diverse areas of the State.

The Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur has made successful efforts in the development of efficient human resources which are serving the nation and leading it on the path of success.

The activities of the university, during the year, have been briefly presented in this report. I hope, the university will continue & manifest its efforts in coming years towards enhanced agricultural production and in improving the socio-economic status of farmers of the State.

( V.S. Tomar )



**Dr. S.K. Shrivastava**  
Director Instruction



डिप्टी उडो-स्टुडिअर फुडिफुडिअर  
षडुओ फु, ईडिडि, िथू ६४८२ ००४ ( . .)

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## PREFACE

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur established in 1964 to strengthen teaching, research and extension activities. The scientists contributed significant work in all the disciplines. Efforts have been made to improve the teaching of students. The classroom facilities have been increased, smart classroom facility has also been extended. Besides excellent library facility, question bank prepared by the teachers have also been provided. Efforts have also been made to address the problems of farmers by the conducting the research and disseminating the technologies among farmers, through Krishi Vigyan Kendra. I hope the information given in the report will be useful to students, scientists, farmers and all concerned.

I express my gratitude to Hon'ble Vice Chancellor, Dr. V.S. Tomar, for his valuable guidance and encouragement in preparation of this report. I convey my thanks to the editorial committee who have contributed a lot in preparation of this report.

( S.K. Shrivastava )

# INTRODUCTION

---

Jawaharlal Nehru Krishi Vishwavidyalaya (JNKVV), Jabalpur was established in 1964, as the biggest multi-campus university, with an approach to narrow down the gap between the experts and farmers, through Joint Indo-American Team on Agricultural Research and Education in 1954-55 and 1959-60 on the patterns of Land Grant Colleges of USA. In subsequent years, the University had to part with its area of jurisdiction due to creation of sister universities - Indira Gandhi Krishi Vishwavidyalaya (IGKV) at Raipur in 1987, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior in 2008 and Nanaji Deshmukh Pashu Chikitsa Vigyan Vishwa Vidyalaya, Jabalpur in 2009.

The Central Administrative Office of the University is located about 7 km North of Jabalpur town on National Highway No. 7. At present, JNKVV encompasses five Colleges of Agriculture (Jabalpur, Rewa, Tikamgarh, Ganjbasoda and Waraseoni); one College of Agricultural Engineering (Jabalpur); 4 Zonal Agricultural Research Stations (ZARS) (Jabalpur, Powarkheda, Tikamgarh and Chhindwara); 4 Regional Agricultural Research Stations (Rewa, Sagar, Dindori and Waraseoni); 4 Agricultural Research Stations (ARS) (Naugaon, Garhakota, Sausar and Tendini) and 20 Krishi Vigyan Kendras (KVK) representing 6 agro-climatic zones spread over 25 districts.

JNKVV has produced competent human resource for managing the activities of agriculture and allied sectors, and the need based research and its rapid dissemination has led to several improved technologies, which have played important role for increased production and productivity of crops on sustainable basis, as reflected in 18.9 % growth rate in total agricultural food grain production during the year 2011-12 and 16.4 % during the year 2012-13 of the state of Madhya Pradesh. The State ranks first in production of pulses, second in production of oilseeds and third in production of cereals at national level. The state's contribution to the national food basket is about 11.2% (2012-13). The State received "Krishi Karman Award" at national level for two consecutive years, i.e. for the years 2011-12 and 2012-13.

The area covered by the University is not only large but also diversified. Since its establishment the university has made laudable progress and has come to the expectations of the people of the state by greatly benefiting the farming community.

The Vishwa Vidyalaya has been established with the following mission and mandate:

## **Mission**

To conduct education, research and



extension activities for enhancing productivity, profitability and sustainability of agricultural production systems and quality of rural livelihood in the state of Madhya Pradesh.

### Mandate

To serve as a centre of higher education and research in the field of agriculture and allied sciences and to disseminate technology to farmers, extension personnel and organizations engaged in agricultural development through various extension programmes.

### Major Events

- |      |   |      |  |
|------|---|------|--|
| 1963 | Establishment of University as per M.P. Legislative Assembly Act. No. 12 of 1963 and its notification in M.P. Gazzette of 25th May.   |      | Govind Narayan Singh the then Hon'ble Chief Minister of Madhya Pradesh on 12th January   |
| 1964 | Padma Bhusan (Late) Dr. J.S. Patel was appointed as first Vice Chancellor of the University in October.   | 1971 | Fourth Convocation of the University chaired by the then Vice Chancellor, Dr. L.S. Negi and addressed by the then His Excellency Governor of M.P. Dr. Satya Narayan Sinha on 12th April  |
| 1964 | Transfer of six Agriculture Colleges, two Veterinary Colleges and 19 Research Farms of Government of M.P. to Vishwa Vidyalaya   | 1973 | Fifth Convocation of the University, held at College of Agriculture, Indore and chaired by the then Vice Chancellor, Dr. Chandrika Thakur and addressed by the then His Excellency Governor of M.P. and Chancellor Dr. Satya Narayan Singh on 15th April                           |
| 1966 | Establishment of Faculty of Agricultural Engineering  | 1984 | Establishment of College of Veterinary Science and Animal Husbandry at Anjora District, Durg (now with IGKVV)  |
| 1967 | First Convocation of the University, Chaired by Dr. J.S. Patel, the then Vice Chancellor, JNKVV and addressed by Dr. V.K.R.V. Rao, Central Minister for Education and Human Resources on 10th January | 1987 | College of Agriculture at Khandwa and Mandsaur were established (now with RVSKVV)  |
| 1967 | Start of College of Agricultural Engineering, Jabalpur  | 1988 | The then Hon'ble Central Minister of State for Agriculture, Shri Harikrishna Shastri visited the Vishwa Vidyalaya  |
| 1969 | Second Convocation of the University, chaired by the then Vice Chancellor Dr. L.S. Negi and addressed by the then His Excellency Vice President of India, Dr. G.S. Pathak on 1st March                | 1988 | The undergraduate degree programme in Forestry started in College of Agriculture, Jabalpur   |
| 1970 | Third Convocation of the University, chaired by the then Vice Chancellor Dr. L.S. Negi and addressed by Shri  | 1989 | Silver Jubilee of the establishment of the University was celebrated on 2nd October. The then Chief Minister of M.P., Shri Motilal Vora and Minister for Agriculture, Shri Shivbhanu Singh Solanki were the Guests of Honour   |
|      |   | 1989 | Celebration of Nehru Centenary was held round the year   |
|      |   | 1997 | The then Prime Minister of India, Shri I.K. Gujral, the then Central Minister for Agriculture, Shri Chaturanand Mishra, the then His Excellency Governor of M.P., Shri Mohammad Shafi Qureshi and the then Chief Minister of M.P. Shri Digvijay Singh visited the Vishwa Vidyalaya |

- |      |  |      |   |
|------|--|------|---|
| 1999 | Golden Jubilee of College of Veterinary Science & Animal Husbandry, Jabalpur was celebrated  | 2007 | Establishment of College of Veterinary Science & A.H., Rewa   |
|      |  |      | Establishment of Dryland Horticulture Station at Garhakota  |
| 2000 | Golden Jubilee of College of Agriculture, Gwalior was celebrated (now with RVSKVV)   | 2008 | Creation of Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya at Gwalior by transfer of some Research Stations, Colleges and KVKs of JNKVV                           |
| 2001 | Sixth Convocation of the University, chaired by the then His Excellency Governor of M.P. Dr. Bhai Mahavir and addressed by the then Secretary, DARE and Director General, ICAR, Padma Bhusan Dr. R.S. Paroda on 10th April | 2009 | JNKVV hosted the AGRIUNISPORTS 2009, the mega event organized with splendid success   |
|      |  | 2009 | JNKVV organized ninth Convocation in October  |
| 2002 | Seventh Convocation of the University, presided by the then His Excellency Governor of M.P. and Chancellor of JNKVV, Dr. Bhai Mahavir, Dr. Sompal, Member, Planning Commission delivered the Convocation Address           | 2009 | Veterinary University created at Jabalpur and colleges of Veterinary Science & A.H. (Jabalpur & Rewa), under the jurisdiction of JNKVV, transferred to new university |
| 2002 | College of Agriculture, Mandsaur, converted into College of Horticulture (now with RVSKVV)   | 2010 | Tenth Convocation held on 25th June. Prof. Gurdev Singh Khush, Adjunct Professor, University of California, USA was delivered the Convocation Address                 |
| 2004 | College of Agriculture, Tikamgarh inaugurated by Hon'ble Chief Minister of Madhya Pradesh  | 2012 | Eleventh Convocation of the University held on May 5. Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR awarded D.Sc. Degree ( <i>Honoris Causa</i> )       |
| 2004 | Centenary Celebration of Zonal Agricultural Research Station, Powarkheda was held. Dr. Mangala Rai, Secretary, DARE and Director General, ICAR, New Delhi was the Chief Guest  | 2012 | Establishment of College of Agriculture at Waraseoni, Balaghat  |
| 2007 | Establishment of College of Agriculture, Ganjbasoda  |      |   |

## Members of the Statutory Bodies

### Members, Board of Management

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Vice Chancellor  
JNKVV, Jabalpur

Chief Secretary

Govt. of M.P.

Department of Farmer Welfare & Agriculture  
Development

Govt. of MP, Bhopal

Secretary

Finance Department

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Gwalior (M.P.)

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Guru Angad Dev Veterinary and A.H.

Vishwavidyalaya

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**Shri Subhash Bhatia**

R-65/A, Shakti Nagar, Gupteshwar

Jabalpur (M.P.)

**Shri Prabhashankar Shukla**

Associate Professor (Agril Engg.)

Govind Vallabh Pant Agriculture and

Proudyogiki V.V.

Dist.: Rudrapur, Pantnagar (Uttanchal)

**Shri Kedarnath Shukla**

M.L.A.

Distt. Sidhi (M.P.)

**Shri Narendra Tripathi**

M.L.A.

Gandhi Ward, Panagar

Jabalpur (M.P.)

**Shri Lakhan Ghanghoriya**

M.L.A.

Motilal Nehru Ward (Sarafa)

Jabalpur (M.P.)

**Dr. Pitam Chandra**

Director, Central Institute of Agricultural

Engineering (CIAE)

Bhopal (M.P.)

**Shri Rajesh Paliwal**

Registrar/Secretary

JNKVV, Jabalpur

### Members, Academic Council

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Dean Faculty of Agriculture

JNKVV, Jabalpur

**Dr. S.S. Tomar**

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JNKVV, Jabalpur

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**Dr. A.S. Tiwari**

Retd. Dean Faculty of Agriculture (JNKVV)

Gwalior

**Dr. K.K. Saxena**

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**Dr. T.K. Bhattacharya**

Dean, Faculty of Agricultural Engineering

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JNKVV, Jabalpur

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Deptt. of SWE, JNKVV, Jabalpur

**Shri Rajesh Paliwal**  
Registrar  
JNKVV, Jabalpur

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**Dr. K.K. Saxena**  
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**Dr. N.N. Pathak**  
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**Dr. P.K. Bisen**  
Dean Student Welfare  
JNKVV, Jabalpur

**Dr. T.K. Bhattacharya**  
Dean Faculty of Agricultural Engineering  
JNKVV, Jabalpur

**Dr. R.S. Khamparia**  
Dean, College of Agriculture  
JNKVV, Jabalpur

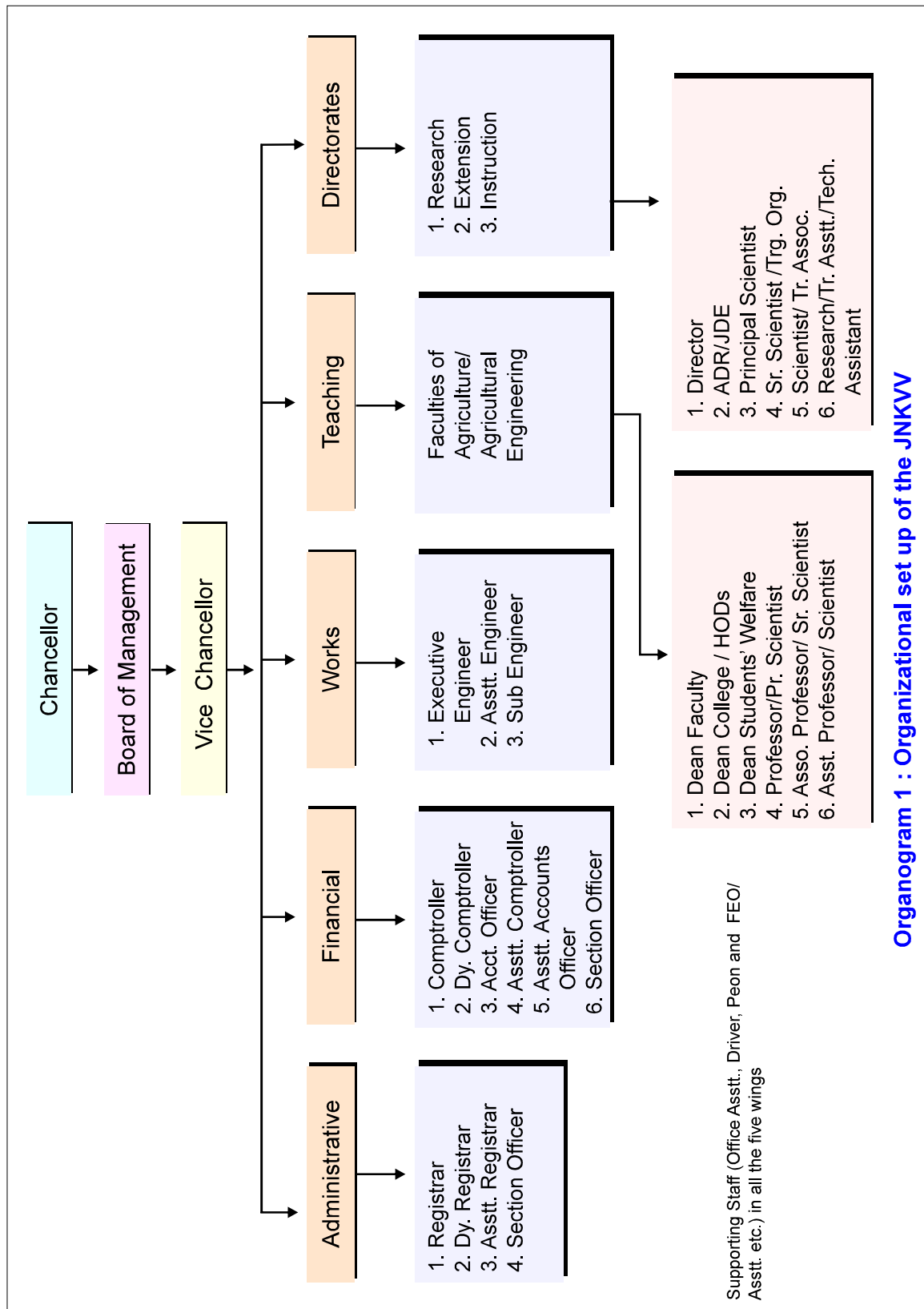
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Professor & Head (Agronomy)  
College of Agriculture Jabalpur

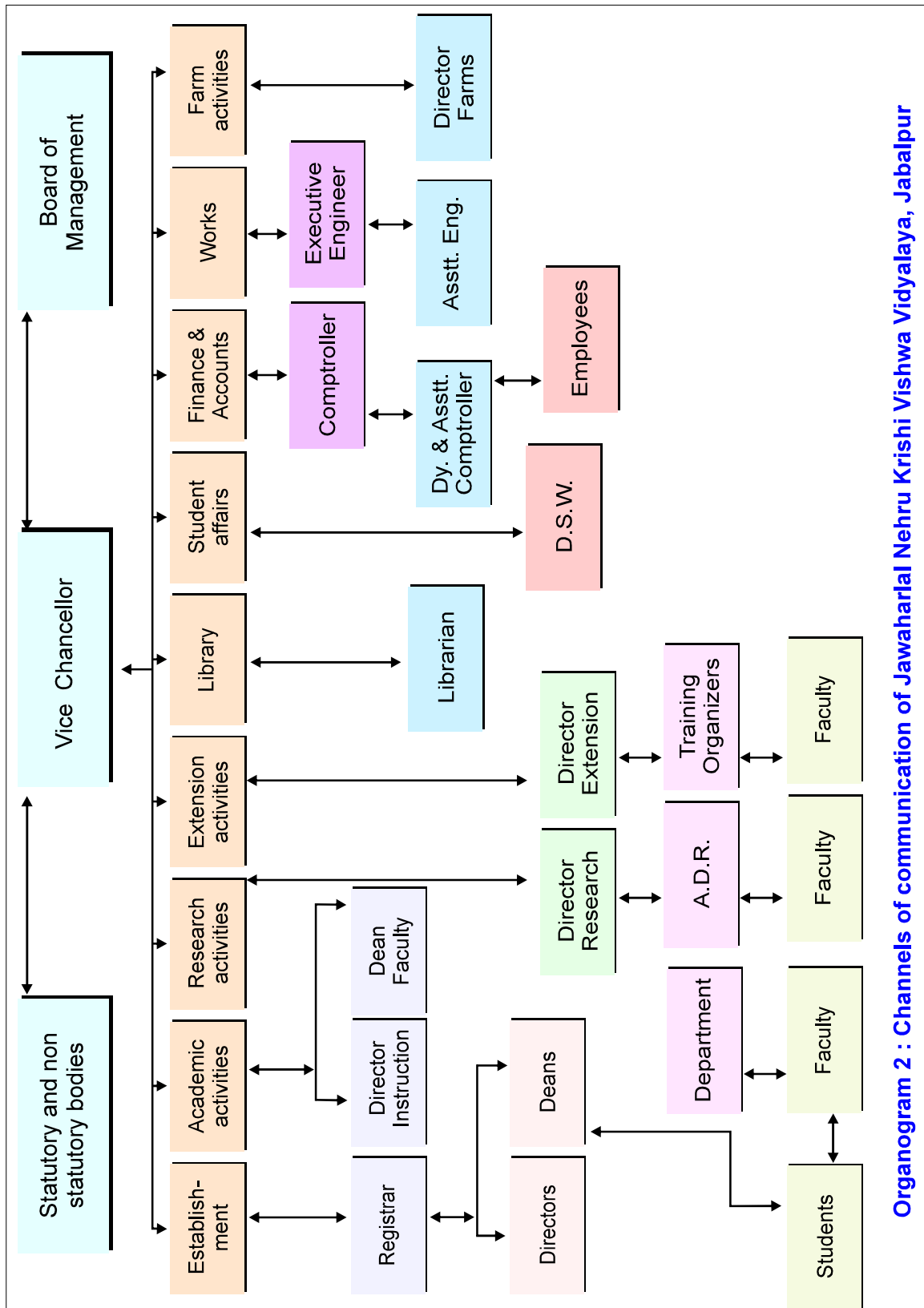
**Dr. N.K. Khare**  
Professor & Head (Extension Education)  
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**Dr. A.K. Shrivastava**  
Professor & Head (Farm Machinery & Power)  
College of Agril. Engg., JNKVV, Jabalpur

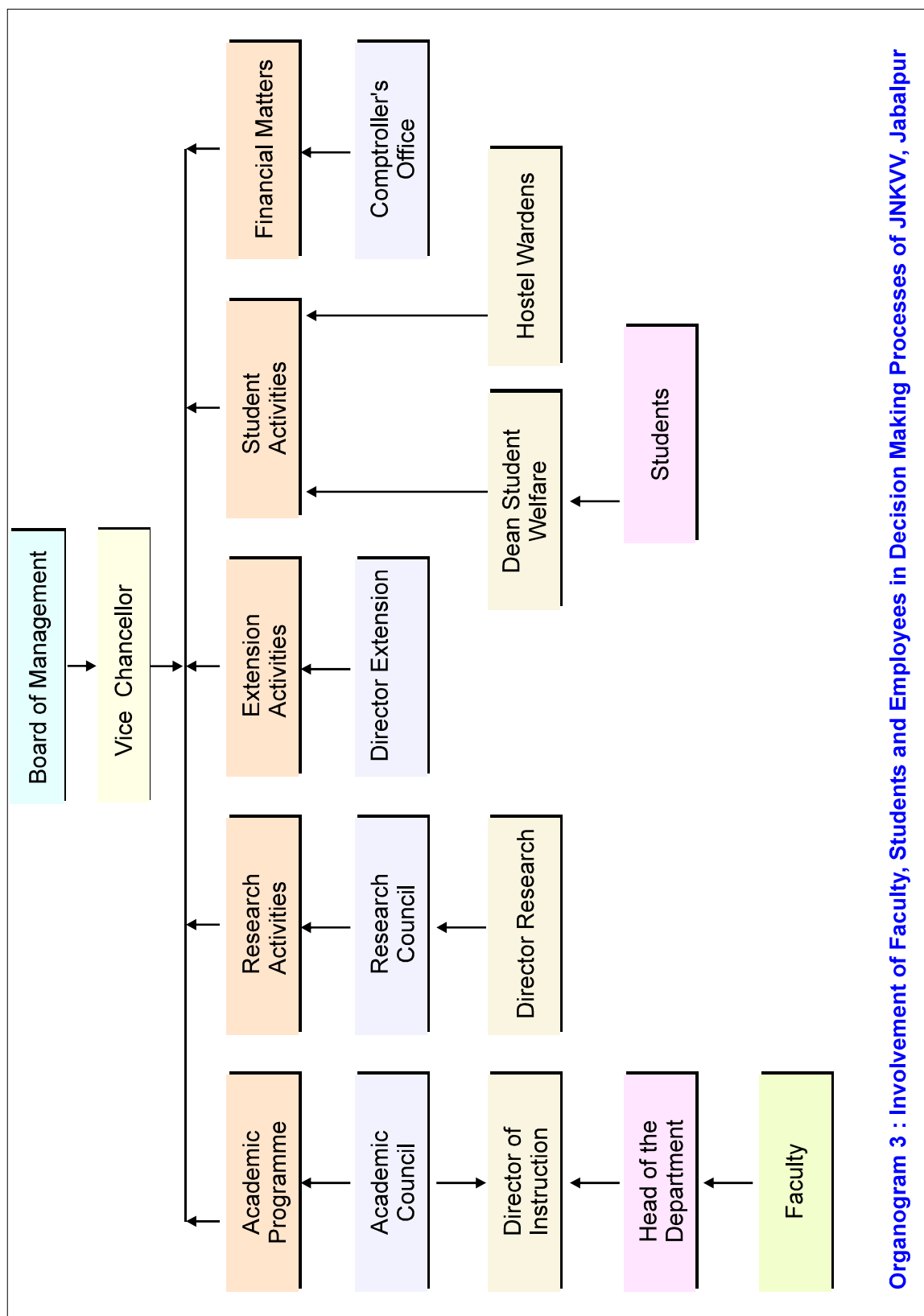
**Shri N.P. Singh**  
Comptroller  
JNKVV, Jabalpur

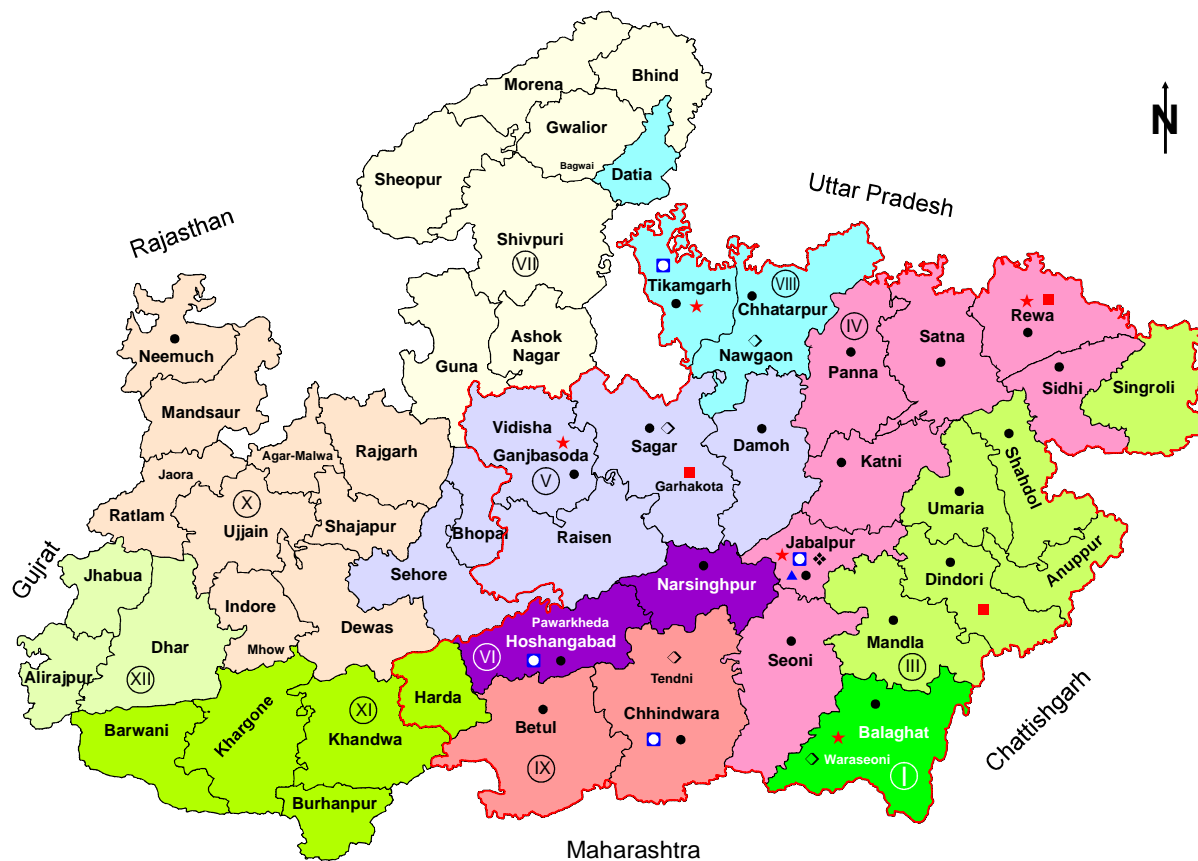
**Shri Rajesh Paliwal**  
Registrar  
JNKVV, Jabalpur





Organogram 2 : Channels of communication of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur





(Districts under JNKVV jurisdiction - encircled by red colour boundary)

AGROCLIMATIC ZONE	
I. CHHATTISGARH PLAINS	
III. NORTHERN HILLS ZONE OF CHHATTISGARH	
IV. KYMORE PLATEAU AND SATPURA HILLS	
V. VINDHYA PLATEAU	
VI. CENTRAL NARMADA VALLEY	
VII. GIRD ZONE	
IX. SATPURA PLATEAU	
X. MALWA PLATEAU	
XI. NIMAR VALLEY	
XII. JHABUA HILLS	

College Research Stations & KVKs	
◆ MAIN CAMPUS	
★ AGRICULTURE COLLEGE	
■ HORTICULTURE COLLEGE	
▲ AGRIL. ENGINEERING COLLEGE	
□ ZONAL AGRIL. RES. STATION	
■ REGIONAL AGRIL. RES. STATION	
◇ AGRIL. RES. STATION	
● KRISHI VIGYAN KENDRA	

### Agroclimate Zones of Madhya Pradesh Colleges, Research Station and KVK's of JNKVV



## EDUCATION

---

Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), Jabalpur named after Pt. Jawaharlal Nehru, the architect of modern India, came into existence on October 2, 1964. JNKVV is the State Agriculture University in Madhya Pradesh managing research, extension and education in agricultural and allied sciences.

JNKVV was inaugurated by Late Smt. Indira Gandhi, the then Minister of Broadcasting, Govt. of India, in 1964, with an integrated mandate of teaching, research and extension. Though the Vishwa Vidyalaya was formally inaugurated on 2nd October 1964, most of its constituent colleges and research stations are quite old.

### 2. Academic programmes

JNKVV has been seat of Agro-Technology and Human Resource Development in Central India. Its prime mission is to impart education in agriculture and its allied sciences so as to provide human resource for meeting the future challenges. The University has two Faculties viz. Agriculture (five constituent colleges at Jabalpur, Rewa, Tikamgarh, Ganj Basoda and Balaghat) and Agricultural Engineering (Jabalpur) with 13 and 5 departments, respectively.

#### 2.1. Academic institutions and programmes at a glance

The University offers three Bachelor's

Degree programmes viz. B.Sc. (Ag.), B.Sc. (Forestry) and B.Tech. (Agricultural Engg). The Masters' Degree programmes are available in thirteen departments under Agriculture Faculty and in three departments in the Faculty of Agricultural Engineering. The programme on Master of Agri-Business Management is also available under Agriculture Faculty. Doctoral degree programmes are available in ten departments of Agriculture Faculty and in three departments of Agril. Engineering Faculty.

In addition the University has also started diploma courses in Horticulture on (1) Seed Production and (2) Nursery Management, at Horticulture Vocational Education Institute, Rangua, Garhakota, District Sagar, from the academic session 2008-09. The Diploma courses are of two years duration (4 semesters) with a capacity of 40 students in each course.

Various colleges of the University imparting education are mentioned in Table 2.1.1 The University has two Faculties viz. Agriculture and Agricultural Engineering. The degrees granted include B.Sc. (Ag.), B.Sc. (Forestry), B. Tech. (Agricultural Engineering), M.Sc. (Ag.), M.Sc. (Forestry), M. Tech. (Agricultural Engineering) and Ph.D. in two Faculties.

The location and year of establishment of the Colleges of JNKVV are presented in Table 2.1.1.

**Table 2.1.1: Location and year of establishment of colleges of JNKVV**

<b>Name of college and location</b>	<b>Year of establishment</b>
<b>Faculty of Agriculture</b>	
College of Agriculture, Jabalpur	1955
College of Agriculture, Rewa	1955
College of Agriculture, Tikamgarh	2004
College of Agriculture, Ganjbasoda	2007
College of Agriculture, Waraseoni	2012
<b>Faculty of Agricultural Engineering</b>	
College of Agricultural Engineering, Jabalpur	1966

**Various degree programmes offered at different colleges****Table 2.1.2: Details of the colleges**

<b>Name of the college with location</b>	<b>Degree programmes offered</b>
<b>College of Agriculture, Jabalpur</b>	<b>i) B.Sc. (Ag.)</b>
	<b>ii) B.Sc. (Forestry)</b>
	<b>iii) M.Sc. (Ag.)</b>
	1. Agronomy
	2. Extension Education
	3. Entomology
	4. Agriculture Economics and F.M.
	5. Genetics & Plant Breeding
	6. Plant Pathology
	7. Soil Science & Agril. Chemistry
	8. Fruit Science
	9. Vegetable Science
	10. Plant Physiology
	11. Agricultural Statistics
	12. Molecular Biology & Biotechnology
	13. Food Technology
	<b>M.Sc. (Forestry)</b>
	1. Agroforestry
	2. Plantation Technology
	<b>M.B.A. (Agri-Business Management)</b>
	<b>iv) Ph.D. (Ag.)</b>
	1. Agronomy
	2. Entomology
	3. Genetics & Plant Breeding
	4. Soil Science & Agril. Chemistry
	5. Plant Pathology
	6. Agriculture Economics and F.M.
	7. Extension Education
	8. Fruit Science
	9. Vegetable Science
	10. Molecular Biology & Biotechnology
	<b>v) Ph.D. (Forestry)</b>
	1. Agroforestry

**College of Agriculture, Rewa**

- |                                   |                              |
|-----------------------------------|------------------------------|
|                                   | <b>i) B.Sc. (Ag.)</b>        |
|                                   | <b>ii) M.Sc. (Ag.)</b>       |
| 1. Agronomy                       | 5. Genetics & Plant breeding |
| 2. Extension Education            | 6. Plant Pathology           |
| 3. Entomology                     | 7. Fruit Science             |
| 4. Agriculture Economics and F.M. | 8. Vegetable Science         |
|                                   | <b>iii) Ph.D. (Ag.)</b>      |
| 1. Genetics & Plant Breeding      |                              |

**College of Agriculture, Tikamgarh**

- |                        |                                  |
|------------------------|----------------------------------|
|                        | <b>i) B.Sc. (Ag.)</b>            |
|                        | <b>ii) M.Sc. (Ag.)</b>           |
| 1. Agronomy            | 4. Vegetable Science             |
| 2. Extension Education | 5. Plant Pathology               |
| 3. Entomology          | 6. Agricultural Economics & F.M. |

**College of Agriculture, Ganjbasoda (Vidisha)**

- |                       |
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| <b>i) B.Sc. (Ag.)</b> |
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**College of Agriculture, Waraseoni (Balaghat)**

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| <b>i) B.Sc. (Ag.)</b> |
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**College of Agricultural Engineering, Jabalpur**

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| <b>i) B.Tech. (Agril. Engg.)</b>             |
| <b>ii) M.Tech. (Agril. Engg.)</b>            |
| 1. Farm Machinery and Power Engineering      |
| 2. Soil and Water Engineering                |
| 3. Post Harvest Process and Food Engineering |

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|----------------------------------|
| <b>iii) Ph.D. (Agril. Engg.)</b> |
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| 1. Farm Machinery and Power Engineering      |
| 2. Soil and Water Engineering                |
| 3. Post Harvest Process and Food Engineering |

**2.2 Admission**

candidates, in accordance with the rules laid down by the Government for permanent residents of Madhya Pradesh State.

**2.2.1 U.G. Programme**

Admission to undergraduate degree programmes is through entrance test conducted by Professional Examination Board, Bhopal. The availability of seats under different UG/ PG / Ph.D. programmes is mentioned in Table 2.2.1.1. Fifty per cent of seats are reserved for various reserve categories of

**2.2.2 Postgraduate degree programmes**

The Director Instruction co-ordinates the entire postgraduate programmes of the University. The Director recommends the constitution of an Advisory Committee of each post graduate student admitted in the

**Table 2.2.1.1 Availability of seats in different programmes at JNKVV under the Faculty of Agriculture and Agricultural Engineering**

Programmes	Intake capacity				
	Free	ICAR	Payment	NRI	Total
B.Sc (Ag.)	240	36	48	12	336
B.Sc (Forestry)	20	3	4	1	28
M.Sc (Ag. / Forestry)	156	38	140	-	334
M.B.A. (Agri Business)	15	-	15	-	30
Ph.D.	32	7	24	-	63
B. Tech.	60	9	12	3	84
M. Tech.	18	3	18	2	41
Ph.D.	12	2	12	1	27

University based on the proposal of the respective Head of the Department. The Director scrutinizes the plan of work of each postgraduate student in his programme of study including thesis-research undertaken by the student for the degree programme. The Director of Instruction also recommends the appointment of external examiner, for evaluating the thesis of every postgraduate student. The Registrar issues the notification regarding the declaration of results and the award of the Degree.

The Advisory Committee is constituted for each student, drawn from different faculties depending on the research topic. Inter campus movement is also allowed to the students for the conduct of their research for utilizing the expertise and infrastructure facilities available. Inter disciplinary approach is adopted in post graduate programmes and the students register courses of other disciplines also. Six new non-credit courses have also been introduced from 2009-10, as proposed by ICAR.

#### **2.2.2.1 Thesis evaluation**

Every student admitted to the PG programme in the University, is required to submit a thesis towards partial fulfillment of the PG programme. The thesis of the student should be of such a nature as to indicate the student's potentiality for conducting research. The thesis is on a topic falling within the field of

major subject and contains the result of the students' own work. A certificate to this effect duly endorsed by the Professor and Head and the major advisor accompanies the thesis at the time of submission for evaluation by the external examiner.

#### **2.2.2.2 Inter institutional collaboration of the PG programme**

The University has established close linkages with other national and international research institutes in conducting collaborative research programmes at Post Graduate level. In these programmes, Post Graduate students complete their course work at JNKVV and carry out theses research work at other institutes. Institutes at which students have conducted their theses research include International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi; International Crop Research Institute for Semi Arid Tropics (ICRISAT), Patancheru, Hyderabad (Andhra Pradesh), Directorate of Weed Science Research (DWSR) Jabalpur, Bhabha Atomic Research Centre (BARC), Central Institute for Cotton Research (CICR), Nagpur (Maharashtra) and Goat and Sheep Research Institute, etc. The University has signed MoUs with various research organizations and private institutes e.g. Jain Irrigations Pvt. Ltd., etc. to conduct collaborative research in various fields of agriculture and agricultural engineering.

### 2.3 Upgradation of teaching facilities

Under the one time catch up grant received from ICAR, works on renovation/modernization of class rooms, laboratories, hostels, departments, library and other teaching facilities have been carried out at all the campy.

### 2.4 Human Resource Development

Human Resource Development is one of the most important functions of the University. Since its establishment, the University has produced 16,628 Graduates and 7,092 Post Graduates (till 2010-11 academic sessions) who are rendering their valuable services in the field of agriculture and allied sectors in the country and abroad. In addition, the University has awarded one year diploma to 56 women who were appointed as Rural Extension Officers by the Government of Madhya Pradesh under a programme funded by the Danish International Development Agency (DANIDA) aimed at providing knowledge and skills of improved agricultural technology to the farm women. The quality education is the top most priority with main thrust on improving the infrastructure and teaching capabilities of the faculty. All the constituent colleges are equipped with adequate facilities to carry out teaching and research activities. However there is need to upgrade the teaching and research facilities at Agriculture College Tikamgarh and Agriculture College, Ganj Basoda.

### 2.5 Development of educational museum

Educational Museum is being developed with the financial help of ICAR, New Delhi. The building of the museum has been constructed. Its phase wise planning is in progress. The museum will contain theme-wise historical agricultural events.

### 2.6 Centre of Advanced Faculty Training (CAFT)

Indian Council of Agricultural Research, New Delhi has recognized the Department of

Soil Science & Agricultural Chemistry, College of Agriculture, Jabalpur as Centre of Advanced Faculty Training, Erstwhile Centre of Advanced Studies (CAS) in Soil Science & Agricultural Chemistry is functioning since 1995. The centre is engaged in organizing training programmes, in which scientists / teachers from different States participate and update their knowledge and skill. In all, these training programmes besides JNKVV trainers, eminent scientists and resource persons from other universities and subject matter specialists from various fields of specialization are invited to deliver lectures.

### 2.7 Instructional material and practical manuals

Various question banks, practical manuals, thesis preparation manual and course material of advanced nature has been developed by the teachers of the University.

### 2.8 Books and book chapter

- | Atul K, Shrivastava et al. 2012. Tractor drawn raised bed seed drill under vertisol, paper published in Agricultural Mechanization in Asia, Africa and Latin America (AMA), Tokyo.
- | Bhale MS and Gaur A. 2012. Seed Borne Diseases of Field Crops and their Management. Agrobios (India), Jodhpur, India. 445p. (ISBN 978-81-7754-476-3).
- | Bhatnagar RK 2013. Book in Hindi on "Mrida Parikshan (Soil Testing)" (ISBN - 13 - 978 -81 - 81922279 -0-0), published by Krishi Sodh Prakashan.
- | Bharadwaj DN edited book on "Berseem" Breeding of field crops, Agrobiosis (Jodhpur) India.
- | Gontia AS and Rao S. 2012. Glossary of Plant Physiology. Publisher- Satish serial publishing house, New Delhi.
- | Gupta, Om and Babbar, A. 2012. Abiotic stresses in pulses, opportunities and management options Chapter No. 16 in book entitled Green Agriculture; Newer Technologies, edited by Dr. Kambaska Bahera published by New India Publishing

- Agency, New Delhi (ISBN No. 978-93-81450-27-7).
- | Gupta PK and Bhale U. 2012. Potential threats of seed associated pathogens in major oilseeds crops. Pp.353-364. In seed borne diseases of field crops and their management book edited by Bhale and Gour. Agrobios (India), Jodhpur . 446p.
  - | Jaga PK. 2012. Handbook of Soil Science published by Diwa Prakashan, T.T. Nagar, Bhopal.
  - | Khare MN, Tiwari SP and Sangvikar R. 2012. Botanicals in crop disease control in Modern Trends in Microbial Diversity of Natural Ecosystem. Eds. Sinha A, Sharma, BK and Shrivastava M, Biotech Books, New Delhi. pp 455-491.
  - | Khare MN and Tiwari SP. 2012. Approaches for health management of planting material in ornamentals. In: Modern Trends in Microbial Diversity of Natural Ecosystem. Eds. Sinha, A., Sharma, B.K. and Shrivastava, M., Biotech Books, New Delhi. pp 431-444.
  - | Khare, MN, Bhale MS and Shrivastava DK 2011. Rules and regulations governing quality seed production, seed law enforcement and penalties on contravene. In seed Technology and Quality Control (Eds. Trivedi, PC) Pointer Publishers, Jaipur, Rajasthan. pp.1-22
  - | Koutu GK Shastri PP, Mishra DK and Mandloi KC, 2012. Hand Book of Cotton , Published by Studium Press, Pvt. Ltd., New Delhi.
  - | Kumar A, Govil M, Mahajan G, SinghTK, Akhtar J and Khan Z. 2012. Trichoderma, a biocontrol agent for plant disease management under organic agriculture in book "Reshaping Technology for Agricultural Development" edited by Kumar S and Prasad B.
  - | Kumar A, Govil M, Mahajan G, SinghTK, Akhtar J and Khan Z. 2013. Tricoderma: a bio agent for plant disease management under organic agriculture. Reshaping Technology for Agricultural Development. Satish Serial Publishing House, New Delhi (ISBN 9789381226506) .
  - | Kurmvanshi SM. 2012. Management of agriculture resources in India, book chapter published in the book Bio-resources Management in India, Ed.
  - | Mehta CR, Nair R and Gupta M. 2013. Engineering interventions for climate resilient agriculture. In: Conservation agriculture - an Indian perspective, edited by Somasundaram et al. NIPA, India.
  - | Mishra DK, Khare D, Bhale MS and Koutu GK. 2012. A Handbook of Seed Certification. Agro bios (India), Jodhpur, India. 249p. (ISBN 978-81-7754-459-6).
  - | Namdev GP, Mawase S, Sarawgi AK & Dhakad KS. 2012. "Impact of System of Rice intensification (SRI) method of rice cultivation in Income generation" Published by Search and Research Development Society, Bhopal, 2012, page. 16
  - | Nema S, Khare C P, Shrivastava JN and Yadav VK. 2012. Sesame Diseases: Current Status and their Management. In Recent Trends in Plant Diseases management in India. Eds. Shahid Ahamad, Published by Kalyani Publishers, Ludhiana. pp 195-209.
  - | Perraju P, Gupta AK, Singh AK, Jha G and Singh RP. 2011. Upland Rice in Madhya Pradesh. In: Upland Rice in India. Edited by Singh. R.K., N.P. Mandal., C.V. Singh. and M.S. Ananta. Scientific Publishers.
  - | Sai Prasad AV, Singh GP, Shukla RS, Divya Ambati published book on Plant Breeding by New Vishals Publication, New Delhi.
  - | Sanjeev K and Bhale U. 2012. Management of seed associated diseases through physical methods. pp.381-387. In: Seed borne diseases of field crops and their management. Prof. M.N. Khare festschrift Volume. Eds. Bhale MS and Gour Ashok. Agrobios (India), Jodhpur. 446p.
  - | Sharma AK, Barche S and Mishra PK. 2013. Scope of light trap as IPM tool for sustainable cultivation chapter No. 12 in Book entitled " Modern biotechnology and its applications" PART 1 by K.K. Behera, published by New India Publishing Agency, New Delhi
  - | Shiv R, Tiwari VN and Ram T. 2013.

Management of Plant Genetic Resources for Precision Farming pp 59-78 In: Precision Farming : A new approach. Eds. Tulasa Ram et al.; Published by Daya Publication House, New Delhi(India)

- | Singh M, Wanjare RH, Dwivedi AK and Dalal R. 2012. Yield response to applied nutrients in 33 years old Soybean - Wheat experiment on a vertisol. Expt Agric. Cambridge University Press.12: 1-15:951-955, July-September, 2012.
- | Tabbasum A, Bhale U and Rangnatha ARG. 2012. Cercospora leaf spot of sesame. pp.237-242. In: Seed borne diseases of field crops and their management. Eds. Bhale MS and Gour Ashok. Agrobios (India), Jodhpur .446p
- | Tiwari SP and Khare MN. 2012. Diversity of nematodes and their problem in Agroecology. In Microbial: Diversity and Functions. Eds Bhagyaraj, D.S., Tilak, K.V.B., and Kehri, H.K. New India Publishing House, New Delhi. pp.185-200.
- | Tiwari SP. 2012. Detection of nematodes through molecular techniques. In: Seed borne diseases of field crops and their management. Eds. Bhale, MS and Gaur, A. Agrobios (India), Jodhpur, pp 63-74.
- | Tiwari SP. 2012. Wheat seed gall nematodes: *Anguina tritici* (Steinbuch, 1797). In: Seed borne diseases of field crops and their management. Eds. Bhale, M.S and Gaur, A. Agrobios (India), Jodhpur, pp 113-122.
- | Tripathi AN, Sharma P, Agrawal PC, Tripathi SK, Singh US, Khetrapal RK and Satpathy S. 2013. Aflatoxins: threat for agricultural trade and food security in biotechnological approaches in crop protection. pp263-298, Biotech Books.
- | Tripathi SK, Nema S, Tiwari RK and Rao SK. 2013. Fungicide resistance and their management in biotechnological approaches in crop protection. pp263-298, Biotech Books.
- | Tripathi AN, Agarwal PC, Hazarika BN, Tripathi SK, Tripathi RK Gotyal B.S. and V. Ramesh Babu. 2012. The biology, epidemiology and management of rice Tungro disease. In: Innovative approaches

in plant disease management, LAP Lambert Academic Publishing House. pp. 306-323.

## 2.9 Audio-visual aids for smart e-classroom

Different colleges of the University have been equipped with modern audio-visual aids and possess smart e-classrooms.

## 2.10 Video conferencing system: distance learning education

Video conferencing units have been installed at JNKVV headquarters and other colleges and are in use in various lectures for simultaneous delivery at other colleges.

## 2.11 Efforts made in the personality development of students including those belonging to weaker sections

- | Book bank facility is provided to all the students including students belonging to weaker sections.
- | A tutorial cell is established by the Dean Students Welfare office for the students of SC/ST and weaker sections. Main objective behind establishment of cell is to provide proper guidance and prepare students for graduation and post graduation level courses in Agriculture. Large number of books and study material related to competitive examinations are available in this cell which includes books published from ICAR, question banks related to various national level competitive examinations, question papers of previous years along with large number of collection of books of CD's containing matter on agriculture science.
- | English and general knowledge coaching started at all the colleges of agriculture for personality development of students belonging to weaker sections and reserve categories for carrier building preparation of competitive examinations and to develop entrepreneurship.
- | Debate/script writing competitions are organized at all the colleges of agriculture

for promoting the students for the skill development.

## 2.12 Examination cell / education technology cell / placement cell and allied facilities

- | Examination cell and education technology cell have been updated with modern amenities, safe drinking water facility with water coolers, photocopier, computers and modern furniture etc.
- | Facility of LCD projector is made available in all the classrooms and the conference halls of all the colleges and biotechnology center.
- | To improve education facilities, flip charts, exhibition panels, display boards, ceramic green chalk boards, data sign boards, lecture stand, magazine displayer, glass wares, chemicals and tools were purchased under Development Grant in various colleges.
- | Examination evaluation cell and academic cell have been established in all the colleges.
- | Use of multimedia viz LCD for PG teaching and conducting PG seminar of M.Sc. students at all the colleges.
- | The Placement Cell counsels students on the availability of scholarships and avenues for higher studies.
- | Books for general knowledge and competitive examinations are purchased for SC/ST and weaker section students.
- | Placement cell and counseling cell have been established and students are benefited through placements in various organizations viz. Bank of India, Union Bank of India, Private organization and Semi Govt. organizations.

## 2.13 Entrepreneurship skills developed under experiential learning and its impact on real professional lives of students

- | Experiential learning programme is going well in all the colleges.

- | A plant tissue culture lab for large-scale planting material production has been established at newly constructed Seed Technology building. Students produce tissue culture plants and learn entrepreneurship skills and professionalism.
- | Seed production programme was undertaken at college of agriculture, Rewa under entrepreneurship skill development programme for the benefit of students.
- | Three proposals of Experiential Learning, sanctioned by ICAR namely, i) hands-on training on fruits and vegetable processing, ii) hands-on training on plant tissue culture, and iii) hands-on training on mass production of bio agents and bio-pesticides are functioning well.
- | Under Experiential Learning on Visual and Graphics Communication, a computer lab with state-of-the-art technology equipments was established for 32 students. The main objective of the programme is to train the students through experiential learning so that they may be able to identify, select and use the visuals and graphic communication in series or in combination according to the requirement of the subject. The specific objectives are - to make students aware of the technical know-how of different visual and graphic aids, to provide expertise and practical exposure in handling operation of visuals and graphic aids in actual fields condition and to commercialize the visual and graphics communication aids.



Inauguration of Experiential Learning lab by Hon'ble State Agriculture Minister, Dr. Ram Krishna Kusmaria



## 2.14 Capacity building and faculty development of teachers / technical and administrative staff

### 2.14.1 Training programmes attended by scientists

- | Dr. S.D. Upadhyaya and Dr. A.B. Tiwari attended training on "Good agricultural and collection practices for medicinal and aromatic plants" scheduled from 25-29 Sep. 2012 at Anand, Gujarat.
- | Dr. S.P. Singh attended training on vital role of women in vegetable production during 20-23 Nov. 2012 at G.B. Pant University Pantnagar.
- | Dr. A.K. Shrivastava attended training on "Statistical models for forecasting in agriculture" during September 11 to October 1, 2012 at Indian Agricultural Statistics Research Institute, ICAR, New Delhi
- | Dr. Seema Naberia attended 21 days winter school on Entrepreneurship opportunities in agricultural mechanization, scheduled from 20 Nov-10 Dec. 2012 at Bhopal, organized by Central Institute of Agricultural Engineering, Bhopal (M.P.).
- | Dr. Deep Singh Sasode attended 21 days winter school on Technopreneurship opportunities in agricultural mechanization scheduled from 20 Nov-10 Dec. 2012 at Bhopal, organized by Central Institute of Agricultural Engineering, Bhopal (M.P.)
- | Dr. Yogesh Patel attended 21 days winter school on Integrated pest and disease management, scheduled from 4-24 June 2012, organized by Deptt. of Entomology, College of Agriculture, JNKVV.
- | Dr. P.K. Jaga and attended 21 days Summer school on Engg. intervention of conservation agriculture for enhancing agriculture productivity and climate change schedule from 22.6.2012 to 12.7.2012 at CIAE, Bhopal (MP).
- | Dr. S.K. Sharma attended 21 days Summer

school on engineering intervention of conservation agriculture for enhancing agriculture productivity and climate change schedule from 22.6.2012 to 12.7.2012 at CIAE, Bhopal (MP).

### 2.14.2 Meetings, seminars and conferences attended

- | Dr. V.K. Shukla, Principal Scientist attended workshop cum consultant meet of Network project on organic farming at Assam (Jorhat) of AICRP on cropping system.
- | Dr. A.K. Jha and Dr. S.K. Billaiya attended Workshop of AICRP on Forage crops during 2013 at JNKVV, Jabalpur.
- | Dr. A.K. Jha, Scientist attended 10 days training on weed science at DWSR, Jabalpur
- | Dr. S.B. Das, Professor attended National Seminar on Modernization and Monitoring of Irrigated Commands during 21-22 November, 2012 at J.N. Krishi Vishwa Vidyalaya, Jabalpur.
- | Dr. Om Gupta, Dr. Anita Babbar, Dr. A.K. Bhowmick, Dr. Suneeta Pandey and Dr. Sunil Pandey attended workshop at GBPUA&T, Pantnagar from 1-3 September 2012.
- | Dr. D. Khare and Dr. M.S. Bhale attended workshop at GAU, Anand from 14-16 April 2012.
- | Dr. Yogendra Singh attended workshop at NRCPB New Delhi from 4-24 December 2012.
- | Scientist participated in XXI Group Meeting of AICRP on medicinal & aromatic plants and betelvine AT TNAU, Coimbatore (on 23 - 26 September 2013).
- | Dr. (Smt.) S. Rao, Dr. A.S. Gontia, Dr. S.D. Upadhyaya, Dr. S.K. Dwivedi, Dr. R.K. Samaiya, Dr. A.B. Tiwari and Dr. (Smt). A. Upadhyay attended 5th World Ayurveda Congress and Arogya Expo December 2012 at Bhopal during 7-10 Dec. 2012.
- | Dr. S.K. Dwivedi, Professor & PI, NAE on

MAPs attended Final Review meeting of Niche Area of Excellence in MAP ICAR New Delhi during 26 October 2012.

- | Dr. S.D. Upadhyaya, Professor attended 25th annual group meeting cum workshop on AICRP in Agro forestry during 19-21, May 2012 at JNKVV, Jabalpur.
- | Dr. S.K. Dwivedi, Professor attended workshop on climate change and livelihood options in Bundelkhand Region at KVK, Tikamgarh during 12-14 May, 2012.
- | Dr. A.K. Rawat, Dr. N.K. Khamparia and Dr. S.D. Sawarkar attended QRT meeting for AINP on SBB project at MPUA & T, Udaipur (Raj.) during 20-22 September 2012.
- | Dr. B. Sachidanand, S.S. Baghel and Dr. A.K. Upadhyay, Dr. H.K. Rai and Dr. P.S. Kulhare attended QRT meeting for AICRP on STCR project at MPUA&T, Udaipur (Raj.) during 20-22 September 2012.
- | Dr. N.K. Khamparia and Dr. S.D. Sawarkar attended QRT meeting for AICRP on LTFE project at MPUA&T, Udaipur (Raj.) during 20-22 September 2012.
- | Dr. S.K. Tripathi, Dr. I.M. Khan, Dr. P. Perraju and Dr. M.R. Dhingra attended rice group meeting cum workshop at Directorate of rice research, Rajendra Nagar, Hyderabad during 8-11 April 2012.
- | Dr. B.M. Mourya, Principal Scientist CSRP attended XXX biennial workshop IFS held at ICAR, Research complex Goa during 16-19 November, 2012.

#### **2.14.3 Papers presented in conferences/seminars**

- | Dr. A.N. Shrivastava presented their research papers in the world soybean research conference (WSRC) organized at Durban, South Africa from 17-22 February 2013, a global meet of soybean researchers, industrialists, farmers, administrators and students.
- | Ms. Stuti Mishra presented poster and oral presentation in the International Conference on "Development and prosperity of nation through young minds: Dr.

Kalam's India Vision-2020 at Bhopal (M.P.) India during 12-13 December 2012.

- | A. Kumar, Ashish, Sahu, Tarendra, Bhalla, Atul, Jain, A.K. and S.K. Tripathi presented paper on Morphological characterization and antagonistic behavior *Trichoderma* spp from Madhya Pradesh. in 34th Annual conference and symposium Crop disease management: Challenges 21-23 January, 2013 Organized by Department of Plant Pathology, N.M. College of Agriculture Navsari, Gujarat and Indian Society of Mycology and Plant Pathology, Udaipur.
- | A.K. Jain, A. Kumar, S.K. Tripathi and A. Tiwari presented a paper on Studies on prevalence, identification of resistant sources and influence of sowing dates on incidence of head smut in Kodo Millet in 34th Annual conference and symposium Crop disease management challenges 21-23 January, 2013 organized by Department of Plant Pathology, N.M. College of Agriculture Navsari Gujarat and Indian Society of Mycology and Plant Pathology, Udaipur.
- | S.K. Tripathi, A.K. Jain and A. Kumar presented paper on Management of leaf blast of rice through bio pesticides in Madhya Pradesh in the national symposium on "Blending Conventional and Modern Plant pathology for sustainable Agriculture" at Indian Institute of Horticultural Research Bangalore 4-6 December 2012 organized by Indian Phytopathological Society, IARI, New Delhi.
- | S. K. Tripathi, A. K. Jain and A. Kumar and R.K. Tiwari presented a paper on Structural and Biochemical mechanism of leaf blast of rice caused by *Pyricularia grisea* and their management in 15th Indian agriculture Scientist and farmers Congress on Agriculture and Global change on 22-24 February 2013 held at Vigyan Bhavan University, Allahabad.
- | S.K. Tripathi and R. K. Tiwari 2013 Invitee paper presented on Integrated management of rice in Madhya Pradesh in National seminar on biodiversity held in New Science College, Rewa.

- | S.D. Upadhyay, G. Swarnalata, A.S. Gontia, A. Nayak, P. Sagar and A. Singh, (2012) presented a research paper presented on "Influence of date of sowing on biochemical parameters and yield of Chandrasur" during "5th World Ayurveda Congress and Arogya Expo" held at Bhopal during 7-10 December, 2012.
- | S.K. Dwivedi, N. Singh Keer, Anubha Upadhyay, Preeti Sagar Nayak and R.K. Samaiya presented a research paper on "Influence of organic chemicals and integrated nutrient management on biochemical parameters of Isabgol (*Plantago ovate* Forsk) in 5th World Ayurveda Congress & Arogya Expo 7-10 December 2012, Bhopal.
- | R.K. Samaiya, D. Nigam, S.K. Dwivedi, Anubha Upadhyay and Preeti Sagar Nayak presented research paper on "Response of Isabgol (*Plantago ovate* Forsk) genotypes for biochemical parameters under different dates of sowing" 5th World Ayurveda Congress & Arogya Expo 7-10 Deember. 2012, Bhopal Madhya Pradesh India pg. 346.
- | K. Basanti, S.D. Upadhyaya, A. Upadhyay, Archana and Priti Sagar Nayak paper presented on Influence of soil moisture stress on morpho-physiological parameters and productivity of Kalmegh (*Andrographis paniculata* Burm. F.) in 5th World Ayurveda Congress held at Bhopal, M.P., 7-10 December, 2012.
- | V.K. Garg, Y. Patel, S.K. Garg, G. Tiwari and V.B Upadhyay presented a paper on New occurrence of rice grasshopper, *Hierogluphus nigroriplectus* Boliver on lentil *Lens esculenta* in Vindhyan plateau of M.P. in national seminar on "Modernization and monitoring of irrigated commands". 21-22 November, 2012, CAE, JNKVV, Jabalpur (MP).
- | S.K. Garg, D.K. Verma, V.K. Garg, G. Tiwari, and V.B Upadhyay 2012 presented a research paper on "Employment generation in rural sector of Madhya Pradesh through Post Harvest processing" in national seminar on "Modernization and Monitoring of Irrigated commands". 21-22 November, 2012, CAE, JNKVV, Jabalpur (MP).
- | Y. Patel, V.K. Garg, P.K Jaga and V.B. Upadhyay, presented a paper on Eco-friendly, cost effective IPM technology for soybean in Vidisha district of Madhya Pradesh in "Modernization and monitoring of irrigated commands" 21-22 November, 2012, CAE, JNKVV, Jabalpur (MP).
- | G.Tiwari, S.K. Garg, D.K. Verma, V.K. Garg, and B.R. Pandey presented a paper on "Prospect of medicinal and aromatic plant cultivation in Halali command area of Vidisha (MP) presented in national seminar on "Modernization and Monitoring of Irrigated commands". 21-22 November, 2012, CAE, JNKVV, Jabalpur (MP).
- | PK Jaga and VB Upadhyay presented a paper on "Potassium nutrition for crop and soil health in National Seminar on strategies to rationalize and reduce consumption on water soluble phosphorus and potassium in the country to minimize import" held from 18-19 December, 2012 at IISS, Bhopal (MP).
- | A.K. Jain, A. Kumar, S.K. Tripathi and A. Tiwari presented a paper "Studies on prevalence, identification of resistant sources and influence of sowing dates on incidence of head smut in Kodo Millet" in 34th annual conference and symposium Crop disease management Challenges, 21-23 January 2013, organized by Department of Plant pathology N. M College of Agriculture Navsari Gujarat and Indian Society of Mycology and Plant Pathology, Udaipur .
- | S.K. Tripathi, A.K Jain and A. Kumar presented a paper on "Management of leaf blast of rice through bio pesticides in Madhya Pradesh" in the national symposium on "Blending conventional and modern plant pathology for sustainable agriculture" at Indian Institute of Horticultural Research Bangalore 4-6 December, 2012 organized by Indian Phytopathological Society, IARI ,New Delhi.
- | S.K. Tripathi, A.K. Jain, A. Kumar and R.K. Tiwari presented Paper on Structural and Biochemical mechanism of leaf blast of rice caused by *Pyricularia grisea* and their management in 15th Indian Agriculture Scientist and farmers Congress on

Agriculture and Global change on 22-24 February, 2013 held at Vigyan Bhavan, University of Allahabad.

#### 2.14.4 Seminar/ symposium/ conferences/ training/ workshops organized

- | One day teachers orientation training programme was organized by the Department of Extension Education under the chairmanship of Dean Faculty of Agriculture and Dean, College of Agriculture, Jabalpur in the month of June to give detail information of the RAWE programme 2012-13. The teachers were exposed with the rules and regulation of the programme. Distributed manuals and other proforma to the staff/scientists who attended the orientation programme.
- | Two days training/workshop was organized from 10-11 October 2012 at 1 signal training core-Army vocational training centre at Batra auditorium on "Mushroom production technology". About 250 army personnel and women participated.
- | Six training programmes were organized by the Department of Plant Physiology, Jabalpur during the year 2012-2013 and

180 trainees actively participated in various training programmes under project entitled "Facilitation center on medicinal plants".

- | Department of Plant Physiology, Jabalpur organized a workshop-cum-exhibition on Commercial cultivation, value addition and marketing of medicinal and aromatic plants", in which 50 participants were benefitted.
- | Trainings imparted on Medicinal and Aromatic Plants given to various beneficiaries by the Department of Plant Physiology, Jabalpur.
- | Farmers and WUA members training "Unnat sinchai technique dwara sabji, fasal evam jal utpadakta me vradhdhi." was organised at village-Karonda Khurd under Ghatara command area on 31 January, 2013.
- | Farmers and WUA members training "Fasal utpadan evam samrakhan technique dwara jal utpadakta me vradhdhi " was organised at Village-Daud Basoda under Jajon Tank area on 21 February, 2013.
- | Two days "Madhya Pradesh Water Sector Restructuring Project" training organized on "Jal utpadakta badhane hetu unnat fasal



National Seminar



MPWSRP Training



Trainings imparted on MAPs to various beneficiaries

utpadan technique" for the WUA members, Agril. Field Officers and farmers of the project site command area on 22-23 March, 2013 at College of Agriculture , GanjBasoda, Vidisha.

- I Department of Soil and Water Engineering Organized National Seminar on "Modernization and monitoring of irrigated commands" from 21-22 November, 2012

#### 2.14.5 Scientists visited abroad

- I Dr. (Mrs.) Anita Babbar, Principal Scientist attended Integrated Breeding Multi Year Course (IB-MYC) scheduled from 15-27 October 2012 in Wageningen, Netherland under Generation Challenge Programme.
- I Shri R.S. Marabi, Assistant Professor, Deptt.of Entomology, Jabalpur attended an international resource and development training course on "Integrated Pest Management from 30 April to 23 May, 2012 at CINADCO's Training Centre, Volcani Agricultural Complex, Israel. Organized by ministry of foreign affairs Israel's Agency for International Development Cooperation, MASHAV.
- I Dr. R.P. Joshi, Senior Scientist, Plant Breeding and Genetics, College of Agriculture, Rewa visited Brazil under JICA Project for soybean cultivation from 17 January to 2 February 2013.

#### 2.14.6 Awards received by the teachers/scientists/students

- I Dr. Usha Bhale, Priyanka Dubey and S.P. Tiwari received Best Paper Award in 2012 on Genetic resources of okra for the utilization in the management of okra yellow vein mosaic disease under climatic condition of Kymore Plateau Zone of Madhya Pradesh in National Symposium on Vegetable Biodiversity jointly organized by ISVS, Varanasi, JNKVV, Jabalpur and IIVR, Varanasi.
- I Dr. R.S. Shukla, Principal Scientist (Wheat) honored for development of wheat variety



MP 3288 during 51st All India Wheat Workshop held at SKRAU, Agricultural Research Station, Durgapura, Jaipur held from 24-27 August, 2012.

- I Ms. Stuti Mishra, AICRP on Soybean was awarded with Best Poster Presentation Award & Best Oral Paper Presentation Award in the international conference on "Development and prosperity of nation through young minds" Dr. Kalam's India Vision-2020 Bhopal (M.P.) India Dec 2012 for the paper "Heat tolerance in agricultural crops: step against climate", from 12-13 December 2012.
- I Dr. P.K. Jaga received "Bharat Siksha Ratan Award-2013" for outstanding individual achievement and distinguished service to the nation on "individual contribution for social and economic growth, held on 15 February 2013 at Deputy Speaker Hall, New Delhi.
- I Dr I.M. Khan, Principal Scientist, Plant Physiology, received Best Oral Presentation Award in the National Symposium on "Climate change and Indian



agriculture"(CCIA-2013) at CRIDA, Hyderabad on 23 January 2013.

- I Dr. G.K. Koutu, Principal Scientist (Plant Breeding & Genetics), JNKVV, Jabalpur



has been awarded with Best Worker Awarded by Hon'ble Vice Chancellor, JNKVV, Jabalpur for his outstanding contribution in Agriculture research. The award carried cash amount of Rs. 10,000, memento and citation.

## 2.15 Students educational tours

### College of Agriculture, Rewa

**Production Group** of students visited various places during 15-21 February 2013.

- | GB Pant Agriculture University, Pantnagar
- | Indian Institute of Sugarcane Research Centre, Lucknow (U.P.),
- | Indian Agricultural Research Institute, New Delhi
- | Agra Agriculture University, Agra.

**Protection group** students visited various places during 5-12 March, 2013.

1. IISR, CISH, Lucknow. (U.P.)
2. Govind Ballabh Pany University, Pantnagar
3. Almora
4. Institute of Vegetable Research, Izatnagar, Bareilly
5. Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

### College of Agriculture, Tikamgarh

students visited various places during 20-29 March, 2013.

- | CSA University of Agri. & Technology, Kanpur
- | Indian Institute of Pulse Research,

- Kanpur
- | Oilseed Centre, Kanpur
- | Central Soil Salinity Research Institute - Regional Research Station (CSSRI-RRS), Lucknow
- | Indian Institute of Sugarcane Research, Lucknow
- | National Bureau of Fish Genetic Resources, Lucknow
- | G.B. Pant University of Ag. & Technology, Pant Nagar
- | National Institute of Cold Water fisheries, Nainital
- | CSWCRTI, Dehradun
- | Forest Research Institute, Dehradun
- | Lal Bahadur Shastri National Academy of Administration, Mussoorie
- | Centre for Potato Research Institute, Kufri and Karlog
- | Indian Agricultural Research Institute, New Delhi
- | Indian Council of Agricultural Research, New Delhi
- | National Agricultural Science Complex, New Delhi
- | RVSKVV, Gwalior

## 2.16 Fellowships / scholarships

Students of JNKVV perform well in various competitive examinations and are awarded fellowships. The scholarships awarded to the students during academic session 2012-13.

National Talent Scholarship	46
Junior Research Fellowship	02
Merit-cum-means	01
Merit Scholarship	97
<b>Total:</b>	<b>146</b>



Educational tour of students of College of Agriculture, Rewa

## 2.17 Rural Agricultural Work Experience (RAWE) and Forestry Work Experience

Rural Agricultural Work Experience (RAWE) Programme has been of great importance for the outgoing students of B.Sc. (Ag). It is compulsory and essential for degree requirement at B.Sc. (Ag.)

level.

JNKVV Jabalpur has introduced Rural Agricultural Work Experience (RAWE) programme during the year 2012-13 as an essential requirement for B.Sc. (Ag). The Dean's Site selection Committee visited the villages under ZARS and KVKs on schedule time to ensure the

S.No.	Name of the College	Total Number	Placement Centre
1.	College of Agriculture, Jabalpur	89	ZARS, Chhindwara 14 Girls KVK, Betul 11 Girls KVK, Seoni 12 Girls KVK, Dindori 18 Boys KVK, Mandla 18 Boys KVK, Narsingpur 16 Boys
2.	College of Agriculture, Rewa	77	KVK, Panna 17 Boys KVK, Sidhi 21 Girls KVK, Shahdol 20 Boys KVK, Umariya 19 Boys
3.	College of Agriculture, Tikamgarh	33	KVK, Navgaon 33 Boys & Girls
4	College of Agriculture, Ganj Basoda	44	KVK, Powarkheda 22 Boys KVK, Harda 20 Boys KVK, Chhatarpur 02 Girls
4.	Department of Forestry, Jabalpur	14	KVK, Seoni 14 Boys & Girls
<b>Total</b>		<b>259</b>	

level. This programme has provided ample opportunities for the final year students in relation to living and working in the village, interacting with the villagers and helping them to learn and gain first hand experiences in the application of agricultural technologies on farmer's fields and understanding of the location specific needs at the house hold

availability of the basic living facilities like food, water etc. in the village or nearby area. Orientation programme of one week was arranged for all the registered students. The concerned course teachers provided orientation to the students for specified day in their respective subject as per the guidelines given in the manual.



The programme was implemented in all the College of Agriculture viz Jabalpur, Rewa, Tikamgarh, Ganjbasoda, and Department of Forestry, Jabalpur. During the year, total 259 final year students of B.Sc. (Ag.) & Forestry have been placed in various Krishi Vigyan Kendra & Zonal Agriculture Research Station of the Vishwa Vidyalaya.

Rural Agriculture Work Experience Programme has been implemented in adopted villages under the guidance and close supervision of KVKs. The main activities have been undertaken by the students focused on intensive observation and analysis of socio-economic and technological profile of farm families in rural areas, conducting need based extension activities and obtaining field experiences through participatory extension approach. The students got opportunities to acquaint themselves with the different farming situations, farm practices adopted by the farmers as well as interacting with the farmers for identification of the needs & problems. The suggestions have been also offered by the students for betterment in the existing socio economic and technological conditions of the farmers. As the result, students developed their confidence in applying the communication and technological skills during the course of the studies. The students have also acquired skills in gaining experience and proper understanding of host farmers and of the concerned farming community.

## 2.18 Visit of dignitaries

- | Dr. Hans-Joachim Braun, Director Global wheat programme and CIMMYT scientist visited the experimental field.

- | Dr. H.S. Gupta, Director IARI, visited the dual purpose fodder wheat (VL 616) on 6 April, 2012
- | Dr. A.K. Singh, DDG, Natural Resource Management (ICAR), visited the AICRP on forage crop.
- | Dr. J.P. Singh, Programme Facilitator, PDFSR, Modipuram, Meerut along with IFS main center Scientists visited main, sub centers (Rewa and Powarkheda) and ECF centers (Katni and Dindori) during 20-23 March, 2012
- | Dr. R.K. Pathak, Ex. Director CISH, Lucknow, visited JNKVV.
- | Director of CIMMYT, Mexico visited JNKVV, wheat Farm
- | Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR, New Delhi visited JNKVV.
- | Dr. S.K. Dhyani, Director, NRCAF (ICAR), Jhansi (M.P.) and Shubhranshu Shekhar, Field Advisor, ATMA Munjar, Bihar visited medicinal and aromatic garden, Department of Physiology, Jabalpur during 2012-13.
- | Dr. R.K. Pathak delivering lecture on "Organic farming principles and farm management system", at Vivekanand Hall, COA, Jabalpur on 15 May 2012.

## 2.19 Central library

The Central Library, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Jabalpur





(M.P.), is an essential constituent of the Vishwa Vidyalaya's mandates. The Central Library of JNKVV is one of the major Agricultural Libraries of Central India. The main activity of library is collection, compilation, tabulation, classifying, accessioning, cataloguing and indexing of all types of reading material related to agriculture and allied fields. Theses and books, annual reports, journals, periodicals etc were also processed. About 300 post graduate and doctoral theses are added to the collection of Central Library, every year. The registered users (faculty, staff and students) are given facilities of borrowing books available in the library where they can get the book issued for a fixed period and then return it or renew it. Students in particular are given special facility of Book Bank where the students are provided books for one semester at a 10% price of book. A separate Book Bank for SC/ST students is also available. 1100 books were purchased during the financial year 2012-13. An amount of rupees fifty to sixty thousand is collected from book bank scheme.

An amount of Rs. 5019665.00 (Rs. Fifty Lakhs Nineteen thousand six Hundred and Sixty Five Only) was received under the budget head C-2(Res.) ICAR P-384-Library Strengthening of Agril Universities vide letter Endt.No.EFP-4/P-384/Libr. Strengthening/933 dated 30th March 2013 during the financial year 2012-2013. The amount was utilized for strengthening library facilities at four agricultural colleges (College of Agriculture, Jabalpur, Rewa, Tikamgarh and Gangbasoda) and one agricultural engineering college at Jabalpur.

Amenities are being created in the central library and constituent libraries to provide better facilities for reading to the students, faculty and readers. Civil work is a necessity and has to be done on priority basis to increase the life of the building, waterproofing is essential to prevent leakage and seepage from side walls, which in turns creates dampness and spoils the reading material. Repairing and replacement of doors and windows is essential

to ensure safety and security of library holdings. Renovation of electrical items will provide better lighting and air circulation to create congenial atmosphere for using the library facilities. It will also ensure the long life and safety of equipments like photocopier, UPS etc. which run on electricity.

The strength of UG, PG and PhD students is increasing every year. Also the numbers of colleges are also increasing and hence furniture and allied items are being procured for proper storage of reading material like Textbooks/ Reference Books/General Books/ Advances/Journals/Dictionaries/ Encyclopedias/Book Series/Annual Reviews/ Monographs/ Serials/ Reading Material and others items. Various newspapers are subscribed for current awareness and newspaper stands are being procured. Notices regarding current opening, conferences/seminars, training etc are displayed on the notice board located in library. Due to increase in strength of students more chairs and reading tables are being procured to accommodate them.

## 2.20 Publications

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## RESEARCH

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State of Madhya Pradesh has witnessed the spectacular growth rate in recent years. This could have been possible due to availability of quality seeds of high yielding varieties with matching technologies for efficient use of nutrient, water and effective management practices for biotic and abiotic stresses and has been reflected in prestigious Krishi Karman award conferred to the State of Madhya Pradesh for highest growth in food grain production. At national level the Madhya Pradesh is having crowning position in production of chickpea, soybean, total oilseeds and pulses. The State ranks second in mustard production at national level. Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV) holds the flagship of revolution in agriculture and allied sciences. It has been the architect of yellow revolution in Central India. For sustainable and incremental development the science needs pace, understanding and effective transmission of information to the end users.

The Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur has following research stations:

### **Zonal Agricultural Research Stations**

1. Head quarter - Directorate of Research

- Services, JNKVV, Jabalpur - 482004
2. Powarkheda, Hoshangabad - 461 110
3. Kundeshwar Farm, Tikamgarh - 472 001
4. Chandangaon, Chhindwara - 480 001

### **Regional Agricultural Research Stations**

1. Kuthulia Farm, Rewa - 486 001
2. Bamhori Farm, Sagar - 470 002
3. Murjhar Farm, Waraseoni, distt. Balaghat
4. Tribal Agricultural Research Station, Dindori - 481 881

### **Agricultural Research Stations**

1. JNKVV Betelvine Research Station, Navgaon, Chhatarpur
2. Dryland Horticultural Research Station, Rangan, Garhakota, Tehsil - Rehli, Distt. Sagar
3. ARS, Tendani, Distt. Chhindwara
4. ARS, Sausar, Distt. Chhindwara

Considering the available potentials, the multi disciplinary research of applied nature is being conducted on natural resources management, crop improvement, crop production, crop protection, horticultural crops, allied enterprises, post harvest technology, farm machinery, energy utilization and socio-economic aspects. Well-equipped and mechanized farms, workshops, laboratories,

agro-met service centers, glass and net houses, library, ARIS-Cell with latest information and communication technology strengthen the research activities of the university. As on date All India Coordinated Research projects, ICAR Network projects, ad-hoc research projects, State Plan and non plan projects, Madhya Pradesh Mandi funded projects, Madhya Pradesh Council of Science & Technology projects, other externally funded projects and Govt of India Projects (Agro-Economic Research Center, CCS, RKVY, FSM, NHM etc), are in operation to carry out the research work in agriculture and allied fields, besides extending product testing facility to corporate sector.

The thrust of research in the Vishwa Vidyalaya continues to be on the evolution of improved crop varieties having resistance/tolerance to biotic and abiotic stresses and development of need based location specific improved technologies to meet out the challenges of climate change and changing demand pattern of agricultural products. New research programmes are also formulated after reviewing the current programme linking to priority of agriculture sector of the state. The Vishwa Vidyalaya is also concentrating on frontier areas of research such as biotechnology and molecular biology, agro-forestry, bio-energetic, organic farming including biological control of pests and diseases, bio-fertilizers, plasticulture, natural resource management, crop improvement, cropping system, food processing and post harvest technology, Hi-tech horticulture, medicinal and aromatic plants, agricultural machinery and allied aspects and integrated farming system approach and conservation agriculture etc.

The university has emerged as a leading research organization having a major stake in the agricultural development of the state. Presently university is looking after the

research need of the farmers of the State and out of eleven agro-climatic zones following agro-climatic zones and the districts under each zone come under the jurisdiction of JNKVV, Jabalpur.

1. Chhattisgarh Plain (Balaghat district only).
2. Northern Hill Zone of Chhattisgarh (Mandla, Dindori, Shahdol, Annupur, Umaria)
3. Kaymore Plateau & Satpura Hills (Jabalpur, Katni, Seoni, Panna, Rewa, Sidhi, Singhroli & Satna).
4. Vindhyan Plateau- Partially (Sagar, Damoh, Raisen & Vidisha districts only)
5. Central Narmada Valley (Narsinghpur, Hoshangabad & Harda)
6. Bundelkhand Zone- Partially (Tikamgarh & Chhatarpur)
7. Satpura Plateau (Betul & Chhindwara)

### 3.1 Varieties released and identified

#### Wheat

**MP 3336** released by Central Varietal Release Committee, New Delhi during August 2012. It matures in 95-105 days, semi dwarf, good tillering, bold and shiny grains with better Chapati making quality, rich in micro nutrients, tolerant to terminal heat and disease of wheat. Gives 48 to 52 q. ha<sup>-1</sup> yield, suitable for irrigated late sown condition of Central zone covering Gujarat, Madhya Pradesh, Chhattisgarh, Kota and Udaipur districts of Rajasthan and Jhansi district of Uttar Pradesh.

**MP 3288** recently released by CVRC, semi





erect plant, dark green foliage, bold and shining grain, early maturing, tolerance to terminal heat, resistance to disease, yield 47-50q ha<sup>-1</sup>.

### Kodo

**JK-98** released by SVRC. It matures in 104 days. Plants are 60 cm in height, erect, semi compact, dense ears, grain brown. Moderately resistant to head smut and resistant to shoot fly. Suitable for sole and intercropping. Yield potential is 25q ha<sup>-1</sup> under rainfed conditions of Madhya Pradesh.

### Kodo millet

**DPS 9-1** matures in 95-100 days. Plants are 60 cm in height, compact ears, grain brown. Moderately tolerant to shoot fly and grain smut. Moderately tolerant to drought. Yield potential is 27-30q ha<sup>-1</sup>. This variety has been identified by CVRC in 2011. It is a potential variety.

### Rice bean Fodder

**JRB J05-2 (Raj moong)** is a rice bean variety and has been developed from selection of local material obtained from adjoining areas of Dindori. It is a semi erect variety with the green fodder yield of 280-310q ha<sup>-1</sup>, 55-63q ha<sup>-1</sup> dry matter yield and 14.8 % crude protein. The seed yield is about 5-6 q ha<sup>-1</sup>. This variety has been identified by CVRC in 2011. It is a potential crop variety for lean period.

### Crop Improvement

#### Wheat

**JW 3304** early wheat tolerant to terminal heat

suitable under late sown irrigated condition will be proposed for Identification in coming workshop of wheat (2012).

**MP 3353** a semi dwarf wheat promoted from NIVT- 3 to AVT (IRLS).

### Rice

- I Conversion breeding for diversification of CMS sources and development of new CMS lines using agronomically superior identified maintainers having high grain quality with high yield potential.
- I Conversion breeding for the improvement of identified NPT (indica-japonica derived) restorer lines has already been initiated.

### Assessment of genetic purity of rice hybrids using molecular markers

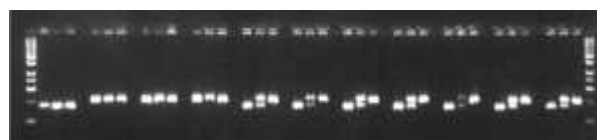
Identified markers for different varieties are as follows

JRH-8 :RM 6100, 208, 19, 164, 234

JRH-12 :RM 6100, 171, 202, 234

JRH-5 :RM 423, 19 and 202

KRH-2 :RM 490, 223, 317, 21



- I Conversion breeding for the improvement of identified NPT ( indica-japonica derived) restorer lines has already been initiated. The material is in BC3 stage. The selection in F2 population made last year were further evaluated for yield.

### Soybean

**JS 20-34:** Identified in 43rd Annual Group Meet on AICRP on soybean. It is an extra early variety matures in 87 days. It has high yielding potential (22-25 q/ha). It is a multiple resistant variety, showing resistance against charcoal rot, blights, bacterial pustules, leaf spots, stem





fly, stem borers and defoliators. It is most suitable for low to medium rain fall, light to medium soils, upland conditions, increasing cropping intensity. It has erect growth habit suitable for intercropping. It possesses excellent germination and longevity.

**JS 20-29 :** It is an early variety, matures in 95 days. It possesses high yielding potential of 25-30 q/ha. It is categorized as multiple resistant for biotic stresses like yellow mosaic virus, charcoal rot, blights, bacterial pustules, leaf spots, stem fly, stem borers and defoliators. It possesses excellent germination and longevity. It is most suitable for 0.45 million plant population. Being an early genotype suitable for double cropping rainfed situation. It has semi erect growth habit suitable for intercropping.

Varieties promoted in Initial Varietal Trial are JS 20-53, JS 20-79 and JS 20-89.

Varieties promoted in Advanced Varietal Trial-I JS 20-69 Central Zone and JS 20-71 In two zones viz., Central Zone and North Eastern Zone.

Variety Promoted in Advanced Varietal Trial-II: JS 20-4.

**Chickpea :** JG 24, JGK 2003-304, JG 2001-4, JG 2007-7 and JGK 13, IC 251741 (JG) were found resistant to wilt and dry root rot respectively under multi-location evaluation test.

## Hybrid wheat research

### Maintenance of CMS lines

- All the 10 CMS lines and its B lines planted well in isolation to maintain the A lines as well as used in diversification by making the large number of crosses.



### Conversion breeding

- 28 BC3F1's wheat hybrid was planted and back cross with their parental lines under conversion breeding programme.



### Hybridization programme

240 Crosses for tolerance to high temperature, high water and nutrient use efficiency, Quality traits (Protein,  $\beta$ -carotene, micronutrients) Rust (Black and Brown rust) were made.





- Many stem rust genes confer certain degree of resistance, offer scope to diversify genetically the cultivars under cultivation.
- Incorporation of more minor genes for durable rust resistance( Sr2, Sr22 etc.,)

### Niger

- In IVT Entry JNS-513 recorded highest seed yield ( $632 \text{ kg ha}^{-1}$ ) followed by JNS-514 ( $565 \text{ kg ha}^{-1}$ ) against NC IGP - 76 ( $492 \text{ kg ha}^{-1}$ ).
- In AVT The highest seed yield was recorded by JNS-119 ( $560 \text{ kg ha}^{-1}$ ) followed by JNS-253 ( $554 \text{ kg ha}^{-1}$ ) and JNS-501 ( $541 \text{ kg ha}^{-1}$ ) against NC IGP - 76 ( $454 \text{ kg ha}^{-1}$ ).

### Jatropha

- Identified JJH 34-6, JJH 14-16 and JJH 21-8 derived through hybridization; propagated clonally is under evaluation for yield consistencies.
- Identified low toxin lines, involved in hybridization programme; plant being screened by stimulation using BA spray at early generation.



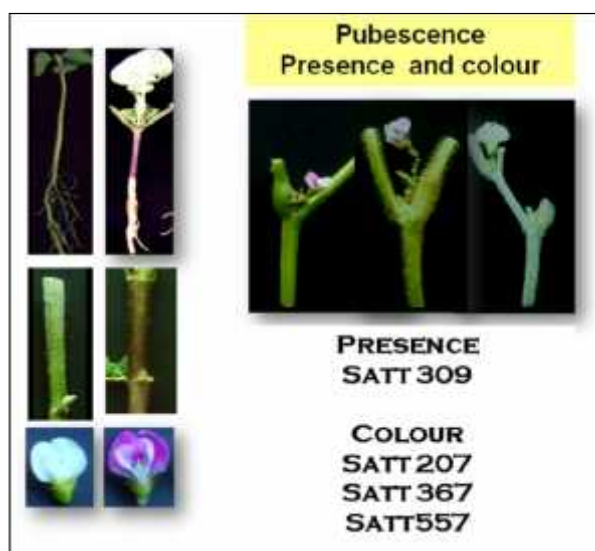
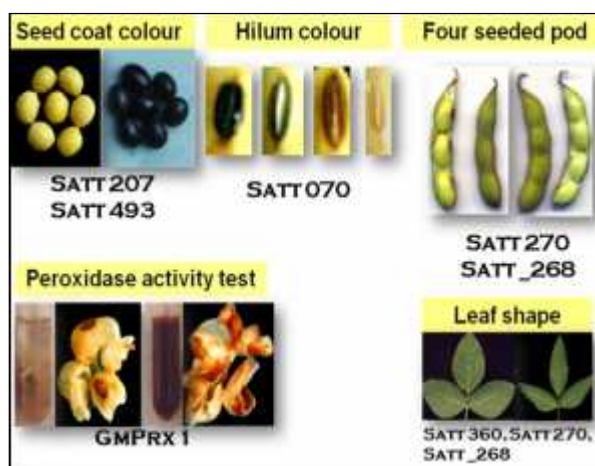
Jatropha JJH 34-6

## Seed Technology Research

### Molecular markers for distinctive, stable and uniform phenotypic traits in soybean

- Out of 22 reference varieties of Linseed 21 were maintained, at JNKVV. Similarly 16 reference varieties of Lentil and 16 reference varieties of Pigeonpea were maintained at JNKVV.

## 3.2 Crop production technologies



### Tillage and planting management in rice-wheat cropping systems

- Direct sowing of rice in line followed by strip till drilling of wheat produced maximum wheat equivalent yield ( $7.05 \text{ t ha}^{-1} \text{ yr}^{-1}$ )



and, net monetary return (Rs. 52,283 ha<sup>-1</sup> yr<sup>-1</sup>). Sowing of rice by transplanting with transplanter followed by strip till sown wheat in a system was comparable to it. These two sowing practices proved most identical for saving of labourers and were found more remunerative.

### Need Based Cropping Systems for Kymore Plateau and Satpura hills Agro climatic Zone.

- Productivity and economic viability of different need based cropping systems were tested and compared with existing cropping systems. The maximum rice equivalent yield (135.47 qha<sup>-1</sup>yr<sup>-1</sup>), net monetary return (Rs. 100723 ha<sup>-1</sup>yr<sup>-1</sup>) and B:C ratio (3.09) were observed with cropping system of hybrid rice (Pro Agro 6444) - onion (Pusa red) - green gram (Pusa Vishal) followed by Rice (Pro Agro 6444) - marigold (African giant) - sesame cropping system with the rice equivalent yield, net monetary return and B:C ratio of 124.57 q ha<sup>-1</sup>yr<sup>-1</sup>, Rs. 91543 ha<sup>-1</sup>yr<sup>-1</sup> and 3.01, respectively.



### View of different crops in the experimental field and in the nursery

#### Development of organic farming package for system based high value crops

- At the end of 10th crop cycle at Jabalpur, scented rice (Pusa Basmati) - wheat (MPO



1101), application of 100% NPK + Zn to both crops produced the maximum rice equivalent yield (53.07) followed by 50% NPK through fertilizer and 50% N through FYM to both crops (49.85q ha<sup>-1</sup>yr<sup>-1</sup>). Though the 1/3 N through each of FYM, vermin compost and NEOC + intercropping of mustard fetched the maximum NMR of Rs 63701 ha<sup>-1</sup>yr<sup>-1</sup> and B:C ratio 2.34 as against the former treatment due to the high cost of organic manure. The total uptake of nutrients was higher under 100% NPK through fertilizers along with zinc.

### Important crops/cropping systems under organic farming

- Inclusion of high value crops in rice based cropping systems was quite feasible under organic farming. Rice-potato-okra



sequence proved to be the best with regard to productivity and monetary advantages.

- I Yields of rice, potato and sorghum fodder were less under organic farming than inorganic farming up to completion of 3 crop cycles, but yields of green pea, okra and berseem were comparable between these nutrient management.

#### **Development of innovative farming practices to mitigate the effect of climate change**

- I The combination of conservation tillage in rice-berseem cropping system with mulching and 125 per cent RDF resulted in maximum rice equivalent yield ( $130.21 \text{ ha}^{-1} \text{ yr}^{-1}$ ), NMR (Rs. 94095  $\text{ha}^{-1} \text{ yr}^{-1}$ ) with B:C ratio



of 2.95. The productivity of component crops under rice-wheat, rice-berseem (fodder and seed), maize-wheat and sorghum-wheat cropping systems were maximum under conventional tillage with mulching and 125 per cent recommended dose of fertilizer. The values of rice equivalent yield, net monetary return and B:C ratio under each cropping system were also maximum with conventional tillage with mulching and 125 per cent RDF.

#### **Development of region specific IFS model under Kymore Plateau and Satpura Hills agro-climatic zones of Jabalpur**

The total land allotted for the IFS Model is 1.0 ha, out of which 0.9 ha area was allotted for cereals, pulses, oilseeds and fodder crops for meeting household's food, feed and fodder demand and 0.1 ha area was allotted for animals shed, threshing floor, Vermicompost, poultry farming, dairy, fishery and common uses. The outcomes of the IFS component are as under:

- I The cropping component gave the production of 8.24 tons  $\text{ha}^{-1} \text{ yr}^{-1}$  in terms rice equivalent yield with NMR of Rs 69380  $\text{ha}^{-1} \text{ yr}^{-1}$ .
- I The dairy component includes three cows and one calf gave the production of 15.12 tons  $\text{ha}^{-1} \text{ yr}^{-1}$  in terms of rice equivalent yield with the NMR of Rs. 54878  $\text{ha}^{-1}$  from November 2012 to March 2013.
- I The others component include Mushroom, Vermicompost and Vegetable production.

Out of these, mushroom + vermicompost unit gave 0.843 ton production in terms of rice equivalent yield with NMR Rs. 3876 and vegetable component gave the 0.820 ton production in terms of rice equivalent yield with the NMR of Rs. 65400 ha<sup>-1</sup>.

### **Farming system modules for improving the profitability of small and marginal farmers**

Results of the experiments on 12 farming communities indicated that to overcome the constraints under farming situation (considering crops-Dairy-horticulture) the utilization of available technology & resources on farm with recycling of products and by-products in each other as enterprises is essential especially by marginal & small farming communities. This would make them economically and socially sound by integrating indigenous technical knowledge (ITK) and advance scientific approaches.

### **Weed management in organic farming**

- | Green manuring of sun-hemp before rice under rice-wheat system proved numerically better than summer ploughing under existing rice-wheat system for controlling weeds.
- | Weed flora differed significantly between green manuring of sun-hemp and summer ploughing before rice under rice-wheat system.

### **The system of rice intensification (SRI)**

- | Under SRI paddy fields are not flooded but keep the soil moist during vegetative phase
- | SRI requires only about half as much water as normally applied in irrigated rice, Less seed (5 kg ha<sup>-1</sup>), fewer plants per unit area (25 x 25 cm), less chemical fertilizer, more organic manures and less pesticides

### **Direct seeding of berseem in rice field**

To overcome the delay in sowing (20-25 days)

of berseem especially under transplanted situation, a technique consisting of direct seeding of berseem in standing paddy crop 15 days prior to harvest by increasing 33 percent (40 kg ha<sup>-1</sup>) seed rate has been developed. In this technique it is also advised that surplus stored water must be drained off from the field before sowing. This technology has the following advantages:

- | Seed germination of berseem in available soil moisture is high and it also curtail cost of field preparation.
- | It gives one additional cutting of berseem over its normal sowing after harvest of paddy crop.
- | Seed production of berseem crop can also be enhanced (5.89 q ha<sup>-1</sup> or 16%) by adopting the technique of application of Boron @ 2.00 kg ha<sup>-1</sup> half as basal and half in two split sprayings, first at the time of flower initiation and second 10 days after (In addition to recommended dose of fertilizer) first spray.

### **Intercropping**

- | Intercropping of maize+cowpea (2:2 rows) at 25 cm apart should be done for getting more tonnage and greater profit than growing of maize as a sole crop.
- | Growing crop sequence of jowar + cowpea in kharif, berseem + sarson in rabi and maize + cowpea in summer proved superior for getting maximum tonnage of green fodder (1763 q ha<sup>-1</sup>yr<sup>-1</sup>) and net monetary returns of Rs. 57443 ha<sup>-1</sup>yr<sup>-1</sup>. Per day productivity (4.83 q ha<sup>-1</sup>) of green fodder is also higher under this crop sequence as compared to other crop sequences

### **For Kymore Plateau and Satpura Hills Agro-climatic Zone**

- | Rice hybrids (JRH-5)- Garlic (G- 41)- Maize

(JM-12) + Cowpea (local) in 4:2 intercropping, produced the highest rice equivalent yield ( $27.6 \text{ t ha}^{-1}\text{yr}^{-1}$ ) with net monetary returns (Rs. 1,60,060  $\text{ha}^{-1}\text{yr}^{-1}$ ) and B: C ratio (4.47) followed by rice hybrids JRH-5 -potato (Kufri Sinduri) -Groundnut (Jyoti), cropping sequence.

### For Narmada valley

- I Soybean (JS -335) -vegetable pea (Arkel) - sugarcane (CO- 86032) system led to the record maximum soybean equivalent yield ( $11.06 \text{ t ha}^{-1}\text{yr}^{-1}$ ), net monetary returns (Rs, 1, 29, 080  $\text{ha}^{-1}\text{yr}^{-1}$ ) with a B: C ratio of (2:84) than the soybean -wheat existing cropping systems.

### Seed yield and economics of niger production under resource constraints

- I Seed yield of  $951 \text{ kg ha}^{-1}$  in Fertilizer + thinning+ plant protection + weeding at optimum time was at par to  $944 \text{ kg ha}^{-1}$  in Fertilizer + thinning + weeding at optimum time & significantly superior to  $844 \text{ kg ha}^{-1}$  in Fertilizer + thinning+ plant protection +  $785 \text{ kg ha}^{-1}$ . The seed yield of  $319 \text{ kg ha}^{-1}$  in thinning+ plant protection + weeding at optimum time was the minimum & at par to  $337 \text{ kg ha}^{-1}$ .
- I The maximum seed yield of  $449 \text{ kg ha}^{-1}$  was noted in JNS-502 followed by  $399 \text{ kg ha}^{-1}$  in JNS-119 which again was significantly higher than  $385 \text{ kg ha}^{-1}$  in JNS-501. Significantly the highest NMR Rs  $8923 \text{ ha}^{-1}$  noted in JNS-502 was followed by Rs.  $6923 \text{ ha}^{-1}$  in JNS-119. The minimum NMR was noted of Rs  $1071 \text{ ha}^{-1}$  in IGPN-8004 JNS-502 resulted in significantly the maximum B:C ratio of 1.97 followed by 1.75 in JNS-119.
- I The minimum B:C ratio of 1.11 is noted in IGPN-8004. Among different fertility levels F3 (150% RDF) recorded significantly the

maximum seed yield of  $385 \text{ kg ha}^{-1}$  NMR Rs  $5670 \text{ ha}^{-1}$  and B:C ratio 1.58 followed by the seed yield of  $340 \text{ kg ha}^{-1}$  NMR of Rs  $4537 \text{ ha}^{-1}$  and B:C ratio 1.5 in F2 (100% RDF).

### Optimum date of sowing in niger

- I The data indicated that significantly the maximum seed yield of  $1053 \text{ kg ha}^{-1}$  recorded in 7 days early to RDS was followed by  $959 \text{ kg ha}^{-1}$  recommended date of sowing-RDS the minimum seed yield of  $743 \text{ kg ha}^{-1}$  in 15 days late to RDS. Significantly the maximum NMR of Rs  $27608 \text{ ha}^{-1}$  in 7 days early to RDS was followed by Rs  $23881 \text{ ha}^{-1}$  in RDS. The lowest seed yield of Rs  $15247 \text{ ha}^{-1}$  in 15 days late to RDS.

### Management of dryland farming

- I In an assessment of rice varieties sahbhagi was superior with the highest yield of  $2623 \text{ kg ha}^{-1}$  and net income Rs.  $28370 \text{ ha}^{-1}$  and B:C ratio of 3.37. Danteshwari was the second best variety with the yield of  $2557 \text{ kg ha}^{-1}$ , net income of Rs.  $27095 \text{ ha}^{-1}$  and B:C ratio of 3.28.
- I Soybean in Kharif and Chickpea in Rabi,  $20 \text{ kg N} + 40 \text{ kg P}_2\text{O}_5$  with  $10 \text{ kg ZnSO}_4 \text{ ha}^{-1}$  was superior in terms of yield ( $2302+1725$ ), net return ( $31436+27225$ ) and B:C ratio ( $4.14+4.02$ ).
- I In intercropping with different row proportions of chickpea and linseed tested for suitability, maximum chickpea equivalent yield  $1118 \text{ kg ha}^{-1}$ , net income of Rs.  $20526$  and B:C ratio of 2.50 was attained by chickpea and linseed in 4:2 system.
- I Maximum chickpea equivalent yield of  $1707 \text{ kg ha}^{-1}$ , net income of Rs.  $33162 \text{ ha}^{-1}$  with B:C ratio of 4.30 were attained by 6:2 system in chickpea and mustard intercropping.



## Wheat

- I On the basis of 2 years of experiment the variety GW 322 , GW 366, and HI 1544 gave higher production in timely irrigated condition with high fertility ( 150 : 60: 40 NPK Kg ha<sup>-1</sup>) and recommended for the region.
- I Variety MP 1203 ,MP 3269 and MP 3336 recommended for late sown irrigated condition with 90:60:40 NPK Kg ha<sup>-1</sup> after harvest of paddy.
- I In durum wheat variety MPO 1215, MP 1106 and HI 8713 gave higher yield in irrigated timely sown condition with fertility level of 150:60:40 NPK Kg ha<sup>-1</sup>.
- I Study of evaluation of herbicides against complex weed flora, Clodinofof + Metsulfuran @ 60+ 4 g ai ha<sup>-1</sup>. Product 400g + 700ml ha<sup>-1</sup> 30-35 days after sowing followed by sulfosulfuran + Metsulfuran @ 40g + 750 ml surfactant both are good for the control of broad and narrow leaf weeds and no phytotoxic effect on wheat crop.
- I The grassy weeds in wheat crop were effectively controlled by use of weediside Clodinofof 60 g or Isoproturon 1.0 kg or Sulphosulfuron 25 g and Fenaxaprop 120 g ai ha<sup>-1</sup> with 500 liters of water at 25-30 days crop stage.
- I The improved variety JW-3211 and border strip irrigation method in wheat produced 17.54% average higher seed yield 42.20 q ha<sup>-1</sup> than the Lok-1 variety and flood irrigation method 35.90 q ha<sup>-1</sup>. Improved variety and irrigation method given Rs.63300 ha<sup>-1</sup> gross monetary return over Lok-1 variety and flood irrigation method Rs.53850 ha<sup>-1</sup>. In improved technology water use efficiency was observed 1.73 kg/ha/cm over farmers' practices (1.17) which was 46.79% higher under Bhaunhari Command area.

## Forage crop management

### Effect of planting method and forage crop combination on fodder productivity

- I The combination of grass + leguminous i.e. Dicanthium + Desmenthus gave maximum green fodder, dry matter and crude protein yield of 651.34 q ha<sup>-1</sup>, 80.21 q ha<sup>-1</sup> and 8.65 q ha<sup>-1</sup> respectively in ridge & furrow method followed by combination of Cenchrus + Desmenthus that gave 467.89, 69.55, and 8.13 q ha<sup>-1</sup> green fodder, dry matter and crude protein yield, respectively. The minimum green fodder yield (350.45 q) observed in the combination of Dicanthium + Stylo under flat bed methods.

### Tillage and nutrient management in rice-oat cropping system

- I Tillage and nutrient management were done in oat crop and residual effect of the treatments were studied on kharif rice. The second year data showed that the combination of conventional tillage practice comprised with 100% RD + biofertilizers i.e. (Azotobactor+ PSB) nutrient management gave the maximum green fodder 560 q/ha, dry matter 182 q ha<sup>-1</sup> and crude protein yield 8.2 q ha<sup>-1</sup> per hectare. But as per the economic point of view, zero tillage practice along with the 100% RD + biofertilizer gave higher net monetary returns besides conservation of time, labour and energy.





### Performance of dual purpose forage crop under different cutting management

- I Oat, barley and wheat crop managed each at four cutting system i.e. no cutting, 50 DAS, 60 DAS and 70 DAS. Second cut was taken for seed. Under these cutting management oat, barley and wheat cut at 70 DAS gave higher green fodder and dry matter yield but oat crop gave the maximum fodder yield and leaf: stem ratio. The seed yields of all crops were 32, 25 and 54.65 qha<sup>-1</sup>.

### Effect of weed management on forage and seed yield of berseem

- I Among all the treatments, oxyflourfen @ 1.00 kg ai ha<sup>-1</sup> was best treatment, controled the weeds very effectively, gave maximum GFY 654.2 ha<sup>-1</sup> and seed yield 3.2 q ha<sup>-1</sup> and reduced the weed density effectively.

### Chickpea in rice fallow

- I Zero tillage by zero seed drill , convention tillage, Zero tillage by manually , reduced tillage, broad-casting and bed planting with three weed management practices pendimathlin, pendimathlin + one hand weeding and control were studied. On the basis of performance of second year bed planting crop reduced tillage and zero tillage by seed drill with pendimethline + one hand weeding attained good crop growth and yield of chickpea 18.32 q ha<sup>-1</sup>



besides saveing time ,diesel and energy than other tillage sowing methods. The application of pendimethline + one hand weeding reduced the weed density.

- I The ridge and furrow method of sowing of soybean produced 32.73% average higher seed yield 15.24 q ha<sup>-1</sup> than normal line sowing method with 22.5 cm spacing 11.25 q ha<sup>-1</sup> and given Rs.45738 ha<sup>-1</sup>. Gross monetary return over normal sowing Rs.33692 ha<sup>-1</sup> under Bhaunhari Command area.
- I The life saving irrigation in soybean produced 28.42% average higher seed yield 15.22 q ha<sup>-1</sup> than without life saving irrigation (11.66 q ha<sup>-1</sup>). The life saving irrigation method gave Rs. 45690 ha<sup>-1</sup> gross monetary return over normal method Rs. 32220 ha<sup>-1</sup> under Bhaunhari Command area.
- I The Uttra variety of Urid produced 28.83% higher seed yield (8.57 q ha<sup>-1</sup>) than local variety (6.67q ha<sup>-1</sup>)and given Rs. 20568 gross monetary return as compared to local variety Rs. 16008 un der Bhaunhari Command area.

## Linseed

- | Linseed sown on 30th October gave the highest grain yield of 13.72 q ha<sup>-1</sup> over 20th October (12.16 q), 10th November (12.07 q ha<sup>-1</sup>) and 20th November (10.29 qha<sup>-1</sup>). Among different varieties, cv. JLS-66, T-397, JLS-73 and JLS-67 produced grain yield in descending order. Lower production in JLS-67 is mainly because of occurrence of heavy frost at flowering & capsule formation stage.
- | Dry sowing of linseed with (5.43q ha<sup>-1</sup>) & without planking (5.40 q ha<sup>-1</sup>) followed by come up irrigation gave slightly high grain yields over seeding after pre sowing irrigation (4.95 q ha<sup>-1</sup>). Among different varieties, cv JLS-66, JLS-73, JLS-67 & T-397 produced grain yields in descending order.

## Water Management

- | The highest seed yield of wheat (4750 kg ha<sup>-1</sup>) was recorded in FIRBS tillage system under soybean-wheat crop sequence.
- | The various irrigation levels the highest wheat seed yield 4249 kg ha<sup>-1</sup> was recorded at 1.0 IW/CPE ratio irrigation schedule.
- | The lowest depth of water was recorded as 25.1 cm in paddy-wheat zero tillage system & highest 32.5 cm in conventional system of soybean-wheat crop sequences.
- | The water use efficiency was highest (185.6 kg ha<sup>-1</sup>) in FIRBS tillage system under soybean - wheat crop sequence. The highest net return Rs. 45325 ha<sup>-1</sup> & B.C. ratio 3.41 were recorded under FIRBS tillage system of soybean - wheat crop sequence.
- | In turmeric the significantly highest yield (228.40 q ha<sup>-1</sup>) was recorded under drip irrigation at 1.0 PE.
- | Among fertigation levels the highest turmeric tuber yield 201.93 kg ha<sup>-1</sup> was recorded under recommended dose of

fertilizer (75 : 75: 75 NPK kg ha<sup>-1</sup>).

- | The highest WUE 633.70 kg ha<sup>-1</sup> cm<sup>-1</sup> was recorded under drip irrigation at 1.0 PE. The lowest WUE 351.2 kg ha<sup>-1</sup>cm<sup>-1</sup> was recorded under surface irrigation.
- | The highest net return and B.C. ratio recorded under drip irrigation at 1.0 PE the values being Rs .364934 ha<sup>-1</sup> and 4.9, respectively.
- | The sprinkler irrigation at 1.0 IW/CPE ratio gave significantly highest wheat yield (4248 kg ha<sup>-1</sup>) as compared with all other treatments. This treatment saved 28.57% irrigation water with the water use efficiency of 170 kg ha<sup>-1</sup> cm and produced 17% higher yield as compared with surface irrigation (yield 3931 kg ha<sup>-1</sup>, WUE 112.3 kg ha<sup>-1</sup> cm<sup>-1</sup>).
- | The sprinkler irrigation at 0.8 IW/CPE and surface irrigation at 1.0 IW/CPE were at par with the wheat yields of 3956 kg and 3931 kg ha<sup>-1</sup>, respectively.
- | Maximum cane yield of sugarcane (157.8 t ha<sup>-1</sup>) was found with drip irrigation at 0.75 PE under normal planting (90 X 90 cm). The net return (Rs. 321740 ha<sup>-1</sup>) was also higher in drip irrigation with normal planting, whereas the WUE (1552 kg ha<sup>-1</sup> cm) was higher with drip irrigation at 0.75 PE in normal planting (120 X 60 cm).
- | Drip irrigation recorded 27.9 % and 58.3 % water saving under normal planting and paired planting, respectively in sugarcane.
- | The sowing of fenugreek in 44th standard meteorological week (SMW) when the atmospheric temperature prevailed between 24-26°C proved optimum and gave maximum seed yield of 1727 kgha<sup>-1</sup> and net return of Rs. 14678 ha<sup>-1</sup>.
- | As regards the moisture regimes irrigation at 0.8 IW/CPE ratio produced significantly higher seed yield (1585 kg ha<sup>-1</sup>) and net return of Rs.1 3190 ha<sup>-1</sup> as compared to control and 0.6 IW/CPE ratio (1106 & 1495 kgha<sup>-1</sup> respectively).

- I In the fenugreek two nipping at 4 and 6 weeks after sowing gave seed yield 7.73 qha<sup>-1</sup> and green vegetable yield 64.93 q ha<sup>-1</sup> and proved most economical with the net return of Rs. 22694 ha<sup>-1</sup>.
- I In coriander the application of four irrigations at 25, 45, 65 and 85 DAS and two cuttings (at 4 & 6 weeks after sowing) produced seed yield 7.92 q ha<sup>-1</sup> and green leaves 99.83 q ha<sup>-1</sup>. This schedule gave net return of Rs. 52347 ha<sup>-1</sup> and B:C ratio of 4.29. The water use efficiency with four irrigations for seed yield and vegetable yield was 4.21 and 21.52 kg ha<sup>-1</sup>mm<sup>-1</sup>, respectively.
- I Maximum mean yield (610 kg ha<sup>-1</sup>) along with net return (Rs. 22268 ha<sup>-1</sup>) with maximum B:C ratio of 1:2.53 were advised under treatment RDF + foliar spray of urea at flowering+ capsule formation stage of crop closely followed by RDF + foliar spray of DAP at both stages. The yield and net return (602 kg ha<sup>-1</sup>). Rs. 21652 ha<sup>-1</sup> along with 1:2.44 B:C ratio were recorded. Both treatments were found to be at par. Lower dose of nutrient (75% RDF) with foliar application of urea or DAP also gave better response for increasing yield T5 (537 kg ha<sup>-1</sup>), T4 (530 kg ha<sup>-1</sup>), T7 (533 kg ha<sup>-1</sup>).
- I Treatment fertilizer + Plant Protection + Thinning and Weeding gave maximum yield (533.33 kg ha<sup>-1</sup>) with maximum economics return (Rs. 26606 ha<sup>-1</sup>) followed by Fertilizer + Plant Protection and Weeding which gave grain yield 499 Kg/ha & Rs. 25226 /ha as net return along with better B:C ratio (1 : 2.59). Fertilizer + Thinning and Weeding except plant protection measures was also found better with the achievement of grain yield ( 493 kg ha<sup>-1</sup>) and NER ( Rs. 24704 ha<sup>-1</sup>) and B:C ratio (1: 2.51).
- I In the deep black soils of Tawa Command area, Vegetable Pea cv. Arkel could be

taken successfully for maximum green pod yield and economic returns the crop should be irrigated at 1.0 IW/CPE ratio with sprinkler system (green pod yield 6878 kg ha<sup>-1</sup>, NMR Rs.72120 ha<sup>-1</sup> and B:C ratio 3.32). The phosphorous level of 60 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> was found to be the most productive (6218 kg ha<sup>-1</sup>) and economical (NMR Rs.6032 ha<sup>-1</sup>, B:C ratio 2.83).

## Plant nutrient management

### Long term fertilizer experiments

- I The response to fertilizers was in order of NPK > NP > N but the degree of response varied year wise due to change of weather conditions.
- I Imbalanced use of fertilizers i.e. application of N alone or NP significantly resulted in adverse effect on yield sustainability and response. On pooled data basis the role of P in crop production has clearly brought out as the yield in NP treatment is found to be 60-150% higher over N alone in soybean - wheat, respectively. While application of 50% of the optimum dose found to be superior over 100% N alone.
- I The detrimental effect of heavy metals (Cd, Pb and Cr) gets minimized due to the balanced use of NPK along with organic manure.
- I Continuous use of sulphur free fertilizer (DAP) resulted decline in organic carbon, available P, K, S and Zn in soil and there is need to ensure supply of sulphur through SSP. Pooled mean yield data of soybean and wheat showed reduction of 7.3 and 6.5%, respectively by the application of 100% NPK-S (DAP) as compared to 100% NPK (SSP).
- I The notion that continuous use of fertilizers decreases the organic carbon in soil is disapproved with the experimental findings as organic carbon content in the soil increased from 5.70 g kg<sup>-1</sup> (initial value) to



- 7.58 g kg<sup>-1</sup> by the application of recommended dose of NPK, whereas with the addition of FYM it further enhanced to 9.85 g kg<sup>-1</sup>.
- | The use of optimum dose of NPK and its integration with organic manure resulted in gradual improvement of available nitrogen, phosphorus, sulphur and zinc status of soil.
  - | A declining trend (176 to 326 kg ha<sup>-1</sup>) from its initial level (370 kg ha<sup>-1</sup>) of available K status was noticed as a result of continuous use of fertilizers and manure in intensive cropping over 39 years, which indicates considerable soil mining of available K.
  - | FYM resulted in additive effect on microbial biomass C and N content, microbial population and their activities (dehydrogenase activity, organic matter decomposition), nodulation, crop yields and maintenance of C/N ratio.
  - | The highest weed population (90038 plant ha<sup>-1</sup>) and relative density (33.63%) of broad leaves and lowest population and relative density (17944 plant ha<sup>-1</sup> and 6.7%) of *Cynodon dactylon* L. were recorded in the experiment. The weed biomass at 20 and 40 DAS was maximum in control followed by 100% N alone. Imazithyper (10 SL) weedicide spray gave 61.51% weed control efficiency (WCE).
  - | The maximum nodule number (49.00) was recorded with 100% NPK+FYM and minimum (26.25) in control. The maximum nitrogen fixation (238.4 kg ha<sup>-1</sup>yr<sup>-1</sup>) was observed with treatment receiving 100% NPK+FYM and the minimum (68.1 kg ha<sup>-1</sup> yr<sup>-1</sup>) with 100% N alone.
  - | Phosphorous fractionation study showed that Ca-P form is the most dominant one. Use of P increased all P fractions while absence of P resulted in decline of Ca-P, available -P, Fe-P, Al-P, saloid -P, occluded-P fractions. It means P fractions are in equilibrium and responsible to maintain supply of P to plant.
  - | Study on potassium indicated that the removal of K by soybean - wheat crops was higher than the applied K. Available K depleted at faster rate as compared to other fractions (non-exchangeable-K and lattice-K). Available K of the soil was found lower than the initial value. Thus, crops need external supply of K through fertilizer.
  - | All fractions of Zn (water soluble, exchangeable, complexes, occluded, organically bound and residual) were found maximum in 100% NPK+Zn or FYM treatment and minimum in control plot. Various fractions of Zn were found to be higher in 0-20 cm soil layer and continued to decrease with depth in all the treatments. Water soluble, exchangeable, occluded and organically bound-Zn fractions jointly contributed only 5.3% part to the total-Zn, whereas the rest 94.7% was left in the residual fraction.
  - | Application of 100% NPK+FYM resulted in least loss (20.4%) of soybean yield by the infection of RAB. Similarly, recommended dose of NPK alone or with Zn or S also helped in reducing the RAB disease caused by *Rhizoctonia solani*.
  - | Superimposition of FYM at 10 t ha<sup>-1</sup> with 150% NPK resulted in superior yield of soybean-wheat (1669 and 5378 kg ha<sup>-1</sup> respectively) over 150% NPK without FYM.
  - | Results of FLD's laid out in high available phosphorus containing soils revealed that use of 50% P through SSP with full dose of N as urea and K as MOP to soybean and wheat crops performed better than the application of DAP in farmers practice or as good as 100% NPK - S.
  - | Under Nutrient Indexing programme the maximum rice yield (4.18 t) was recorded in Khamariya village followed by Udna (3.89 t ha<sup>-1</sup>) and Magarmuha (3.78 t ha<sup>-1</sup>). Whereas the maximum wheat yield 4.42 t ha<sup>-1</sup> was recorded in Magarmuha village followed by Udna (4.01 t ha<sup>-1</sup>) and

Khamariya ( $3.42 \text{ t ha}^{-1}$ ). The analysis of plant and soil sample is in progress.

### **Micronutrient, secondary nutrients and pollutant elements in soil and plants**

- | Under tribal support plan (TSP) 14 FLDs were conducted in (2 in gram and 12 in wheat crops) the farmers fields of Kundam Tehsil of Jabalpur to demonstrate the effect of S and Zn and their combined effect on gram and wheat crops.
- | Zinc and iron deficiency in standing crops can be corrected by the foliar spray of 0.5% and 2% of  $\text{ZnSO}_4$  and  $\text{FeSO}_4$  respectively at an interval of 10 to 15 days.
- | Among the soil test methods evaluated, DTPA and AB-DTPA extractants were found most suitable for the extraction of micronutrients.
- | In case of sulphur deficiency application of  $20 \text{ kg S ha}^{-1}$  to cereals and  $40 \text{ kg S ha}^{-1}$  to pulses and oilseed crops every year gave the optimum yields.

### **Wheat**

- | The recommended dose of fertilizer  $120 \text{ kg N}$ ,  $60 \text{ kg P}_2\text{O}_5$  and  $20 \text{ kg K}_2\text{O ha}^{-1}$  significantly increased the wheat grain and straw yields over farmer's traditional practice (32-23-0).
- | Combined application of  $5 \text{ kg Zn} + 40 \text{ kg S ha}^{-1}$  also found significantly superior to  $5 \text{ kg Zn}$  or  $40 \text{ kg S}$  alone for wheat grain and straw yields.

### **Chickpea**

- | The recommended dose of fertilizer ( $20 \text{ kg N}$ ,  $80 \text{ kg P}_2\text{O}_5$  and  $20 \text{ kg K}_2\text{O}$ ) increased the grain and straw yields of chickpea by 50 and 26.9%, respectively over farmers practice (9-23-0).
- | Application of  $5 \text{ kg Zn}$  and  $40 \text{ kg S ha}^{-1}$  alone increased 16.67 and 11.11% grain yield

over RDF.

- | Combined application of  $5 \text{ kg Zn} + 40 \text{ kg S ha}^{-1}$  gave ( $1.55 \text{ t ha}^{-1}$ ) 5.55 and 11.11% higher grain yield than  $5 \text{ kg Zn}$  ( $1.5 \text{ t ha}^{-1}$ ) and  $40 \text{ kg S}$  ( $1.45 \text{ t ha}^{-1}$ ) alone, respectively.

### **Soybean**

- | Application of  $0.5 \text{ kg ha}^{-1}$  Mo significantly increased the soybean yield ( $2.43 \text{ t ha}^{-1}$ ) and P and Mo content in grain over control ( $2.28 \text{ t ha}^{-1}$ ) but Mo levels were found non-significant for S content in grain of soybean.
- | Application of B @ 0.5, 1.0, 1.5 and  $2 \text{ kg ha}^{-1}$  significantly increased the soybean yield and B content in grain and stover over control except B content at  $0.5 \text{ kg ha}^{-1}$  but the B levels were found at par amongst themselves for yield and B content in grain. As residual effect the maximum wheat yield  $6.03 \text{ t ha}^{-1}$  was recorded with  $2 \text{ kg B ha}^{-1}$  which was 6% higher than control ( $5.69 \text{ t ha}^{-1}$ ).
- | Grain yield ( $2.86 \text{ t ha}^{-1}$ ) at  $5 \text{ kg Zn ha}^{-1}$  was found significantly superior to  $2.5 \text{ kg Zn ha}^{-1}$  ( $2.75 \text{ t ha}^{-1}$ ). The residual effect of Zn on wheat yield was found non-significant. The maximum wheat grain yield  $5.81 \text{ t ha}^{-1}$  was observed at  $7.5 \text{ kg Zn ha}^{-1}$  which was 12.82% higher than control.

### **Soil test crop response correlation**

- | The targeted yields were achieved within  $\pm 2\%$  to  $\pm 30\%$  from affixed target. In 50% cases the targets were achieved within  $\pm 10\%$ . In particular, the targets were achieved in 80% cases, when the fertilizer recommendation based on targeted approach coupled with  $5 \text{ t FYM ha}^{-1}$  i.e. IPNS mode was followed.
- | The output results have been tested through Demonstration trials in farmer's fields and assured through follow up trials as well.

## Soil biodiversity and biofertilizers

- | Through a survey on nodulation status of soybean cultivated in Madhya Pradesh only 17% cropping area holds very good nodulation, 31% good, 35% moderate and 17% poor.
- | On an average 23% grain yield of pulses is obtained with indigenous isolates, whereas the effective isolates of JNKVV improves the grain yield up to 29%.
- | Among farmers 62% are using microbial inoculants and remaining 38% farmers are not using inoculants in cultivation practices.
- | Most of the farmers (82%) find positive response from use of bio-inoculants in cultivation of crops. However, 13% farmers are unable to obtain assured response and 4% are in negative opinion about inoculums.
- | Dual inoculations of seeds with Rhizobium and PGPR responded better than mono-inoculation towards higher yield of grain and straw of crops.



- | Supplementation of organic manure promotes activity of beneficial microorganisms in soil.

## Integrated nutrient management in rice-wheat cropping system

- | Results of 25 years continuous long term experiments indicated that application of 50% NPK through fertilizers + 50% N substituted through FYM / Green manure to rice and 100% fertilizers to wheat recorded the highest wheat equivalent yield ( $7.2 \text{ t ha}^{-1}$  /yr), net monetary returns (Rs.  $44,353 \text{ ha}^{-1}$  /yr) and the highest system productivity



100% NPK to both rice & Wheat



50% NPK + 12t FYM to rice & 100% NPK to Wheat



50% NPK + 12t WS to rice & 100% NPK to Wheat



50% NPK + 12t GM to rice & 100% NPK to Wheat

(30.2 kg ha<sup>-1</sup> day<sup>-1</sup>) than the 100 -100 % fertilizers to both crops. Thus there was a saving of 50% NPK costly fertilizers without the sacrificing the productivity and profit with improvement in soil health.

- I Results of 31 year of continuous manuring with same level of fertilizer under rice-wheat cropping system revealed that 120:80:40 kg NPK ha<sup>-1</sup> proved superior over all the combinations. Deviations from this level of fertilizers resulted in rice yield reduction.
- I A 28th years continuous experiment was carried out on INM in rice-wheat crop sequence at Jabalpur. Results revealed that productivity of individual crop components and cropping system as a whole (WEY), were maximum (Rice 31.74 q ha<sup>-1</sup>, wheat 30.80 q ha<sup>-1</sup> and WEY 52.62 q ha<sup>-1</sup> year<sup>-1</sup>) with the application of 50% NPK through fertilizer+50% N through green manuring to rice and 100% NPK to wheat. The same treatment also produced the maximum system productivity (18.86 kgha<sup>-1</sup> day<sup>-1</sup>) while the NMR (36246Rs ha<sup>-1</sup> yr<sup>-1</sup>) and B:C ratio (1.86) were higher where the full quantity of fertilizers (RDF) supplied to both crops.
- I All INM treatment proved their superiority over application of 100% NPK to both the crops in maintenance of N, P and K contents in soil. Thus, there was a saving of 50% NPK costly fertilizers through INM without sacrificing the productivity and profit of the cropping system along with the improvement in soil health and dependency on inorganic fertilizers. Based on the sustainability yield index of productivity worked out from the yields of crops during last 28th years, INM treatments particularly fertilizer + FYM or green manure produced almost at par sustainable grain yields of entire cropping system than 100% NPK through fertilizer to both crops.

### **Paddy - wheat cropping system under irrigated /rainfed conditions**

- I Results of the field experiments on 25 farmers field in Katni district showed that maximum yield of rice-wheat cropping system was noted with the application of recommended dose of NPK and Zn.

### **Nutrient management in organic farming**

- I Rice-berseem system proved to be better than rice-wheat system with regard to productivity and economics under organic farming system.
- I Application of FYM, Vermicompost and NC each equivalent to 1/3 of recommended N was more remunerative than other combinations of organic manures.
- I Gradual improvement in organic carbon content and microbial population of soil was noted over initial status of the soil.

### **3.3 Crop Protection**

#### **Insect pest management**

- I Population dynamics of sugarcane borers through pheromone traps.
  - o In pheromone traps, capturing of the moth (ESB) start 3rd week of March, reached to peak at 21st SMW (0.52 moth/trap/day). The moths were captured till the 27th SMW week (0.05 moth/ day/ trap).

#### **Sesame**

- I Seed treatment of Imidacloprid 70 WS (7.5g kg<sup>-1</sup> seed) + foliar spray of Profenophos 50 EC (0.1 %) was found to be most effective against major insect pests of sesame with highest seed yield (576 kgha<sup>-1</sup>) and net profit followed by seed treatment with Thiamethoxam 2.5 WG (5 g kg<sup>-1</sup> seed) + foliar spray of NSKE-5% (558 kg ha<sup>-1</sup>).

**IPM module**

- I Early sowing just after onset of monsoon. Use moderately resistant varieties; TKG-22, JTS-8 and TKG-306
- I Use recommended dose of fertilizer 60N: 40P: 20K kg ha<sup>-1</sup>. Nitrogen should be applied three times: 20 kg as basal and rest in two top dressing. Potash must be applied for developing resistance against pests.
- I Inter cropping of pigeon pea with sesame in 3:1 row ratio or with black gram in 3:3 row ratio. EIL for Antigastra-10% plant infestation.
- I Two foliar sprays of well emulsified solution of neem oil 1% or NSKE 5% or Profenophos 50EC @ 1.0 lit ha<sup>-1</sup> at about 35-40 and 50-55 DAS.

**Forecasting module for major pest (Antigastra catalaunalis) of sesame**

Prevalence of maximum temperature (31-36°C), mean temperature around 27°C and lower rainfall (below 55mm) during vegetative stage of crop (30-34 SMW) recorded in maximum increase of number of larval population during reproductive phase of the crop (35-39 SMW). Predictive equation explained more than 80% variability of pest population. The observed peak larval population and predicted peak larval population are quite closure. However, rainfall of corresponding and previous week had similar significantly negative correlation (-0.66 and -0.53).

Equation for the forecasting module

$$Y = -0.750 + 0.084X_1 - 0.058X_2 + 0.002X_3$$

$$R^2 = 0.88^* \text{ Standard Error} = 0.028$$

\*Significant at 5 % level

$$Y = \text{Leaf roller larval population / plant}$$

$$X_1 = \text{Weekly maximum temperature of preceding weeks (30-34th SMW)}$$

$$X_2 = \text{weekly mean temperature of preceding weeks (30-34th SMW)}$$

$$X_3 = \text{weekly total rainfall during peak period (35-39th SMW)}$$

**Soybean**

- I Emamectin Benzoate 5%SG @ 6.25 g a.i. ha<sup>-1</sup> and HGW86 10% OD or Cyazypyr (Cyantraniliprole) @ 60 g a.i. ha<sup>-1</sup> were found to be highly effective in reducing the infestation on soybean due to insect pest complex and did not have any phytotoxic effect on the crop.
- I Application of Bacillus thuringiensis var. kurstaki @ 1013 spores ha<sup>-1</sup> or Heterorhabditis indica - PDBC isolate aqueous formulation @ 2 billion infected juveniles / ha recorded significantly lowest larvae of Lepidopteran foliage feeders viz. Chrysodeixis acuta and Spodoptera litura and registered highest soybean grain yield.
- I Beauveria bassiana (DOR), was found to be most effective against Lepidopteran defoliator complex of soybean (94-98% larval mortality) followed by Metarhizium anisopliae (92-98% larval mortality) and Verticillium lecanii (94% larval mortality) respectively. Similar findings were observed in the field also.

**Pigeonpea**

- I Early maturing entries UPAS-120, AL-1495, TJT-501, RVKT-260, AL-201 and RVKT-260 were least preferred by pod fly, gram pod borer, pigeonpea plume moth, bruchids, pod bug and physiological disorder, whereas WRG-79 was found to be promising as it recorded maximum grain yield of 1585 kg ha<sup>-1</sup>.
- I Medium maturing entries Guliyal local red, LRG-52, Khargone-2, WRG-98, Khargone-2 and JKM-7 were least preferred by pod fly, gram pod borer, pigeonpea plume moth, bruchids, pod bug and physiological disorder, respectively. Genotype WRG-181 was found to be

promising as it recorded maximum grain yield of 2357 kg ha<sup>-1</sup>.

- I Treatment Indoxacarb 15.8 SC @ 0.5 ml L<sup>-1</sup> Novaluron 5.25% + Indoxacarb 4.5% SC @ 825 ml ha<sup>-1</sup> and Emamectin Benzoate 5%SG @ 11 g a.i. ha<sup>-1</sup> recorded minimum grain damage by pod infesting insect pest complex (viz. pod fly, gram pod borer, pod bug and pigeonpea plume moth, respectively) and also recorded maximum grain yield.
- I Treatment Acetamiprid 20SP @ 20 g a.i. ha<sup>-1</sup> recorded minimum grain damage by pod fly and pod bug, respectively and also recorded maximum grain yield.
- I Chemicals proved their superiority in controlling pod pest complex in comparison to microbials (*Bacillus thuringiensis* and *Beauveria bassiana* both SC and WP formulations) and botanical (Neem Seed Kernel Extract)
- I Studies on influence of crop habitat diversity (viz., pigeonpea sole, pigeonpea bordered with maize and sorghum, respectively) on biodiversity of natural enemies of insect pests of pigeonpea revealed that a total of six natural enemies was recorded on pigeonpea which included Lady Bird beetle, *Cheilomenes sexmaculatus* Fab.; Spiders; Dragon fly, Damsel fly, Mud wasps and *Cotessia* (= *Apanteles*) sp., respectively. Maximum populations of all the natural enemies were observed on sole pigeonpea crop followed by pigeonpea crop bordered with maize and sorghum respectively.
- I Studies on influence of climate change on biodiversity of natural enemies of insect pests of pigeonpea revealed that a total of six natural enemies was recorded on pigeonpea which included Lady Bird beetle, *Cheilomenes sexmaculatus* Fab.; Spiders; Dragon fly, Damsel fly, Mud wasps and *Cotessia* (= *Apanteles*) sp., respectively. Maximum populations of all

the natural enemies were observed on sole pigeonpea crop under unprotected condition in comparison to protected condition. Similar findings have been observed in Narsinghpur and Hoshangabad districts.

### Chickpea

- I Emamectin benzoate 5%SG @ 200 g ha<sup>-1</sup>, Novaluron 5.25% + Indoxacarb 4.5% SC @ 825 g ha<sup>-1</sup>, Emamectin Benzoate 5%SG @ 11 g a.i. ha<sup>-1</sup> and HaNPV 0.5%AS @ 250 ml ha<sup>-1</sup> was found to be highly effective in reducing the gram pod borer infestation on chickpea and did not have any phytotoxic effect on the crop.

### Brinjal

- I Emamectin benzoate 5% SG @ 10 g a.i. ha<sup>-1</sup>, Rynaxypyr @ 0.3 ml L<sup>-1</sup> and Pyriproxyfen 5% EC + Fenpropathrin 15% EC @ 500 ml ha<sup>-1</sup> were found to be most effective against shoot and fruit borer and also registered highest fruit yields.
- I Application of *Beauveria bassiana* @ 1.5 kg ha<sup>-1</sup> and treatment sequence comprising of NSE 5% suspension + *B. thuringiensis* @ 1 kg ha<sup>-1</sup> (NSE+NSE+Bt+NSE+NSE+Bt) recorded significantly lowest damage due to brinjal shoot and fruit borer and also registered highest fruit yield.

### Chilli

- I Emamectin benzoate 5%SG @ 200 g ha<sup>-1</sup>, ready mix formulations XLC425 (Profenofos 40% + Fenpyroximate 2.5% EC) @ 817.5 ml ha<sup>-1</sup> and Pyriproxyfen 5% EC + Fenpropathrin 15% EC @ 500 ml ha<sup>-1</sup> were found to be most effective against insect pest complex of chilli.

### Okra

- I Pyriproxyfen 5% EC + Fenpropathrin 15%

EC @ 500 ml ha<sup>-1</sup> and Emamectin benzoate 5% SG @ 10 g a.i. ha<sup>-1</sup>, was found to be most effective against insect pest complex of okra and tomato and also registered highest fruit yields.

### 3.4 Plant diseases management

#### Evaluation of new fungicidal formulation against leaf blast

- | New fungicidal formulation Kresoxim methyl 40% + Hexaconazole 8% WG (RIL-068/F 1.48 WG ) @i g L<sup>-1</sup> significantly reduced the leaf blast severity (10.2%) and increased the grain yield (57qha<sup>-1</sup>) over untreated check (39q ha<sup>-1</sup>)
- | Trifloxystrobin 25% +Tebuconazole 50% @ 0.4 g L<sup>-1</sup> reduced the sheath blight disease severity ( 22%) and increased the grain yield ( 48.68q ha<sup>-1</sup>) as compared to check (35.37q ha<sup>-1</sup>).
- | Soybean seed treated with Trichoderma viride @ 4 g kg<sup>-1</sup> seed harboured 23.93 q/ha yield over control (15.98) and reduction (32%) of Pratylenchus thornei
- | Solarization of nursery bed and transplanting of seedlings of tomato to the main field with neem cake exhibited reduced nematode population
- | Combination of neem cake and Trichoderma viride (2.5 kg ha<sup>-1</sup>) reduced soil and root of lesion's nematodes population in chickpea.

#### Evaluation of bio pesticides against leaf blast

- | Of the tested products Pf1 liquid formulation (TNAU) @5ml/l was found Significantly superior in reducing the leaf blast severity (30.3% ) and increasing the grain yield (53q/ha ) over untreated check (42q ha<sup>-1</sup>).

#### Control of false smut of rice

- | Control of false smut of rice was studied in PS5 during the year 2012 under natural epiphytotics. Among the tested products, Nativo 75 WG (50% PE) was found highly effective for controlling the false smut (2.10 infected /panicle) followed by propiconazole 50% PE (7.50 infected /panicle) over untreated check (21.70) and increased the grain yield significantly

#### Kernel smut

- | Analysis of results of rice disease monitoring studies indicates that Kernel Smut (Bunt of rice) caused by Tilletia barclayana is wide spread and prevalent in major rice growing areas of Madhya Pradesh.
- | Average 17.6% seed samples exhibited the pathogen association in the range of 0.01-0.50%.Standard NaOH (2%) seed soak method was employed for confirmation. As per Indian Seed Act, the Central Seed Certification Board has fixed the maximum 0.10 and 0.50 % infected seed by number in Foundation and Certified seed lots, respectively.
- | Commonly grown varieties IR 36 and Kranti are susceptible for bunt pathogen.

#### Soybean

- | In all 6 mycoflora were found associated with soybean seeds. The association of Macrophomina phaseolina ranged from 2.0 to 14.0 % in seeds from Tikamgargh, whereas Colletotrichum dematium, the fungus responsible for anthracnose was in the range of 3.0 to 09.0% from Jabalpur. The association of Fusarium oxysporum was from 4.0 to 15.0% in seeds from Seoni. The seed rot causing fungi Aspergillus niger, 2.0 to 17.0% in seeds from Sehore and Aspergillus flavus 4.0 to 16% in seeds from Chhindwara were noticed. The purple



stain of soybean seeds was in the range of 4.0 to 14.0% from Betul. Seed dressing with Flow able Thiram @ 2.5ml kg<sup>-1</sup> of seed (T2) and Vitavax 200 (containing Thiram 37.5% and Carboxin 37.5%) @ 2g/kg seed (T4) effectively reduced the association of *Macrophomina phaseolina*; *Colletotrichum dematium*; *Aspergillus flavus*; *Aspergillus niger*; *Curvularia lunata*; *Fusarium oxysporum*. Standardized the detection techniques of *Macrophomina phaseolina*; *Colletotrichum dematium*; *Curvularia lunata*; *Fusarium oxysporum*, *Phoma medicaginis* with seeds.

### 3.5 Medicinal & aromatic plants

- I The Mancozeb was the best treatment in reducing the disease intensity and enhancing the dry root and seed yield followed by copper oxychloride.
- I The Carbendazim was recorded as the best treatment followed mancozeb, for both, reducing the percent disease index and enhancing the yield of the crop.

### 3.6 Agro-forestry

#### D. sissoo based Agrisilviculture system

Mean data of 3 years showed that, open condition gave higher grain yield (33.25 q ha<sup>-1</sup>),



followed by 75% pruning (25.90 q ha<sup>-1</sup>), 50% pruning (20.97 q ha<sup>-1</sup>) and 25% pruning (18.01 q ha<sup>-1</sup>). No pruning recorded lowest grain yield (12.59). Among the paddy variety i.e., MR-219 gave higher grain yield (25.92 q ha<sup>-1</sup>) than IR 36 (23.13 q ha<sup>-1</sup>) and WGL 32100 (21.66 q ha<sup>-1</sup>). Agroforestry system (pruning) was more profitable (Rs. 36377 ha<sup>-1</sup>) than unmanaged agroforestry system i.e., no pruning (Rs. 28317 ha<sup>-1</sup>) and crop alone (Rs. 28178 ha<sup>-1</sup>). Under managed agroforestry system i.e. growing of crop with different pruning intensities, paddy + sissoo in 25% pruning was more profitable (Rs. 40753 ha<sup>-1</sup>) as compared to other pruning treatments.

#### D. sissoo + Wheat (Late Sown Varieties):

Mean data of 3 years showed similar trend, open condition recorded higher grain yield of 26.99 q ha<sup>-1</sup> followed by 75% pruning (23.99 q ha<sup>-1</sup>), 50% pruning (21.09 q ha<sup>-1</sup>), and 25% pruning (19.35 q ha<sup>-1</sup>). No pruning gave lowest grain yield (15.16 q ha<sup>-1</sup>). Among the late sown wheat variety, variety GW-273 gave higher yield (23.65 q ha<sup>-1</sup>) followed by MP-3020 (21.07 q ha<sup>-1</sup>) and GW-366 (19.25 q ha<sup>-1</sup>) and can be recommended for late sowing condition under agrisilviculture system (D. sissoo + Wheat). Agrisilviculture system gave significantly higher monetary return (Rs. 36070 ha<sup>-1</sup>) than growing of crop alone (Rs. 26882 ha<sup>-1</sup>) and tree alone (Rs. 29112). Managed agroforestry system, wheat + D. sissoo in 25% pruning gave higher monetary returns (Rs. 40018 ha<sup>-1</sup>) compared to crop alone and tree alone. Among varieties GW-273 recorded high monetary return (Rs. 35123 ha<sup>-1</sup>) as compared to other varieties.

#### D. sissoo + Wheat (Normal Sown Varieties)

Mean data of three years showed that, open condition gave higher yield as compared to crop grown under tree. Crop yield increased with increasing pruning intensity, hence 75%





pruning gave higher grain yield ( $21.89 \text{ q ha}^{-1}$ ) followed by 50% pruning ( $19.64 \text{ q ha}^{-1}$ ) and 25% pruning ( $17.38 \text{ q ha}^{-1}$ ), whereas no pruning gave the lowest grain yield ( $14.94 \text{ q ha}^{-1}$ ). Among normal sown wheat variety, variety MP-3173 gave higher yield ( $20.92 \text{ q ha}^{-1}$ ) than variety MP-3288 ( $19.2 \text{ q ha}^{-1}$ ) and Sujata ( $18.39 \text{ q ha}^{-1}$ ). Agrisilviculture system gave significantly higher monetary return (Rs. 29809  $\text{ha}^{-1}$ ) than growing of crop alone (Rs. 18079  $\text{ha}^{-1}$ ) and tree alone (Rs. 27321). Managed agroforestry system, wheat + D. sissoo in 25% pruning gave higher monetary returns (Rs. 34849  $\text{ha}^{-1}$ ) compared to crop alone and tree alone. Among varieties MP-3173 recorded high monetary return (Rs. 28967  $\text{ha}^{-1}$ ) as compared to other varieties.

### 3.7 Horticulture

#### Vegetable Crops

- I In broccoli cv. Green Magic grown during Rabi season on medium black soil, application of poultry manure @  $2.5 \text{ t ha}^{-1}$  + half NPK rec. ( $60:40:30 \text{ kg ha}^{-1}$ ) at final field preparation produced the maximum head yield ( $205.02 \text{ q ha}^{-1}$ ) and B:C ratio (4.58). Hence, it recommended as INM package for broccoli in Jabalpur conditions of Zone-VII.
- I In Rabi season Okra cv. VRO- 6 the application of NPK ( $150:80:100 \text{ kg ha}^{-1}$ ) + Vermiwash (5 sprays at 10 days interval 30 days after sowing) gave maximum yield ( $88.20 \text{ q ha}^{-1}$ ) with B:C ratio (2.18).
- I An application of Azospirillum @  $5 \text{ kg ha}^{-1}$  along with the recommended dose of NPK ( $100:60:50 \text{ kg ha}^{-1}$ ) has been found effective for obtaining highest seed yield ( $4.16 \text{ q ha}^{-1}$ ) in brinjal cultivar Jawhar under Jabalpur conditions.

#### Spices

##### Onion and Garlic

- I Application of oxyfluorfen 23.5% EC before planting + one hand weeding at 40-60 days after transplanting in garlic, was found superior in terms of marketable bulb yield, WCE and B:C ratio.
- I Combined application of  $110:40:60:40 \text{ kg}$

Crop/ Family	Chemical constituents	Uses	Technology developed
<i>Withania somnifera</i> / Solanaceae	Withanolide A and B,  Withaferin A <i>somniferin</i> ,  Free amino acids	Antibiotic, antiviral, antiamoebic,  Anti-inflammatory, arthritis, anxiety, insomnia, stress, cardio-protective, antioxidant, and antitumor activities	Maximum withaferin - A content is at 50% flowering in leaves (110 days).  Maximum withanolide -A and B percentage were estimated at Field maturity in root (150 days).  Root powder can be best stored in glass container up to nine months of storage

NPKS along with organic manures equivalent to 15.0t FYM and Azospirillum and PSB @ 5kg each ha<sup>-1</sup> was better with respect to marketable bulb yield of onion and B:C ratio.

## Fruits

### Custard apple

- I Among the six entries fruit weight varied from 340.5 to 509.5 gm., number of seeds 35 to 66 and pulp percentage 52.2 to 60.08%. Based on size and TSS percentage of fruit JCA-1 and JCA-2 were found superior over others. The JCA-3 and JCA-6 were noted higher pulp content over other genotypes.
- I The planting material of Custard apple Cv. Arka Sahan (225 grafts) and Balanagar (25 grafts) were collected from IIHR, Bangalore (Karnataka) and planted in the field on dated 30.09.2011.

### Jamun

- I The Jamun genotypes varied in their physico - chemical composition and plant height. The average fruit weight was found between 12.81 to 22.96 g and stone weight ranged from 0.45 to 6.10 g. similarly the pulp percentage ranged from 75.70%. Whereas, the TSS ranged from 13 to 17%.

### Bael

- I The survey and collected were conducted

near Jabalpur district and seven genotypes were marked for physical parameter. The fruit weight ranged from 449.2 to 886.6 gm. and number of seeds ranged from 15 - 90. The Maximum fruit weight was recorded in JB - 2 (886.6 gm.) followed by JB - 1 (744.2 gm). The minimum number of seeds was recorded in JB - 1 (15) followed by JB - 2 (37).

## 3.8 Plant Physiology

### Single component value added products

Arjun powder, Bel powder, Gudmar leaf powder, Giloy stem powder, Kalmegh powder, Mamphal leaf powder, Stevia powder, Sheonag stem bark powder, Adusa leaf powder, Bhui-amla powder etc. and popularized as brand material.

### Multi-component value added products

Madhunashini powder, Jawar nashak powder, Herbal anti dandruff hair oil, Aloe vera powder, Herbal tea (with and without natural sweetener), Arjun tea (with and without natural sweetner), Laxative powder also popularized as brand material.

### Post harvest processing technology of Ashwagandha

Harvesting of leaves at 50% flowering stage (110 DAS) yields maximum withaferin-A content. Maximum withanolide-A and B

Crop/ Family	Chemical constituents	Uses	Technology developed
<i>Cassia angustifolia</i> / Caesalpinia deae	Bioactive anthraquinone glycosides viz; sennoside A, B, C and D.	The leaves have laxative and cathartic properties. Therefore, used in abdominal disorder.	Leaf picking days for obtaining maximum sennoside A and B content - 90 DAS, 130 DAS.  Best packaging material for maximum storability of leaf sennoside A and B is black polythene and aluminum foil paper packet.

percentage were estimated at 150 DAS in root. Shelf life of root powder can be maintained if stored in glass container upto nine months of storage.

### **Post harvest processing technology of Senna.**

- | Black polythene and alluminium foil paper packet were evaluated to be the best packaging material for storability of leaf sennoside A and B

### **3.9 Designing and development of tapping device**

Out of the six proto-types of tapping device developed, the tapping device with a roller blade was found effective. The tapping device made up of high carbon steel has a long cylindrical handle measuring 17.5 cm with a cut at the distal end to hold the roller blade of 3.5 cm diameter. The 5.0 mm wide roller that moves freely on its axil has a sharp blade of dimension 2.0 mm long and width ranging 0.5 mm to 0.8 mm. The 2.0 mm flat rim on its either side of the blade acts as a stopper that prevents the sharp blade from travelling beyond 2.0 mm depth in the bark even on application of pressure during tapping.

#### **Newly developed tapping device**

The newly design tapping device when provided to the tappers, they tapped bushy Guggul plants by rolling the blade over the main stem. In spite the operation of the new device being easier in comparison to their



locally made implement, its short handle was a major constraint as spines of the plant injured their hands. Fitting the handle of the new device into the long handle of their traditional device solved the problem. In Madhya Pradesh the device was tested by Guggul tappers in Morena and Sheopur districts. The mean yield varying from 250- 450 g. guggul per plant was obtained after the use of the new tapping device.

### **3.10 Food science and technology**

#### **Studies on shelf life extension**

- | Irradiation treatments in combination with low temperature storage and packing mushroom in LDPE (100 gauge) was found suitable for shelf life extension and maintenance of quality, facilitating its market distribution and sale in the country.
- | An enhancement in the shelf life of wild edible mushrooms up to a period of 8-24 days could be achieved by the application of 1.0-1.5 kGy radiation dose where as in cultivated mushrooms up to 12-24 days could be achieved by the application of 1.5-2.0 kGy radiation doses.
- | Irradiated samples of wet Ganoderma lucidum treated with 2kGy radiation dose were devoid of any mould growth and kept well up to the 6th month as compared to control (1 month) where as vacuum packed dry G. lucidum was in good condition up to 18 months with 2.0kGy radiation dose.
- | This technique of preservation could be used by mushroom growers for storage as well as for better economic return particularly during peak harvesting season, also by the traders for both domestic markets as well as for export trade.

#### **Evaluation of nutraceutical incorporated buns**

- | The nutraceutical incorporated buns were developed and evaluated for sensory,

physical, functional, biochemical parameters & storage stability.

- | An organoleptically acceptable buns containing enhanced amount of nutraceuticals can be prepared by incorporating garden cress powder, flax seed powder, okara powder and oat flour at 4, 4, 5 and 15% respectively.
- | These buns with elevated levels of fibers, omega-3 fatty acids, alpha-glucans and nutrients especially protein and iron can be produced on industrial scale.
- | The consumption of these buns could be beneficial for improving the nutritional and health status of general population where bread & buns consumption is high.

#### **Nutritious warries and their quality evaluation**

- | The nutritious warries were developed from various combinations of bengal gram, green gram, black gram and lentil by incorporating bamboo shoots & analyzed for various quality attributes. Warries developed with 20-30% bamboo shreds with all pulses were found best in overall quality.
- | It contained higher amount of carbohydrate, crude fiber and potassium as compared to control. The developed warries packed in polypropylene (200 gauge) were found in good condition for consumption upto 12 months of storage period.
- | Bamboo warries with good cooking quality and storage stability can be promoted at urban market which can help in the up-gradation of economic status of tribal and rural people .
- | Dalia could be developed from wheat, soybean and green gram grits in the ratio of 80:10 10 was nutritious having all essential nutrients.
- | Nutritious warries made from soybean, black gram and potato in the ratio of 32: 48:

20 was excellent.

- | 1.25 kGy gamma radiation treatments in combination with LDPE could be successfully utilized for shelf life extension of tofu up to 15 days without any deleterious effect on quality.
- | Infant food developed from wheat, soybean, green gram, ragi / amaranth with 5% carrot powder and skimmed milk powder contained balanced amount of essential amino acids, calcium , phosphorus, and -carotene as a source of vitamin A with low amount of fibre. Thus, this product could be recommended for infants as a supplementary food.
- | Noodles developed from refined wheat flour with chickpea and soybean had good sensory qualities and rich in proteins and minerals. Bamboo fortified warries made in the ratio of 20 : 80 and 30 : 70 (bamboo shreds : green gram / bengal gram / mixed pulses) were found to be highly acceptable. They contained good amount of proteins, fibres and minerals.
- | Nutraceutical buns developed from refined wheat flour in combination with garden crass, flax seeds, okra powder and oat flour at the level of 4, 4, 5 and 15%, respectively contained good amount of fibres, omega free fatty acids, -glucans and minerals. Thus, it could be used for curing many nutritional deficiencies and disorders.
- | Bamboo fortified warries made in the ratio of 20:80 and 30:70 (bamboo shreads : greengram / blackgram / bengal gram / mixed pulses, bengal gram and lentil,40:30) were found to be highly acceptable. Nutritionally , they contained protein in the range of 21.82-23.28%, fiber 6.24-14.42% and ash 4.44-7.88% on dry wt. basis .Iron and phosphorus varied from 8.14-15.40 and 1108-2007 mg /100g dry product respectively . The results showed that the products could be well stored up to 8 month under vacuum packaging

conditions. Hence, they have a potential to increase the food basket and income to the farmers.

- I An organoleptically acceptable 4 types of Nutraceutical buns developed from refined wheat flours in combination with garden cress, flaxseeds, okara powder and oat flour at the level of 4,4,5 and 15%, respectively had the elevated levels of fibres, omega-3-fatty acids, B-glucans and minerals may be utilized in various nutritional deficiencies and disorders as a functional food.
- I The infant food developed from wheat, soybean and green gram contained good amount of protein (13g), calcium (214mg) and phosphorus (493mg) per 100g product as compared to the product made from green gram or bengal gram alone. Fortification of 5% carrot powder enriched the product with carotene- a source of vitamin A. The supplementation of ragi or amaranth increased the level of calcium and other minerals to a great extent. Further, to enhance the nutritional quality, fortification of skimmed milk powder (10 to 20%) showed an excellent acceptability. Being low in fibre, the product could be recommended as supplementary food for infants.
- I The chapatis and noodles made from wheat: chickpea (90:10), wheat : soybean (90:10) and wheat : chickpea : soybean (90:05:05) were acceptable and good in sensory qualities. The other product mathri made from above combinations had a limit of fortification up to the level of 20% without affecting the quality of the product. These developed products were better in protein quantity and quality as well as rich in mineral contents. Hence, they could be recommended for formulations.
- I Nutritious dalia was made from the grits of wheat, oat, soybean, green gram and horse gram in different proportions. The excellent

product was made from the wheat, soybean and green gram in the ratio 80:10:10. It was nutritious having all the essential nutrients.

- I Nutritious warries were developed from black gram, green gram, soybean mixed with vegetables ash guard, potato and brinjals. The best product was made from soybean, black gram and potato in the ratio of 32:48:20. They had excellent consumer acceptability and thus could be recommended for commercialization.
- I The technology for preservation and packaging of tofu was standardized using gamma radiations in different packaging materials. The results showed that 1.25kGy gamma radiation treatment in combination with LDPE could be successfully utilized for shelf-life extension of tofu up to 15 days without any deterioration of product quality.

### 3.11 Agricultural Economics

#### End-term evaluation study/ appraisal in respect of the implementation of the bringing green revolution to Eastern India (BGREI) programme

- I The study was conducted in Bastar, Durg and Bilaspur districts of Chhattisgarh. It was observed from the study that the project did not get so much success in the study area; although the paddy growers replaced their local seed of paddy with high yielding and hybrid varieties but still there was found a considerable yield gap over the potential yield of the rice. The cost of micro nutrients and other inputs including fertilizer gave negative but no significant response over the yield of rice in the study area revealed that state government intensified their efforts in this regard. In spite of seed, better package of practice of rice including balanced use of fertilizer and other inputs should also be demonstrated in the field of paddy growers. All the ecological regions viz; shallow low land, hybrid and

irrigated traditional have significant impact on the productivity of the crop. This calls for implementing ecology specific technologies under the programme for enhancement of the productivity level of rice to reach to its full potential. There is a need to develop managerial skills in the paddy growers so that they will be able to develop themselves as a manager of their farms.

#### **Spread of new varieties of hybrid rice and their impact on the overall production and productivity in Madhya Pradesh**

- I The study comprises of 80 Hybrid Rice adopters and 20 HYV non-adopters of two districts (Rewa and Mandla NFSM districts) of Madhya Pradesh. The study revealed that the expenses on seed (0.152), chemical fertilizer (0.082), human labour (0.243) were positive and highly significant, which reveals that if all things remains constant and at the present level of technological adoption an additional expense of Rs. 1/- each on seed, chemical fertilizer and human labour will be able to increase the yield of hybrid rice up to 0.152, 0.082 and 0.243 kg/ha respectively. The expenses on manures, pesticides, machine labour were found to be positive but non significant, which shows the need to provide extra attention while using these crucial inputs at their farms. There is also a need to provide skill oriented training and demonstration to them at their field.

#### **Hulling and milling ratio for paddy in Chhattisgarh and Madhya Pradesh**

- I The study comprises of 40 modern rice millers and 40 traditional rice millers (hullers) of two top rice growing districts Raipur and Durg of C.G and Balaghat and Katni of M.P. The study revealed that the paddy to rice conversion ratio was found to

be higher in parboiled rice (61-67 %) as compared to non parboiled rice (51-57 %). The huller of the study area processed area non parboiled rice on the bases of custom hiring basis.

#### **Impact of NREGA on wage rates, food security and rural urban migration in Chhattisgarh and Madhya Pradesh**

- I The study comprises of 200 NREGA house hold as 50 non NREGA house hold on different districts of Chhattisgarh and Madhya Pradesh. The study revealed that out of the total man days generated employment, an increasing trend was observed to other caste while decreasing trend was notice in case of Schedule Castes and Schedule Tribes in the year 2010-11 as compare to 2008-09. Women got higher employment opportunity in NREGA than those of men. A decreasing trend was noticed in case of house hold completed 100 days employment. This might be due to the fact that bottom level planner do not have clear-cut vision of how to generate employment. Hence, there is need to involve agricultural scientist, thinkers and planers in policy implication. This program should tune up with Comprehensive District Agriculture Plan for effective and efficient implementation.
- I The study revealed that the level of engagement of the Gram Sabha is very low as far as planning for NREGA is concerned. Nevertheless plans are being prepared for the scheme in each Panchayat. Inadequate planning is leading to inability of the Panchayats to take up more activities resulting deficient response (in terms of number of days of work provided or delay in providing works) to the demand for work raised by the community. There is also a need to look at the plans from an integrated perspective where the works of NREGA can be converged with other line departments.

As of now, convergence is driven only by the directives from the state government. There is also need to involve agricultural scientist, thinkers and planners in policy implication at bottom level. This program should tune up with Comprehensive District Agriculture Plan for effective and efficient implementation.

### **Impact /assessment of soil testing laboratories in Madhya Pradesh**

- I The study was conducted for 2 soil testing laboratories of Madhya Pradesh, The 100 farmers of Sagar and Dhar districts (50 in each districts) randomly selected for the investigation. Study revealed that the infrastructure available for soil testing in the state was found very poor. On an average one laboratory serves 66000 farmers and 51000 hectares of cultivated area. Out of the total respondents only 71 received their soil testing report, out of which only 49 (69%) adopted recommendations provided by Soil Testing laboratory. Although per hectare expenditure on seed, fertilizer and plant protection measures of adopted farmers increased for all crops after adopting soil testing analysis recommendation.
- I Per hectare expenditure on labour was also found increased in all crops except in soybean. The cost of cultivation and cost of production of all the crops reduced drastically, while cost-benefit ratio was found to be increased after adaption of recommendation of soil testing. The lack of knowledge about soil testing technology (70%) non-availability of soil testing report (62%), less co operation from officers of agriculture department (46%) and complicated method of testing soil sample (30%) were found the main constraints in adoption of soil testing recommendations. Thus, there is an ample scope for

improvement the analyzing capacity as well as dissemination ability of the soil testing laboratories. If this, coupled with professional management through proper linkages, can bring radical changes in the soil testing service in the state to extent the farmers' satisfaction.

### **Assessment of pre and post harvest losses of wheat and soybean in Madhya Pradesh**

- I The study comprises of 160 wheat growers and 160 soybean growers of different agro climatic regions of M.P. The study revealed that that the majority of respondents had lack of technical knowhow of post harvest technology specially storage techniques. They never found to be followed sun drying, admixing with ash, smoking and other pest control measures in their storage structure. Even they were not found to be followed rat guard and removed infested grain from their storage grain. Hence, efforts should be made to popularize post harvest technology amongst the farmers so that they could able to take advantage of time place form and possession utility of the product and earn more by reducing the pre and post harvest losses occurred in their products.
- I Assessment of marketable and marketed surplus of wheat, gram & tur in Madhya Pradesh

The study comprises of 100 wheat growers, 100 gram growers and 100 tur growers of Hosangabad, Vidisha and Narshingpur districts of M.P. An average HH was found to be sold their 82.56 per cent (wheat), 88.43 per cent (gram) and 93.14 per cent (tur) of the total production in the market. The maximum of quantity of grains were found to be sold in month of March and April just first after the harvested of the crop. It is also observed from the data that more than 90.00 per cent of total marketed surplus has been sold in regulated



market/cooperative society and remaining 10.00 per cent had been found to be sold to private traders or to agricultural/professional money lenders present in the villages. As the size of holding increased the marketed surplus sold to govt. agencies has been found to be increased, while sold to private trader/money lender has been found to be decreased.

#### Problems and prospects of oilseeds production in Madhya Pradesh

The study comprises 240 soybean grower of Chhindawara, Khandwa and Narshingpur districts and 120 mustard growers of Mandla, Morena and Chhatarpur districts of Madhya Pradesh. The study reveals that oilseeds production has increase tremendously due to successful implementation of TMO and ISOPOM programme in the state. The cultivation of soybean and mustard was also found profitable over competing crops i.e. maize and wheat. There is still found remarkable scope for increasing yield of these crops in the state as farmers were found to be harvested yield below the potential of the area under study.

Possibilities and constraints in increasing pulses product in MP and impact of National Food Security Mission on pulses

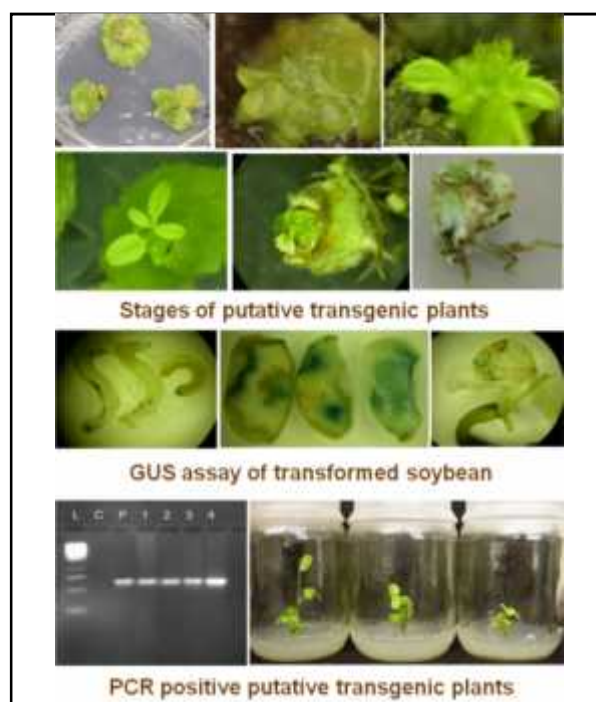
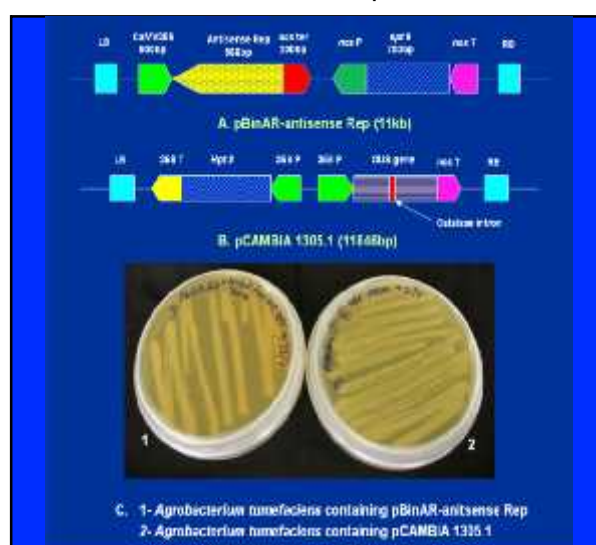
" The study was conducted in Sehore and Vidisha district. The results of the study clearly revealed that although NFSM has definite impact on production of Gram Lentil Urd and Mung but Tur reported negative growth trend in production. Farmers of both the district reported numbers of problems and constraints. Diseases and infestation of insect and pest were the major problems which need special attention.

### 3.12 Bio-Technology

- Characterization of phytase producing bacteria from soil: phytase producing

micro-organism was isolated from soil and screened using phytase specific medium and identified as *Bacillus* sp. on the basis of 16S rRNA gene

- Genomic DNA was isolated from bacterial cultures: Standardization of protocol for bacterial DNA isolation and isolate the DNA from bacterial isolates
- The phy gene amplification: amplification of phy gene was achieved by using phytase specific primers through PCR
- Sequence analysis of phytase from bacterial isolates: PCR product has been



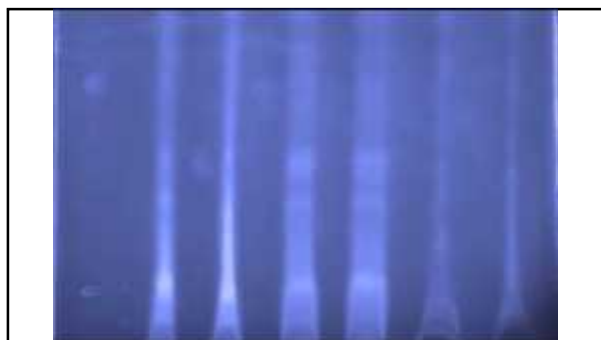


sequenced for their molecular analysis to get the desirable fragment of phy gene of identified bacterial isolate.

- | Regenerated BYMV resistant soybean using antisense RNA

### **Transgenic soybean resistant against yellow mosaic virus**

- | Plant regeneration protocol in oat for its further utilization in genetic transformation
- | Gene construct with phy gene for transformation of oat
- | Micropropagation protocol of pomegranate.
- | Cloned markers for drought tolerance in wheat and developed SCAR markers for reliable selection



TLC of Microbial Pigments

- | Converted maize parents to QPM and hybrid seed is being generated for field trials
- | Analyzed molecular diversity among soybean cultivars and mutant against root rot and yellow mosaic virus (YMV) disease
- | Molecular cloning of phy gene from fungi (published 7 gene sequences in NCBI public domain).
- | Developed low-cost production technology for better recovery of fungal *Monascus purpureus* pigments from various agro by products.

### **3.13 Agricultural Engineering**

#### **Farm machinery and implements**

##### **Self propelled 8 rows rice transplanter**

- | The machine was found time, labour and cost saving and of very much use of the farmers. This machine reduces the dependency of labour during peak season to avoid delay in transplanting. The machine is liked by the farmers but mat type nursery raising is a problem.

##### **Soybean cultivation**

- | In tillage treatments, m. b. plough with one pass followed by cultivator with one pass and disc harrow with one pass was found to be best suitable for soybean cultivation in vertisol in terms of physical properties of soil (i.e. moisture content, bulk density, hydraulic conductivity, bearing strength of soil), cost of cultivation, benefit cost ratio, net energy and energy per kg of soybean yield in comparisons to m. b. plough with one pass followed by cultivator with two passes and disc harrow with one pass and cultivator with one pass followed by disc harrow with one pass.
- | Sowing methods on tillage treatment, raised bed planter with open drainage channel was best suitable sowing method

of soybean in vertisol in terms of physical properties of soil (i.e. moisture content, bulk density, hydraulic conductivity, bearing strength of soil), yield and benefit cost ratio compare to raised bed planter and seed cum fertilizer drill.

### Bio-fuel efficiency

- | Recovery of Jatropha methyl ester found as 87.5% and amount of glycerol as 20%. Recovery of soybean methyl ester found as 97.5% and amount of glycerol as 12.5%
- | Phase stabilities of 200°, 195° and 190° proof ethanol of 2% from the each proof with biodiesel (15, 20 and 25%) and diesel were found stable in single phase at temperatures of 10, 15, 20, 25, 30, 35, 40



Testing of Diesel Engine fuelled with biodiesel blend

and 45°C except 0 and 5°C

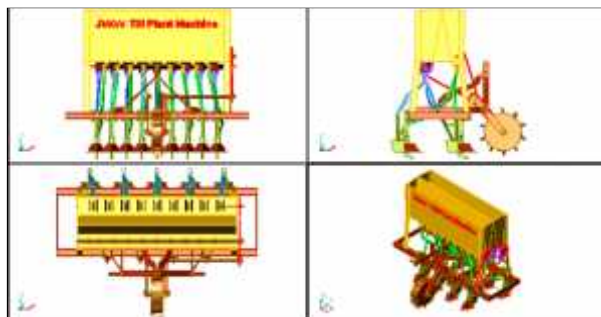
- | Fuel consumption, brake specific fuel consumption, brake thermal efficiency and input energy of 190° proof blend with biodiesel and diesel found excellence with respect to other proof blends except diesel at no load, 0.93, 1.86, 2.8 and 3.73 kW for constant speed of 1500 rpm
- | CO<sub>2</sub> emission increased with increasing brake loads at constant speed of 1500 rpm in all fuel blends except diesel fuel.
- | 190° proof ethanol fuel blends emitted lower ha<sup>-1</sup> in comparison to other proof ethanol fuel blends at all brake loads for constant speed of 1500 rpm.
- | CO<sub>2</sub> emission increased with increasing brake loads at constant speed of 1500 rpm in all proof ethanol fuel blends.
- | CO<sub>2</sub> emission emitted lower at all brake loads for constant speed of 1500 rpm in 200° proof ethanol fuel blends with respect to other proof ethanol fuel blends except diesel.
- | Unused oxygen emission was decreased with increasing brake loads at constant speed of 1500 rpm in all proof ethanol fuel blends.
- | In both the biodiesels and its intermediate blends at 100% brake load, the power output was increase from 0.23 to 3.91%. the reduction in power was found in JEE40D60 i.e. - 0.076%.
- | The maximum torque was found in JME40D60 biodiesel which was 9.82% higher than diesel followed by JME20D80 i.e. 9.46 and JEE80D20 i.e. 9.28%.
- | The specific fuel consumption of the tractor at 100% brake load both the biodiesel and its blends were found increased from 0% to 13.11%.
- | In both the biodiesels and their blends at 100% brake load, exhaust gas temperature were reduced in some blendings but it was increase in some blends as compare to diesel.

### Bioethanol production from waste potato using co-culture of *Saccharomyces cerevisiae* and *Zymomonas mobilis*

- | Co-culture of yeast and bacteria resulted in maximum yield of bioethanol at 30°C incubation temp. and 96 hrs. Incubation period in SSF method.
- | Using SiSF method, pH 4.5 and incubation temp. 25°C with incubation period of 96 hrs gave maximum yield of bioethanol.

### Design and development of furrow openers for till plant machine

- | Field capacity 0.489 ha. / hr, total time required for tillage and sowing operations



was 72.27% less than conventional method i.e. (cultivator x 1 + disc harrow \*1+ seed drill x 1). 6.4% more yield than zero tillage machine. Cost of operation: is Rs.346/ha.

### Studies on vibrational characteristics of different tractor seats

- | Laboratory study of transmitted whole body vibrations at tractor seat-operator interface concluded that about 90% of vibration attenuation (maximum) can be achieved by using isolators of different rubber materials for different tractor seats, at corresponding engine speeds. WBV transmitted at tractor seat-operator interface by using rubber isolators of natural, neoprene and SBR materials indicated that vibration attenuation under various field conditions

i.e. tar road, farm road and ploughing operation, to about 16.2% by SBR; 26.28% by neoprene and 13.41% by neoprene in most severe vertical direction. However, amplification in vibration was also observed under farm road for lateral acceleration. The cost of vibration isolators is about Rs. 50 per piece only.

### Cooling structure for vegetables

- | The cooling structure increases the shelf life of tender coconut by 18 days as compared to ambient conditions.
- | The designed cooling structure maintains an average temperature of 24.48°C and relative humidity of 97.14 per cent inside the structure and gives the shelf life of 28 days with physiological loss of weight of merely 4 per cent.
- | For cultivation of wheat crop in vertisole it is



observed that six row raised bed planter gave satisfactory result in view of field capacity, field efficiency, and formation of the raised bed. Higher tillage resulted in to easy formation of raised bed with higher yield (49.5 q/ha).



## Soil & Water Engineering

### Demarcation of groundwater potential zones with the help of RS and GIS

The integration of remote sensing and GIS has proved to be extremely useful to identify groundwater potential zones. Thematic maps of soil, geomorphology, lithology and land use/land cover were prepared using various data sources for Narsingpur district. The maps were then overlaid and applied decision rules to decide the ground water potential of the area.

Result obtained by the thematic maps depends upon the combination of all parameters which controls the groundwater availability. The area with the combination of loamy, kaolinitic soil, flood plain, alluvium lithology and river is considered as an excellent zone for groundwater prospect with weighted score 485-600. Similarly the result obtained by the combination gradually varies from very good, Moderate, Poor and very poor groundwater zone with weighted score 400-485, 280-400 & 180-280 respectively. The area which has clay, montemorillonitic soil, denudational slope of proterozoic rocks, basaltic lava, flow hard rock and barren and waste land are considered as poor groundwater zones with weighted score 80-100.

Considering geomorphology as the most important feature in demarcating ground water potential zone, it was given weight 40, followed by lithology with 35, soil with 15 and land use/cover with weight 10. Score was allotted to individual feature in each theme on the scale of 0-7. Based on the marks gained; ground water potential zones were demarcated.

The result shows that out of the total area of 5133 km<sup>2</sup>, about 2344 km<sup>2</sup> has excellent ground water potential, 1530 km<sup>2</sup> has very good potential, 678 km<sup>2</sup> and 86 km<sup>2</sup> of area

comes under good and moderate ground water potential zone respectively, whereas 496 km<sup>2</sup> area belongs to poor ground water potential zone.

The analysis in confusion matrix shows that the producer's accuracy for poor class and excellent class was 100%, whereas for very good and good potential, the accuracy was 66.67%. The user's accuracy for the poor class was 75%, for very good and good it was 100% and for the excellent class it is 86.67%. The overall accuracy of the classification obtained was 88% giving satisfactory result.



75.4% of the total area is under excellent and very good potential zone and 11.2% of the area falls under moderate and poor potential zone, rest 13.3 % falls under good potential zone.

Ground water potential zones of the study area

### Enhancement of water productivity in command area

- I A Water User Association (WUA) is a co-operative association of individual water users who wish to undertake water-related activities for their mutual benefit. This study was carried out to find working status of water user association's in Command

area. These were surveyed through proforma quarries and the information provided was analyzed for three different basins namely the Narmada basin, Betwa basin, and Tones basin.

- | Income level of majority of water users in all three basins is maximum Rs 25000 per year. Narmada basin has water users who spend most of their time in agriculture. While in Betwa and Tones basin farmers spend only 40 percent time in agriculture and lot of time (50 to 60%) in other related work.
- | Farmer's co-operation in water distribution, machinery use, fertilizer distribution, transportation, Land use and hiring facilities is maximum in Narmada Basin. Support of other government department is also higher in Narmada basin. Availability of improved machinery as well as experienced workers is better in Narmada basin.
- | Water users in Narmada basin have more capacity to invest in advance agriculture like drippers, sprinklers, sprayers, and new machines etc as compared to other basins. But adoption of new techniques and seed replacement is more in Tones basin. These activities are increasing water productivity.
- | Narmada basin has better sufficiency of water resource. However timeliness and prices are told as better in Tones basin. Similarly Tones basin has better result due to better efficiency.
- | Water productivity has increased due to



Main Canal of Bijoree and Bauchhar WUAs

use of new techniques in Tones basin and it is found maximum as 3.2 kg/m<sup>3</sup> and in Betwa basin maximum was achieved as 4.0 kg/m<sup>3</sup>.

- | A Study on Comparative Performance of Water User Association was carried out in three WUAs namely Bijori, Bauchar and Govindgarh of Jabalpur, Narsinghpur and Rewa district with the aim of finding out the factors responsible for the functioning of Water User Association and its performance and to find out the factors responsible for project performance.
- | The tail-end supply ratio is highest in WUA3 (Govindgarh). The area uniformity ratio in WUA3 is less because in this WUA tail reach water users have no wastage of water whereas the delivery timeliness ratio is low in WUA2 (Bauchhar).
- | Carrying capacity ratio is highest in WUA3 (Govindgarh). In WUA2 (Bauchhar) poor structure ratio is highest. Fee collection performance of WUA3 (Govindgarh) is more than other WUAs, expenditure in maintenance is more in WUA1 (Bijori). For WUA3 (Govindgarh) personnel cost ratio is more, due to expenditure in personnel activities like training, wages etc. The manpower number ratio is lowest in WUA3 (Govindgarh).
- | The sustainability of irrigated area is more in WUA1 (Bijori) and area infrastructure ratio in WUA3 (Govindgarh) is more than other WUAs.
- | Water distribution efficiency is estimated to be in the range of 35-40%. The main cause of low efficiency was water distribution system is inequitable delivery of water to the field.
- | Water delivery indicators namely Tail-end supply ratio (0.58), area uniformity ratio (0.96) and delivery timeliness ratio (1) are within the acceptable range, hence this can be said satisfactory in Bijori WUA.
- | Similar trend of values in indicators was

found in case of Govindgarh WUA and Bauchhar WUA. Poor structure ratio of 0.50 and 0.83 indicate the poor condition of structure and high man power number ratio 0.009 and 0.06 shows engagement of more staff than optimum.

- | Tail-end supply ratio is highest in Govindgarh WUA because sufficient canal water is available for irrigation in tail reach. The area uniformity ratio in Govindgarh WUA is less because in this WUA tail reach water users have no wastage of water and the delivery timeliness ratio is low in Bauchhar WUA because of sufficient canal water is not available in the irrigation time.
- | Highest water productivity was found in Govindgarh WUA medium farmers (1.14 kg/m<sup>3</sup>) and lowest in Bijori and Bauchhar WUA marginal farmers (0.31 kg/m<sup>3</sup>).
- | Maximum water productivity of wheat in tail reach is shown by Govindgarh WUA in medium farmers (1.93 kg/m<sup>3</sup>) and the minimum in Bijori WUA large farmers is 0.39 kg/m<sup>3</sup>. Water productivity of wheat is highest in Govindgarh WUA and lowest in Bijori WUA in head, middle and tail reaches in all four farmers category as compared to other WUA's.
- | Enrichment of Ground Water Bank through Haveli Recharge.
- | In Haveli system rain water is held in field embankments so an additional amount of ground water recharge is possible. The Haveli stored water is released in 39 to 40th week of SMW. The water storage period is from 26 to 38th week of SMW which is best suitable period for ground water recharge by Haveli system.
- | This study was done in three villages, Shahsan and Dhaneta of Patan block and Ghunsor village of Shahpura block of the Jabalpur district. Khasra maps of all three villages were taken from the revenue department and Haveli fields were demarcated for each village by taking

transact walk across the study area.

- | It was found that the present Haveli area in these three villages is 6260 ha, 3940 ha and 14987 ha respectively. In the study area, average rainfall was measured as 1169 mm in 2011.

### 3.14 Adaptive research trials in farmers field

- | Total 18 trials were conducted at Tikamgarh, Sagar, Rewa and Ganjbasoda on drainage, ridge furrow sowing in Soybean field, improved varieties of Soybean & Paddy as well as improved technology for vegetable production during Kharif season at 147 locations of farmer's field. During Rabi season 28 trials were demonstrated on improved irrigation methods improved varieties, diversified cropping for Wheat, Gram as well as vegetable production at 106 farmers field. More than 3500 farmers visited these trails and acquainted with the improved technology. Total 16 trials were conducted on drainage, ridge furrow sowing, life saving irrigation by sprinkler irrigation, zero tillage seed drill, integrated nutrient management, weed management in soybean field, SRI and dry sowing method for paddy, hybrid variety for okra, integrated nutrient management and plant protection in sesame and variety replacement in urid as well as improved technology for vegetable production during Kharif season at farmer's field.
- | During Rabi season 18 trials were demonstrated on improved irrigation methods, improved varieties, ridge and furrow for wheat and chickpea, INM and IWM in chickpea, as well as vegetable production at farmer's field.
- | Geomorphologic attribute maps are prepared using Geological Survey of India (GSI) published maps and visual onscreen interpretation of satellite data for Tons and

Sindh Basin. All the image interpretation and database generation was carried out by using ERDAS Imagin 9.2 image processing and ARC GIS 9.3 GIS software.

- | Tons and Sindh Basin, situated in the part of Madhya Pradesh and covers an area of about 1.24 M-ha and 2.75 M- ha respectively.

### **Trainings for members of Water Users Association (WUAs)**

- | In order to increase the potential utilization of irrigation systems in the project area trainings were organized for officers from Department of Agriculture, Horticulture and Water Resources as well as field workers from Krishi Vigyan Kendras of the basin area.
- | In the year 2012-13 total 05 trainings of Officer of the Department of Agriculture, Horticulture, Water Resource and SMS of KVK's were conducted. Total 72 participants attended the trainings.
- | Training to WUA members were organized by KVKs at Damoh, Katni, Chhatarpur, Tikamgarh Panna, Sagar, Umariya, Rewa and College of Agriculture, Ganjbasoda. In



total 45 trainings, 2473 members of Water User Association were benefited at 9 locations during the year 2012-13.

### **3.15 Post harvest technology**

Performance evaluation of Porridge mill and development of nutritious mixed porridge.

- | Nutritious porridge is prepared by blending wheat porridge with defatted soybean cake at the rate of 5%, 10%, 15% and 20% respectively.
- | The protein content ranges from 13.8% to 18.1% whereas carbohydrate content range from 71.6% to 64.5%.
- | The overall acceptability was found to be more in 5% blend ratio followed by 10%, 15% and 20%.

### **Multistage grinding of the spices**

- | Coriander powder was prepared by coriander seeds at moisture content 7%, 9%, 11% & 13%.(db) using single and double stage grinding at 6, 8, 10, 12 Kg/hr feed rates.
- | After evaluation of all quality attributes (viz. Volatile oil (%), Fineness modulus, Particle size (mm) and Average value of colour change) of ground coriander powder it was concluded that the best quality product was obtained with 7% m.c. and at a feed rate of 8 kg/h using double stage grinding. The results showed the superiority of double stage grinding over single stage grinding.

### **Design, development and testing of groundnut testa remover**

- | The best de-hulling efficiency of groundnut testa remover are 67.17%, 73.94 %, 75.41% 76.87% and 80.37% at 10.5%, 9.2%, 8.9%, 8.3% and 7.4% moisture content of kernels at 40 kg/ h feed rate, 1.225 and 1.083 m/s roller speed respectively.



- The best machine capacity of groundnut testa remover are 25.83, 24.63, 25.28, 26.11 and 27.72 kg/h at 10.5%, 9.2%, 8.9%, 8.3% and 7.4% moisture content of kernels at 40 kg/ h feed rate, 1.225 and 1.083 m/s roller speed respectively.

### Optimization of process parameter for the production of the aloe vera juice powder

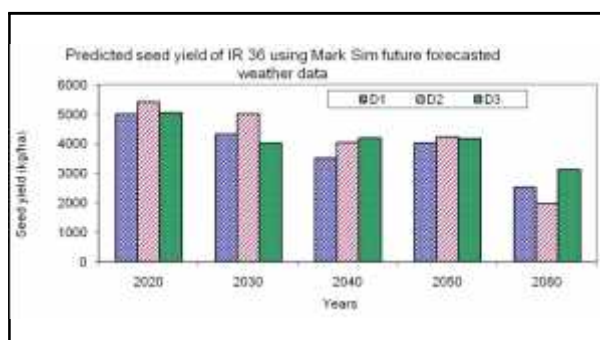
Best quality Aloe vera juice powder with average bulk density 0.26 g/ml, packed density 0.32 g/ml, hygroscopicity 0.19 g/g, moisture content 7.89% and pH 5.65 was obtained at an inlet air temperature of 141 °C, feed pump capacity of 21.8% and maltodextrin concentration of 3.5%.

### 3.16 Agricultural meteorology

#### Climate change study using DSSAT model

Genetic coefficient of IR 36 based on 4 years data of Jabalpur centre RMSE:1817 (very high) while validating forecasted and observed yield.

- Rainfall and rainy days are shifting to September and October



Effect of frost (Jan 08, 2013)

- Tmax increasing during rabi during initial stage, while Tmin increasing during kharif seasons.

- In soybean Tmax and EVP significant at flowering; RH and RD during initial stages. July is better with JS 97-52 variety. In rice IR 36 and Kranti proves better in rainfed. Yield significantly increases by applying extra irrigation and in chickpea Thermal units and RH were correlated with chickpea yield. Early and late sowing better with Desi as compared to Gulabi and Kabuli. Negative relation between temperatures and pest and beneficial insects were observed. Usability percent of forecasted rainfall, Tmax, and Tmin decrease during monsoon, and winter seasons.

#### Yield forecast

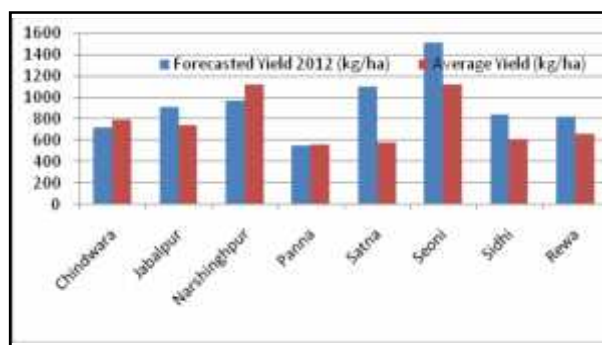
- Develop, validate, and issue multiple crop yield forecast for crops (rice and wheat) of Jabalpur Zone at mid season (F2) and pre-harvest (F3) stages.

#### Micro level rainfall variability

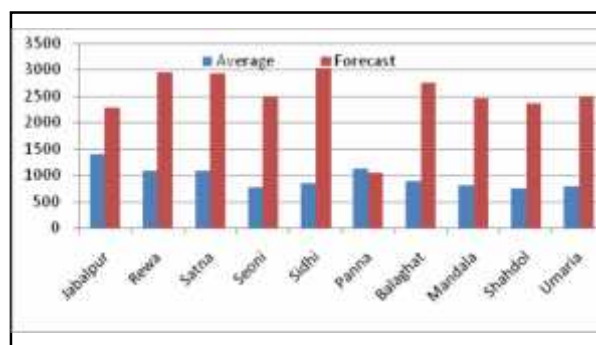
- Micro level rainfall variability in Tikamgarh district of Bundelkhand was analyzed. Niwari block is highest and Tikamgarh Block is lowest rainfall variability among the six blocks of Tikamgarh district.
- Thermal time based aphid forewarning model was validated for Bhundelkhand Agroclimatic Zone. The Growing degree days values accumulation from 1 to 25th



Effect of hail (Feb 15, 2013)



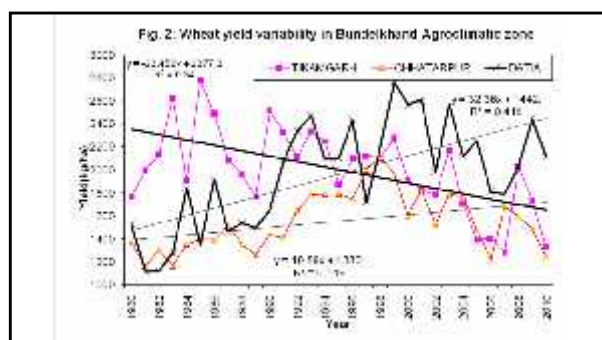
Yield forecast generation-Kharif rice  
(F2 Stage) 2012



Yield forecast generation-wheat  
(F2 Stage) 2012-13

January will be able to forewarn the peak aphid infestation in Mustard.

- I The Humid Thermal Ratio (HTR) was estimated and some criteria for forewarning of susceptible period of groundnut leaf spot was developed. Regression based model was developed with inclusion of HTR. The model was validated at Tikamgarh district of MP.



- I Error scores for four seasons between forecasted weather parameters and observed weather parameters for Tikamgarh district was analyzed.

### National Agricultural Innovation Project

The Department of Extension Education, JNKVV being the lead centre completed ICAR Project on National Agricultural Innovation Project (NAIP) Component - III on "Integrated farming system modules to ensure sustainable livelihood security for the peasants of disadvantaged districts of Madhya Pradesh (Oct. 2008 to March 2012). The major findings of the project are as follows.

**Crop Production:** Farmers were growing traditional seeds, after adoption of new improved varieties they got maximum benefits in terms of increase in crop productivity.

**Livestock:** Farmers were adopting local breeds of animals from so many years. After adoption of artificial insemination they got improved animal breeds and maximum milk production.

**Soil and water conservation:** Farmers had lack of techniques of soil and water conservation, after construction of soil and water harvesting structures like stop dam, field bunding, loose boding structures etc. they got maximum benefits and also learnt the techniques of soil and water conservation.

**Income and employment generation:** The baseline income of farmers was approximately Rs. 10,000/- per house hold / year, after adoption of different improved technologies under NAIP Project they got increased income like Rs. 16,000 - 18,000/- per house hold / year and gained benefit in case of employment.

**Market linkage:** With the help of producer company farmers had taken loan for starting different interventions like small scale enterprises, purchase improved variety seeds, fertilizers, insecticides & pesticides etc. and got maximum profit in terms of increase.

### 3.17 JICA project

#### Fertilization in soybean

- I Pot experiments on soybean and sorghum were conducted at Jabalpur to achieve significant impact on growth, yield and nutrient uptakes by soybean and sorghum crop.
- I Correlation between uptake of P and P-extractants on soybean crop showed the trend as Truog > Olsen > Bray.

#### Production constraints

- I There is a wide gap between practices adopted by the farmers and recommended by the Vishwa Vidyalaya. This gap is reflected in average yield of about 12 q/ha,
- I Although gradual varietal replacement was observed and farmers are replacing JS 335 by JS 95-60 and JS 93-05.
- I The major gap was observed in use of sowing methods, plant geometry, seed rate, use of biofertilizers, treatment of seed with fungicides/insecticides which are cost effective technologies. The farmers also not observing soil test based use of fertilizer application.
- I In areas with high rainfall coupled with rainfall during flowering and podding stage along with problem of water seepage due to

irrigation command specially on sample holdings of Hoshangabad, Harda and Raisen districts, the yield were extraordinary low due to Rhizoctonia disease.

#### Collection of whitefly and YMV infected soybean/ alternate host plants

- I Collection of whitefly biotypes and YMV infected soybean leaf samples in kharif season from 17 District of Eastern MP.
- I Genomic DNA isolation of whitefly samples and YMV infected soybean leaf samples.
- I Amplification of isolated DNA using specific primers whitefly biotypes and YMV

#### Preparation of observation sheet

For collection of insect pests and observation of intensity of infestation the observation board has been prepared for farmer's use. This will help in identification of specific insects for their proper control.

#### New drainage, tillage, and sowing method combination for stabilizing soybean yield

- I The combination of conventional tillage+raised broad bed + open drainage methods found good for seed germination, initial growth, and productivity (28 q/ha ) in rainy season in Madhya Pradesh.





### **Effect of seed treatment on incidence of insect pest and natural enemies on soybean**

- I Seed treatment with thiamethoxam @ 3g/Kg seed & imidacloprid @ 5ml/Kg seed were found effective to check stem fly and whitefly at early crop growth.
- I Grain yield was higher in seed treatment with thiamethoxam (1753 kg/ha) followed by conventional method, Trizophos 40 EC @ 800ml/ha at 20 days - Chlorpyrifos 20 EC @ 1.5 l/ha at 50 days (1718 kg/ha) with maximum net return (Rs. 4793 and Rs. 4057 respectively).

### **Soybean cultivars against soil moisture stress and high plant population in eastern M.P**

- I Plant Population was reduced maximum in excessive moisture stress (12.40%). There was drastic reduction in nodule numbers, Fresh weight and dry weight under high plant population (HPP) and excessive moisture (EM).
- I Number of pod per plant was reduced under HPP and EM. Whereas there was no change observed for days 50 (%) flowering and maturity. Number of branches per plant was reduced under HPP and EM.
- I Biological yield was recorded the highest under high plant population followed by control and excessive moisture condition.
- I Test weight was drastically reduced under excessive moisture stress.
- I The yield reduction was realised 42% and 35% in EM in comparisons to HPP and control, respectively.
- I Harvest index was high under high plant population, reduced control and excessive moisture condition. Under control condition

the highest yield was recorded by- JS 20-71 (3120.37 kg./ha), JS 2087 (2990.74 kg./ha) and RVS 2001-4 (2601.85 kg./ha).

- I Under high plant population condition the highest yield was recorded by JS 20-50 (3611.11 kg ha<sup>-1</sup>), JS 20-87 (3277.78kg ha<sup>-1</sup>), RVS 2001-4 (3194.44 kg ha<sup>-1</sup>).
- I Under excessive moisture stress the highest yield was recorded by JS 20-87 (2055.56kg ha<sup>-1</sup>), JS 20-71 (1935.19kg ha<sup>-1</sup>), RVS 2001-4 (1861.11kg ha<sup>-1</sup> and JS 20-50 (1833.33kg ha<sup>-1</sup>).

### **3.18 Visits abroad**

#### **Visit of Scientist to Brazil under JICA project**

- I Dr. Sunil Bhaskarrao Nahatkar, Principal Scientist, Directorate of Research Services, Dr. R. P. Joshi, Subject Matter Specialist, Collage of Agriculture, Rewa, Dr. Manoj Shrivastava, Senior Scientist, Sesame & Niger project (ICAR), College of Agriculture, Jabalpur and Dr. Amit Kumar Upadhyaya, Scientist, College of Agriculture, Tikamgarh visited Brazil to learn Brazilian soybean cultivation technologies during 17th January 2013 to 2nd February 2013. During this period they visited Embrapa Soja, Londrina, IAPAR (Parana State Agriculture Institute), Londrina, Integrada (Farmers Association), Londrina, COAMO (Oil factory) Parana, CAMPO, Brasilia, Embrapa Cerrado, Brasilia, Embrapa



Agrosilvopastoral, Sinop and Farmers fields at various places

### **Scientists attended world soybean research conference at Durban, South Africa**

I The scientists of attended Word Soybean Research IX Conference was organized from 18th of February to 22nd of February, 2013 in ICC, Durban South Africa, hosted by the Protein Research Foundation and the Oil and Protein Seeds Development Trust, and organized by Paragon Conventions Africa, in which planners, scientists, farmers, entrepreneurs, manufacturers, industrialist and business houses participated and exchanged their ideas and opinions to enhance soybean production for supply of quality protein to malnourished population of the world. The research papers on soybean research and development were presented by Dr. A. N. Shrivastava, Principal Scientist (Plant



Breeding), Dr. B. S. Dwivedi, Scientist (Soil Science), Dr. Sanjeev Kumar, Scientist (Plant Pathology), Dr. C. J. Singh, Subject Matter Specialist (Food Science) and Dr. Amit Jha, Scientist (Agronomy).

I Dr. S.S. Tomar, Director Research Services and Dr. S.K. Rao Director of Farms JNKVV, Jabalpur attended the Global Launch of the Maize and Wheat CGIAR Research Programme at Mexico from 16-20 January, 2012.

I Dr. (Mrs.) Anita Babbar ,Principal Scientist

attended Integrated Breeding Multi Year visited Course (1B-MYC) scheduled from 15th -27th October 2012 in Wageningen , Netherland under Generation Challenge Programme.

### **Research review Meetings**

I On the initiative of Hon'ble Vice Chancellor, Dr. V.S.Tomar,, JNKVV, Jabalpur the crop improvement review meeting was held on 3 - 4 February, 2013 at Directorate of Research Services, JNKVV, Jabalpur. The Hon'ble VC, special invitees experts Dr. S. A.Patil Former Vice Chancellor, UAS Dharwad and Ex Director IARI and Dr. Satyanarayana, Ex Director Extension, ANGRAU.

### **Review Meeting of MP-JICA Project**

I To review the progress of MP-JICA project for financial year 2012-13 the meeting was organized on 7th February 2013 at Conference hall of Directorate of Research Services,



JNKVV, Jabalpur. The meeting was chaired by Dr. S. S. Tomar, Director of Research Services, JNKVV, Jabalpur. From JICA side Dr. Dr. Sohei Kobayashi, Chief Advisor, JICA, Dr. Koji Tsuji, JICA Expert and Miss Nakanishi, Project Coordinator, all the principal investigators and co-principal investigators from JNKVV, Jabalpur and RVSKVV, Gwalior were present. The results of experiments conducted during FY 2012 were presented by all the principal investigators.

I Under Consultancy & Processing Services,

JNKVV has received total amount Rs. Rs. 1,23,69,020/- during 2012-13 for product testing viz. Fertilizer, seeds, insecticides, weedicides and fungicides etc.

### 3.19 Projects Sanctioned

1. Drying and dehydration characteristics and potential for value addition in under utilized as well as commercially important fruits and vegetables of Madhya Pradesh" PI Dr. Aparna Sharma, Assistant Professor College of Agriculture Ganj Basoda (Vidisha). sanctioned by MPCST, Bhopal for Rs. 4.36 lakhs.
2. End term evaluation study/ appraisal in respect of the implementation of Bringing Green Revolution to Eastern India (BGREI) Programme. PI Dr. Ashutosh Shrivastava Principal Scientist (Ag. Economics), AERC, Jabalpur sanctioned by Government of India for 5.00 lakhs
3. Biocontrol potential of local isolates of Tricoderma in Madhya Pradesh. Dr. Ashish Kumar, Asstt. Professor (PP), College of Agriculture, Rewa sanctioned by MP Council of Science & Technology, Bhopal for Rs. 6.39 lakhs
4. Maximization of soybean production on Madhya Pradesh" (MP-JICA Project) P. I Dr. S. S. Tomar, Director Research Services, JNKVV Jabalpur. Sanctioned by JICA for Rs. 55.50 lakhs
5. CSS on Developing guidelines for conduct of DUS test in small millets. P. I. Dr. Abhinav Sao, Scientist (PB) RARS, Dindori. Sanctioned by Government of India for Rs. 12.74 lakhs
6. Baseline survey of flora and fauna around atomic power plant at Chutka (BARC) P. I. Dr. S. D. Upadhyaya, Professor (Crop Physiology.), College of Agriculture, Jabalpur. Sanctioned by Govt. of India (BARC), for Rs. 24.55 lakhs.
7. Metabolic and molecular profiling of aromatic rice germplasm of India for gaining insight about aroma. P. I. Dr. G. K. Koutu, Principal Scientist (PB), College of Agriculture, Jabalpur Rs. 10.85 lakhs
8. Effective utilization and popularization of gypsum as source of nutrient in different crops of Vidisha district of Madhya Pradesh. P. I. Dr. R. S. Raghuwanshi, Associate Professor (Ag. Economics) Ganj Basoda (MP) Sanctioned by FCI Awarli Minerals, Jodhpur for Rs. 2.27 lakhs
9. Development of farm equipments and machinery testing, training and demonstration facility at JNKVV. Jabalpur. P.I. Dr. Atul Shrivastav, Professor (FMP), College of Agricultural Engineering, JNKVV Jabalpur sanctioned by State Govt. (under RKVY) for Rs.160.00 lakhs
10. Strengthening of plant tissue culture and bio agent production facility. P. I. Dr. Sharad Tiwari, Professor (PB), Biotechnology Centre, JNKVV Jabalpur for Rs. 56.50 lakhs.
11. Metabolic and molecular profiling of aromatic rice germplasm of India for gaining insight about aroma. Principal Investigator Dr. G. K. Koutu, Principal Scientist (PB), College of Agriculture, Jabalpur. Sanctioned by Dept. of Biotechnology Government of India, New Delhi for Rs. 10.20 lakhs
12. Collection, evaluation and utilization of elite lines of wheat from different parts of MP P. I. Dr. R. S. Shukla, Principal Scientist (Plant Breeding), sanctioned by State Govt. (MPCST) for Rs. 7.82 lakhs
13. Centre for academic in agribusiness management. Principal Investigator, The Head, Department of Agricultural Economics and Farm Management, College of Agriculture, Jabalpur for Rs. 200 lakh.
14. Setting up a DNA finger printing laboratory at JNKVV Jabalpur. Principal Investigator, Dr. Sharad Tiwari, Professor (PB), Biotechnology Centre, JNKVV Jabalpur for Rs. 200 lakh.
15. Establishment of College of Agriculture Balaghat. Principal Investigator, The Dean,



**3.20 List of ongoing AICRP's/NWPs**

S.No.	Name of Project	Centre
<b>Agriculture Faculty</b>		
1.	Maize Improvement	Chhindwara
2.	Rice Improvement	Rewa
3.	Niger	Chhindwara
4.	Linseed	Sagar
5.	Linseed	Powarkheda
6.	Sesame	Tikamgarh
7.	Sesame	Powarkheda
8.	Soybean	Jabalpur
9.	Chickpea	Jabalpur
10.	Millet Improvement	Dindori
11.	Millet Improvement	Rewa
12.	Wheat Improvement	Powarkheda
13.	Wheat Improvement	Sagar
14.	Integrated Farming System Research	
	(i) MAE	Jabalpur
		Rewa
		Powarkheda
	(ii) ECF	Dindori
		Katni
15.	Surgarcane	Powarkheda
16.	Micro-nutrients of Soils	Jabalpur
17.	Soil Test Crop Response	Jabalpur
18.	Long Term Fertilizer Exp.	Jabalpur
19.	Nematode Pests & their control	Jabalpur
20.	Vegetable Improvement	Jabalpur
21.	Potato Improvement	Chhindwara
22.	Sub Tropical Fruits	Rewa
23.	Barley Improvement	Rewa
24.	Agro-Forestry	Jabalpur
25.	Forage Crops	Jabalpur
26.	Dryland Agriculture	Rewa
27.	<b>NSP</b> -Breeder Seed Production Unit	Jabalpur
28.	<b>NSP</b> -Seed Technology Research Unit	Jabalpur
29.	<b>NSP</b> – Vegetables (Merged with AICRP on Vegetable)	Jabalpur
30.	Production of Breeder Seed of Annual Oilseed Crop,	
31.	- Soybean	Jabalpur
32.	- Groundnut	Jabalpur
<b>All India Network project</b>		
33.	NWP on Betelvine	Jabalpur
34.	NWP on Biofertilizer (BNF)	Jabalpur
35.	NWP – Organic Farming	Jabalpur
36.	NWP on Onion & Garlic	Jabalpur
<b>Agricultural Engineering Faculty</b>		
37.	Farm Implements & Machinery	Jabalpur
38.	Ground Water Utilization	Jabalpur
39.	Harvest & Post Harvest Technology	Jabalpur
40.	Renewable Sources of Energy for Agricultural and Agro based Industries.	Jabalpur
41.	Agro-meteorology	Jabalpur
42.	Water Management	Powarkheda

## ON GOING AD-HOC PROJECTS

S.No	Title	Amount (Rs. in lacs)
1.	Rapid conversion of normal maize inbreds to quality protein maize and further enhancement of limiting amino acids in elite inbreds through market assisted selection"	52.61
2.	Enhancing chickpea Production in Rainfed Fallow Land (PRFL) of Madhya Pradesh	134.31
	Identification of potential vegetation for bio drainage and fitting in evaluation of bio drainage in Tawa Command of Madhya Pradesh	55.52
3.	Isolation and characterization of phygene from fungi and its transformation in <i>Avena sativa</i> (Oat)	3.95
4.	Marker assisted breeding of abiotic stress tolerant rice varieties with major QTLs for drought, submergence and salt tolerance at Rewa	48.60
5.	Integrated Agri-biotechnologies of socio-economic upliftment of Baiga and Gond tribes of Madhya Pradesh	108.48
6.	Preservation of water chestnut ( <i>Trapa bispinosa roxburg.</i> ) by gamma radiation	17.55
7.	Seed Production in Agricultural Crops.	111.50
8.	Establishment of mother plant nurseries for high pedigree planting material of fruit crops	42.62
9.	Estt. Of five Model Nursery of medicinal and aromatic plants under JNKVV (Jabalpur/Rewa/Powarkheda/Sagar/dindori)	100.00
10.	Development of molecular markers in chickpea breeding for developing superior cultivars with enhanced disease resistance	56.39
11.	Molecular breeding selection strategies to combine and validate QTLs for improving WUE and Heat tolerance in wheat	33.75
12.	Selection and utilization of water logging tolerance cultivars in pigeonpea	68.53
13.	Metabolic and molecular profiling of aromatic rice germplasm of India for gaining insights about aroma	10.20
14.	Exploration, collection and conservation of wild species and land races from Eastern Madhya Pradesh	9.77
15.	Exploration, collection and conservation of germplasm of mango in Rewa Dist. of MP	8.47
16.	Data generation and evaluation of production technology of medicinal and aromatic plants using IT tools	3.33
17.	Ensuing livelihood security through management of genetic resources and seed supply system in tribal areas of Madhya Pradesh	751.47
18.	Baseline survey of flora and fauna around atomic power plant at Chutka (BARC)	24.55
19.	Network project on Biotic Stress (Rusts) of wheat, Powarkheda	5.05
20.	CSS on National Project on Management of Soil Health and Fertility	31.15
21.	Integrated farming systems to ensure sustainable livelihood security for the peasants of disadvantaged districts of MP (NAIP)	622.18

S.No	Title	Amount (Rs. in lacs)
22.	End term evaluation study/ appraisal in respect of the implementation of Bringing Green Revolution to Eastern India (BGREI) Programme	5.00
23.	Technology Mission Citrus	284.06
24.	Network project on harvest, processing and value addition of Natural resin and gums	61.15
25.	Business Planning and Development (BPD) Project	327.61
26.	Development of new plant type varieties with higher yield and in built resistance to major pest and disease	14.65
27.	Network project on hybrid rice research	9.00
28.	Network centre on National initiative on climate change resilient agriculture - AICRPDA-NICRA (ICAR)	30.25
29.	Weather based agro advisories and assessment of vulnerable areas of major food crops production zone. AICRPAM-NICRA (ICAR)	13.05
30.	National Initiatives on Climate Resilient Agriculture (NICRA) Real time pest surveillance in Pigeon pea	5.00
31.	Climate change and <i>Lak</i> crop performance at Jabalpur (NICRA)	4.00
32.	Development of transgenic Oat ( <i>Avena sativum</i> ) over expression fungal	7.98
33.	Biocontrol potential of local isolates of <i>Trichoderma</i> in Madhya Pradesh	6.39
34.	Development of farm equipments and machinery testing, training and demonstration facility at JNKVV, Jabalpur	490.00
35.	Collection, evaluation and utilization of elite lines of wheat from different parts of MP	7.82
36.	Survey, collection and conservation of wild and traditional cultivars of Vindhyan Plateau of MP	7.70
37.	Stress Tolerance Rice for Africa and South Asia (STRASA)	20.00
38.	Maximization of soybean production in Madhya Pradesh (India) MP-JICA Collaborative project	15.50
39.	Stress Tolerance Rice for Africa and South Asia (STRASA)	20.00
40.	CSS on Developing guidelines for conduct of DUS test in small millets	12.74
41.	Development of transgenic Oat ( <i>Avena sativum</i> ) over expression fungal	7.98
42.	Biocontrol potential of local isolates of <i>Trichoderma</i> in M. P."	6.39
43.	Development of farm equipments and machinery testing, training and demonstration facility at JNKVV, Jabalpur	490.00
44.	Collection, evaluation and utilization of elite lines of wheat from different parts of MP	7.82
45.	Survey, collection and conservation of wild and traditional cultivars of Vindhyan Plateau of MP	7.70
46.	Conservation strategies for enhancing the use of genetic resources of Small millets to ensure long term benefit to tribal farmers of Madhya Pradesh	11.91
47.	Revalorizing small millets in rainfed regions of South Asia	6.40

## EXTENSION

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Directorate of Extension Services is working as a fundamental pillar and important component of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur. It is carrying the responsibility for promotion of proven technologies of agricultural and allied disciplines in the state through quick and timely transfer. Directly and indirectly it is working for the betterment of rural residents by technology assessment, demonstration and imparting trainings. Supportive extension activities such as farmers' fair, seminars, symposiums are also conducted. Interpersonal communication, print and electronic media are extensively used as a means to transfer the technology effectively by Krishi Vigyan Kendras.

Farmers are also approached through the extension workers and officers of other extension agencies who are duly trained by the Krishi Vigyan Kendras of the respective districts as a master trainer in different agro-climatic zones of 25 districts.

The Directorate is administering 22 Krishi Vigyan Kendras under the competent direction of the University and also functions as a coordinating unit in close association with the University Research System on one hand and with the Zonal Project Directorate, Zone -VII, on the other to fulfill the motto of the university that is "To reach the unreached through extension system". Along with Krishi Vigyan Kendras, Communication Center and Agricultural Technology Information Center are also working under the Directorate.

The Directorate realizes the importance of human resource development activities for the staff of KVKs and has given high priority to the HRD programs. To update the knowledge and

skill of KVK scientists, Directorate of Extension arranged 1 backstopping/review, 4 workshops and 5 trainings were organized.

### 4.1 Agricultural Technology Information Centre

The Agricultural Technology Information Centre (ATIC) is a "Single Window System" linking the various units of research institutions with intermediary users and end users (rural population) in decision-making and problem solving exercise. Thus, the project is being implemented at JNKVV, Jabalpur with the following objectives.

#### Objectives

1. To provide a "Single Window Delivery System" for the products and plant species available from JNKVV and its institutes to the farmers and other interested groups, as a process of innovativeness in technology dissemination at the institute level.
2. To facilitate direct access to the farmers and to the institution, resources available in terms of technology, advice, technology products etc. for reducing technology dissemination losses.
3. To provide mechanism for feedback from the users to the institute.

#### Activities of agricultural technology information center:

**Technological inputs & sales:** Technical inputs, products of JNKVV such as improved seed varieties under the brand of Jawahar Seeds, planting materials of ornamental plants, fruit trees and other plant material, mushroom spawn, medicinal and aromatic

plants and seeds, bio-fertilizers and honey were sold under the umbrella of ATIC. Farmers purchased literature worth Rs. 18460 and 117 quintals of Jawahar Seed this year.

**Priced publication:** Krishi Vishwa, the technical bulletin based on technical package of practice of agriculture and allied discipline is printed in the Communication Center and is sold from ATIC. Total seed sold was of Rs. 3112700/- (Rs. Thirty One lakh, twelve thousand and seven hundred only) and publication sold was of Rs. 414151/- (Rs. Four lakh, forty one thousand, one hundred and fifty one only).

**Un-priced publication:** The Directorate of Extension / College / ZARS / KVKs regularly organize farmers' fair, Kisan Sangoshthis, monthly meeting and scientist-farmer interfaces. During these occasions a large number of farmers participate. In these programs, technical literature comprising of pamphlets, leaflets, technical brochures and folders are provided free of cost.

**Diagnostic services:** Diagnostics services like soil testing, water testing, and plant clinic, covering field crops, horticultural crops, medicinal and aromatic crops and animal clinic are rendered.

**Visit of farmers to ATIC:** Farmers and field extension officers of State Department of Agriculture, Horticulture and Food Processing, Veterinary and Animal Husbandry of Madhya Pradesh and other states visited ATIC. This year total 37 farmer teams visited ATIC and received technical guidance.

**Trainings:** ATIC organizes need based trainings for the extension functionaries, farmer and farm women on crop production technology (agronomy, horticulture, medicinal and aromatic plants), INM and IPM, women empowerment, crop diversification, rain water management, organic farming, management

of live stock and income generating activities, like mushroom cultivation, bee keeping, lac production, sericulture and backyard poultry, wormy compost production & piggery etc. This year, ATIC organized 2 trainings in which 90 farmers and farm women were present.

**Enquiry letters and calls:** Farmers also call ATIC for technical advice on agriculture and allied disciplines time to time, which are answered duly and referral services are also provided. Total 733 calls of the farmers were answered this year. Twenty seven letters of the farmers were received enquiring about agricultural and allied disciplines' practices which were duly answered.

**Technology displayed:** About 35 laminated photographs showing various technologies related to Agriculture, Veterinary and Agriculture Engineering. The photographs are enough to tell the farmers regarding the technologies of the university generated for various sections of the farmers.

**Farmers visited:** Total 3183 farmers and farm women, visited the centre to learn various technologies related to agriculture and allied disciplines.

#### 4.2 Communication center

Center works as printing and radio recording unit where Krishi Vishwa, the technical magazine of the University is printed along with other essential official document of the university.

#### Radio programs recording

Radio programs for 'Krishi Vishwa Vidyalaya Se Kheto Tak' broadcasted every Monday from Akashwani Jabalpur, between 7.20 pm to 8.00 pm, is recorded in the Communication Center recording studio covering range of topics on technologies related to agricultural and allied discipline. This

year 52 radio programs were recorded.

### Printing

One of the important and essential work performed by the Communication Center is of printing Krishi Vishwa and various other documents. These are as follows:

SNo.	Name	Number of Copies
1.	Masala Phasley	4000
2.	Pushpa Visheshank	3000
3.	Phal Visheshank	5000
4.	Krishak Labharth Yojnaye	500
5.	New Year Diary	700
6.	Table Calendar	3000
7.	Wall Calendar	3000

### 4.3 Krishi Vigyan Kendra (KVK)

To fulfill the need of food and nutritional security amongst the population, latest technology generated by the research system, is disseminated through the Krishi Vigyan Kendras which are funded by Government of India. The assessed technology acts as a model for line departments and catalyzes the existing extension process for betterment which is demonstrated and is well supported by trainings of extension functionaries, farmers and farm women. Capacity building of rural youth on income generating activities and women empowerment is also done. Other extension activities to provide pace to the technology transfer to the beneficiaries is also organized.

For proper functioning, KVKs are strengthened by improving the infrastructural facilities and the man power to work as knowledge and resource center to extend support the public, private and voluntary sector initiatives in the field of agriculture.

#### Mandate of KVK

Mandate of the Krishi Vigyan Kendra is as follows:

Assessment, refinement and demonstration of technology/ methodology/products

#### Activities of KVK

Following activities are conducted to fulfill the mandates:

1. On farm testing to identify the location specificity of technologies in various farming systems.
2. Frontline demonstrations to establish production potentials of newly released technologies on farmers' fields and provide feedback.
3. Training of farmers and farmwomen to update their knowledge and skills in modern agricultural technologies and training of extension personnel to orient them in the frontier areas of technology development.
4. Work as resources and knowledge centre of agricultural technology for supporting initiatives of public, private and voluntary sector for improving the agricultural economy of the district.
5. Create awareness about frontier technologies through large number of extension activities like farmer fair, field day, strategic campaign, ex-trainees meet, etc.
6. The seed and planting materials produce by the KVKs are also made available to the farmers.

#### Location of KVKs

Following Krishi Vigyan Kendras are functional under JNKVV:

Chhindwara (1982), Balaghat (1992), Seoni (1994), Shahdol (1994), Sidhi (1994), Tikamgarh (1994), Betul (2002), Panna (2002), Dindori (2003), Damoh (2004), Harda (2004), Hoshangabad (2004), Jabalpur (2004), Narsinghpur (2004) Rewa (2004), Sagar (2004), Chhatarpur (2005), Katni (2005),



Mandla (2006) and Umari (2006).

### Method of need assessment

Every extension program was designed on the basis of assessed need of the beneficiaries with the help of PRA, RRA and feedbacks received from the beneficiaries and extension functionaries related to the problems.

### Funding sources

Indian Council of Agricultural Research (ICAR) funded for KVKs' programs and activities. Beside this, the university also provided the funds for implementing different programs, especially for production of quality seeds at Instructional Farm.

Funds were also made available by the Central Government for producing quality seeds of major crops on the farmers' fields through participatory mode. State Government provided fund under National Horticultural Mission for production of quality planting material of horticultural crops. Directorate of Extension Services and Communication Centre are being funded by the State government under State plan.

Agricultural Technology Information Center is functional on revolving fund. Extension activities organized at Zonal Research Stations, Regional Research Stations and College Campi were funded by the ICAR and State Government.

### Monitoring system

Efforts were made to improve the monitoring system for which different programme were launched for timely submission of information. E-linkage facility was created in five KVKs. The need based infrastructural facilities were provided in all the KVKs for smooth functioning. Reporting and documentation system was functional under which monthly, half yearly annual to five yearly

reports was prepared by each KVK and was scrutinized by the competent authority.

Scientific advisory meetings were also used as tool to monitor the activities of KVK. SAC meetings were organized by KVKs once every six months in which work progress of the past six months was reviewed and action plan of the forthcoming six months were developed for implementation in the operational areas. Pre-zonal and zonal workshops of KVKs were organized successfully to review the progress of all the KVKs. Authorities from the Directorate visited the Krishi Vigyan Kendras to gather first hand progress information.

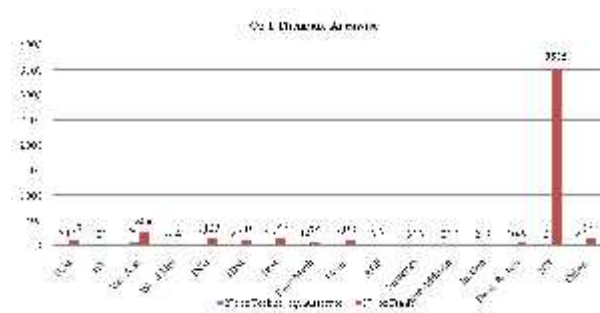
### Human resource development

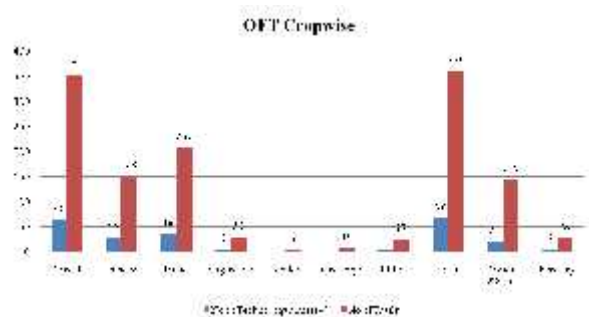
The Krishi Vigyan Kendra with the consent of the Directorate of Extension Services allows and sends its staff to participate in trainings, workshops, seminars and conferences for their knowledge and skill improvement in order to serve the beneficiaries better.

### On-farm testing

During 2012-13, 328 technologies on different aspects of agriculture and allied disciplines were conducted by KVKs. These were conducted in participatory mode and 6703 trials were conducted. The process gave opportunities to the scientists to work and interact with farming community and collect useful feedback for production purposes.

The approach helped the farmers to get convinced with the technological options assessed on farmers' fields. The suitable





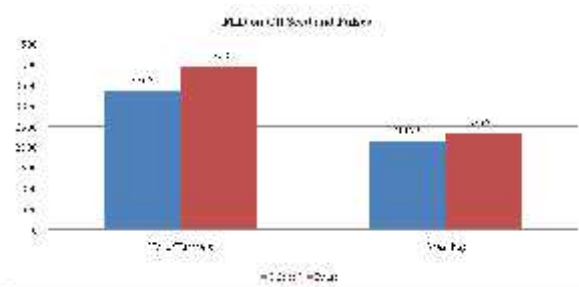
technologies identified by the scientists were taken in the FLDs programs for their wider acceptability and horizontal expansion.

### Frontline demonstrations

The university conducts large number of field demonstrations to make the farmers aware of the new technologies generated by the scientists. Front Line Demonstrations are regularly conducted in Kharif and Rabi seasons on need based components of production technologies. Total front line demonstrations on crop were in 11237.9 ha of 20443 farmers and on enterprise were 526 of 1509 farmers.

### Frontline demonstrations on oilseed and pulses:

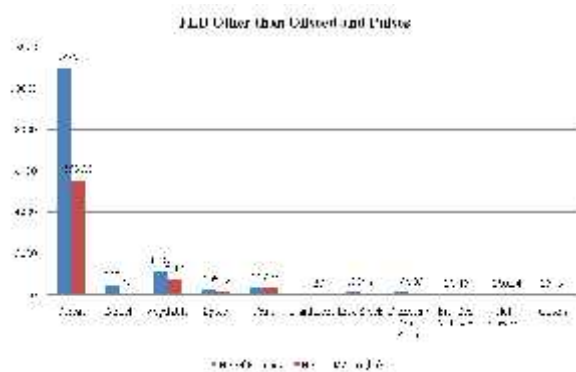
A comprehensive FLD programme on oilseed (soybean, Niger, sesame, groundnut, linseed mustard) and pulses (arhar, moong, urd, lentil, pea and gram) was taken up on farmers' field through KVKs for transferring the improved location specific technologies. FLD on oilseeds and pulses covered 4455.2 hectares area and 7325 farm families during 2012-13. Major emphasis was given on introduction of improved varieties, IPM, INM and IPDM. Superiority of improved technology



over farmers' practices was demonstrated successfully.

### Frontline demonstrations on other than oilseed and pulses

FLD programme on other than oilseeds and pulses were organized in 525.75 hectares, covering 13473 farm families on crops and enterprise, and 12238 ha/units of demonstrations were laid. Major emphasis was given on production technologies including ICM, INM, IPM and IDM along with farm machineries, animal husbandry, drudgery reduction and income generation.

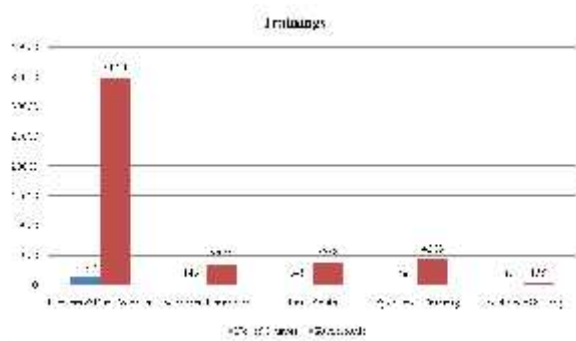


### Training programmes

The university has given high priority for competency development. It has an extensive programme of imparting skill-oriented trainings to the farmers and extension officials.

### Training for extension personnel

To update the knowledge and skill of extension functionaries, KVKs arranged courses to benefit extension officials. These



courses were formulated looking to the needs of field extension functionaries.

The Human Resource Development (HRD) could play a key role in the progress of agriculture. Field extension personnel were offered the latest production technology of field crops, vegetables, fruit crops, medicinal and aromatic plants etc.

During 2012-13, 149 in-service training programs were conducted in which 3271 participants upgraded their knowledge and skill.

### **Training for farmers and farm women**

One of the mandates of KVKs is to organize trainings for farmers and farm women. In training programs, emphasis was given for skill improvement on various aspects of management of field crops, vegetables, fruit crops, medicinal and aromatic plants like plant protection, identification of symptoms of diseases, pest damage, nutrient deficiency and their management practices. During 2012-13, 1403 training programs were organized and 34720 participants were benefitted. These need based training programs facilitated them to update the knowledge and skills for improved farming.

### **Training for rural youth**

Efforts were also made to organize vocational training courses for rural youths, school dropouts etc. with the aim to generate employment opportunity for them.

The courses covered cattle management, poultry, lac cultivation, maintenance and repair of farm equipments, mushroom cultivation, preparation of wormy compost, nursery management, vegetative propagation of fruits and ornamental crops.

During 2012-13, 143 vocational training courses on various aspects were organized in

which 3638 rural youngsters learnt the skill necessary for self-employment.

### **Trainings on livelihood security**

To ensure livelihood security of the rural people 37 livelihood trainings were provided in which 156 trainees were benefitted

### **Sponsored training programme**

The trainings organized by KVK but sponsored by other agencies such as Department of Farmers' Welfare and Agriculture Development were 78 in which 4203 farmers and farm women were benefitted. In all there were 1338 trainings held in which 37617 participants were benefitted directly.

### **Vocation trainings program (VTP)**

Other than mandatory trainings, vocational training programs were conducted by the Krishi Vigyan Kendras for skill development of the beneficiaries with the objective of their financial self-dependence. Trainings were organized on seed production technology, wormy composting, stitching and bag making, basic maintenance of farm implements and computer application etc. Total number of trainings organized this year was 39 in which 57 women and 824 participants were benefitted.

### **Other extension activities**

Other extension activities conducted were 4717 including Farmers' Fair, Kisan Sangoshthis and Crop Days are the regular features of the extension activities of the university. These were organized at different colleges, research stations and KVKs to equip the farmers, farm women and rural youths with the latest development of agricultural research and technologies, review their reactions and to assess their problems.

Eight farmers' fair (farmers and farm women: 32242; extension functionaries 339), and 16 field days (farmers and farm women: 477; extension functionaries: 39) from block level to state level were organized. There were 47 farmers' seminar, group meetings and Kisan Sangoshthis in which 1433 farmers and farm women and 78 extension functionaries participated. There were 37 animal health camps organized in which 1692 farmers and farm women along with 43 in-service personnel participated.

### News letter

All Krishi Vigyan Kendras published KVK news letter on quarterly basis. These newsletters covered the events scheduled for following three months and achievements made by them in the previous quarter. Technical recommendation, as per need, were also made available through these newsletters for further dissemination to farmers, farm women, field extension workers and agri-input dealers. These news letters were sent to larger numbers of panchayats, farmers, field extension personnel and district authorities. In this year 23500 copies of news letter were printed out of which 23062 were distributed.

### Kisan mobile advisory service

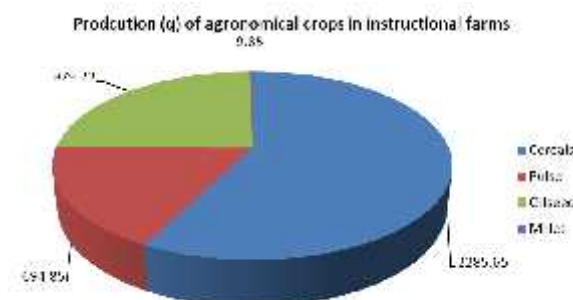
This programme was launched by the university in 2008-09 and is still continuing successfully. Through KMA service need based technologies in form of text messages in Hindi language were sent to farmers, farm women, extension functionaries, Akashwani Kendra and agri-input dealers on their mobile once a week on a fixed day, quickly. Beneficiaries were not charged for this service.

### Seed production program

Each KVK has implemented the seed production programme both in Kharif and Rabi seasons and produce the quality seeds of

Soybean, Rice, Maize, Wheat, Gram, Small millets on the instructional farm. Quality seeds were produced by the KVK which were made available to the farmers and government farms for further multiplication.

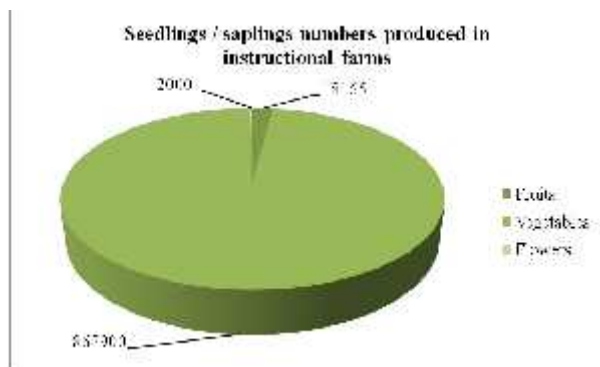
SNo.	Crop	Production (q)
1.	Arhar	5.2
2.	Black Gram	40.58
3.	Gram	622.62
4.	Pigeonpea	26.45
5.	Soybean	913.63
6.	Lentil	39.6
7.	Sesame	4.15
8.	Ground Nut	2.5
9.	Linseed	18.75
10.	Niger	0.6
11.	Kodo	5.95
12.	Ragi	3.9
13.	Wheat	1714.1
14.	Paddy	559.05
15.	Maize	12.5



### Quality planting materials

Infrastructural facilities were developed in six KVK viz. Betul, Jabalpur, Damoh, Sagar, Katni and Chhindwara to produce quality planting material of horticultural crops. These KVKs have developed the scion block of different horticultural crops and started producing the quality planting material.

SNo.	Horticultural Crops	Seedling / sapling numbers
1.	Vegetables	867900
2.	Fruits	18165
3.	Flowers	2000



#### 4.4 Crop cafeteria

Crop cafeteria was established in each KVK for live demonstrations of new agricultural and allied technologies to the farmers and farm women visiting the Krishi Vigyan Kendra. The technologies demonstrated this year mainly were SRI in paddy, ridge furrow technology in soybean, rain water harvesting and micro-irrigation, medicinal and aromatic crop unit, improved seed production unit, agro-climatic based crop production unit, millet production unit and nutrition kitchen garden unit. Few other demonstrations laid were wormy compost unit and farm yard manure unit.

#### 4.5 Technical programme for drought prone area

Special technical program was conducted for drought prone area in which technologies such as SRI in paddy, Ridge furrow technology in soybean production, crop diversification were promoted using live demonstrations, electronic media, trainings to the beneficiaries and extension functionaries and providing technical guidance to the allied departments.

#### 4.6 NICRA (National Initiative on Climatic Resilient Agriculture):

National Initiative on Climate Resilient Agriculture (NICRA) is a network project of the

Indian Council of Agricultural Research (ICAR) launched in 2011. The project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. The research on adaptation and mitigation covers crops, livestock, fisheries and natural resource management. The project consists of four components viz. strategic research, technology demonstration, capacity building and sponsored/competitive grants. It was operational in Balaghat, Chhatarpur and Tikamgarh Krishi Vigyan Kendras.

#### 4.7 Tribal sub plan (Agro-forestry):

Tribal Sub Plan (Agro-forestry) is implemented with the objective of transfer of technology and extension of forest crops In Krishi Vigyan Kendra - Dindori, Jabalpur, Mandla, Seoni, Shahdol and Umariya.

#### Tribal sub plan (pulses):

Funded by Indian Pulse Research Center, Kanpur program is implemented in tribal populated districts of Madhya Pradesh namely Shahdol, Mandla and Dindori with the objective of extension of improved production technology of pulse crop.

#### 4.8 Nutri-cereal project:

Department of Farmers' Welfare and Agricultural Development is establishing food processing unit in 7 districts i.e. Betul, Chhatarpur, Dindori, Jabalpur, Rewa, Sidhi and Tikamgarh.

# FARMS

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## 5.1 Seed production system of JNKVV

Jawaharlal Nehru Krishi Vishwa Vidyalyaya (JNKVV) is the premier institution for seed production and distribution in the country. It caters around one fourth of breeder seed requirement of the nation and ranked 2nd after UAS Dharwad. The clientele include National and State Seed Corporations, State Farms Corporation of India, State Department of Agriculture, Horticulture & Farm Forestry and Animal Husbandry, State Agriculture Cooperatives, KRIBHCO, Ministry of Agriculture, Govt. of India, National Dairy Development Board, Bhart Krishak Samaj, National and Multinational Seed Companies, Progressive Farmers, Oil Federations and several others. The university has developed an expertise in production, processing and management of seeds of spices, sugarcane, medicinal & aromatic plants within the well conceived and unique framework of single window system of operation.

The important features of the seed production programme are: maintenance breeding based production. Effective internal monitoring system and In house strong quality assurance mechanisms; diversification of nucleus/breeder seed production programme with a view to meet the growing demand of quality seed of vegetables, species, sugarcane, medicinal and aromatic plants have added new dimensions. The seed production programme is reviewed every year at university level during Kharif & Rabi seasons. The university has also initiated need-based training programmes for seed professionals from State Agricultural Universities (SAU), State Department of Horticulture, State Seed Corporations, State

Seed Certification Agencies, national and multi-national seed companies to update knowledge on seed technology, seed certification standards and covering all important and relevant aspects of seed production, processing and storage. Considering these activities and contribution of JNKVV in National Seed Programme first time initiated best Breeder Seed Production Centre award by ICAR was given to JNKVV for 2013-14 in AIC National Seed Project Group Meeting at Srinagar.

## 5.2 Single window system

The execution of system envisages planning, production, monitoring, processing, marketing and supply of seeds to the indenters from a single window. It is being operated through Director Farms of the University. The system has been effective for the successful implementation of seed production programme. The Nodal Centre for the programme is under operation at Jabalpur with two satellite centres viz., Tikamgarh and Powarkheda located at Zonal Agricultural Research Stations.

## 5.3 Financial resources

Financial assistance has been made available from ICAR under National Seed Project since the year 1983. The project has also been strengthened in terms of infrastructure and manpower in the year 1993. The project has developed the large operational systems that utilize the internal scientific/technical resources of the University to produce quality breeder seed. The system is strongly supported by Nucleus Seed Programme (Field crops) ICAR, Mega Seed Project ICAR; Vegetable ICAR; Spices-Govt.



of MP & GOI and Water Management Project (World Bank).

#### Financial Returns from Farms (Rs. in lakhs)

Year	Receipt	Expenditure	Net Receipt
2012-13	987.48	510.77	466.42

#### 5.4 Seed production planning

Seed production programmes of all the crops are being planned based on indents of national and state seed corporation through ICAR, private seed sector, seed market intelligence reports and based on previous year sales and demands. The total indent of all the sectors put together is being planned on the basis of suitability of the selected varieties to different agro-climatic zones of MP.

#### 5.5 Crop improvement

A dynamic seed sector has been developed at JNKVV with continuous release of improved varieties and hybrids from crop research programmes. To ensure the crop research programmes, strong support is provided from the State.

**Maintenance breeding:** The maintenance breeding is one of the important activities of seed production programme of the university. The programme involves a dedicated team of crop scientists located at various research stations to maintain the varieties. Crop varieties are being maintained by Single Plant Selection (SPS) grown in progeny rows. The SPS bulk seed is multiplied to produce breeder seed depending up on the indents.

#### Size of seed production programme

Crops	Number	Varities
Field crops	32	250
Vegetable crops	13	23
Spices	11	26
Fruit plants	05	15
Medicinal & aromatics	20	35
Ornamental plants	20	40
<b>Total</b>	<b>101</b>	<b>389</b>

#### 5.6 Status of breeder seed production

JNKVV produces more than 20% of Breeder Seed Produced by NARS for field crops as well as substantial quantities of Breeder, Foundation and truthfully labeled seeds of vegetables spices and medicinal & aromatic crops. Similarly a large number of saplings of Aonla, Mango and Beer are being produced and supplied. The University has been a major player in the multiplication of seeds and saplings of medicinal & aromatic plants by virtue of developing several improved varieties.

Year	India	JNKVV	% Contribution
2012-13	117826.88	19271.72	16.35

#### Information regarding seed replacement rate (SRR)

The replacement of the farmers saved seed with the certified seed of high quality will have a improvement increasing yield potential to the extent of 15 to 25% in different crops. The impact of certified seed increasing the yield potential has been well recognized by the farming community. Chickpea varieties of JNKVV namely JG-315 (wilt resistant; insolation to 5 races) and JG 74, (wilt resistant; insolation to 2 races) of Fusarium and oxysporium, are used as donor, world wide. Releases of new varieties (J-11, JAKI- 9218, JG- 30, etc.) have changed the monoculture of JG-315 and enhanced the yields in Madhya Pradesh and Maharashtra substantially. Developed white rust resistant variety of mustard JM-1 for the first time and napus variety Jawahar Teri Uttam with low erusic acid and glucosinolate. JG 11 brought the chickpea revolution in Andhra Pradesh by covering 70% area with potential yield of 36.0 q/ha by replacing age old wide adopted variety Annagiri.

## Maintenance breeding of Wheat varieties



Single Ear to Row Progeny Plot



Single Ear to Row Progeny Plot



Selection of Single Ear heads



Harvesting of Single Ear Heads

## Maintenance breeding of Chickpea varieties



Layout of Maintenance Breeding Block



Maintenance Breeding Block of Field Crop Varieties



Single Plant Progenies of Chickpea Varieties



Single Plant Progenies of Chickpea variety JG-322



### Maintenance breeding of Moong and Urid varieties



Single Plant Progenies of Moong & Urid varieties



Breeder Seed Production plots of LBG-20

### Maintenance breeding of Rice varieties



Long Row Plot of variety Kranti



Breeder Seed Production Plot of MTU-1010



Maintenance breeding of CMS lines of rice



Maintenance breeding of CMS lines of rice



Single plant progeny of Soybean



Long row of Soybean variety

### Breeder seed production plots of Chickpea



JG-11



JG-315

### Breeder seed production plots of Wheat varieties



JW-3211



GW-322

### Seed replacement rate of important crops in Madhya Pradesh

Crop	Seed Replacement Rate% 2012-13
Paddy	21.09
Maize	49.78
Jowar	13.65
Bajra	87.96
Kodo	0.73
Urd	14.69
Moong	30.88
Arhar	22.27
Til	7.77
Ramtil	0.86
Groundnut	0.88
Soyabean	33.56
Cotton Hy	100.00
Wheat Dwarf	31.36
Wheat Tall	4.53
Barley	1.19
Gram	12.19
Pea	10.95
Lentil	4.02
Mustard	28.25
Linseed	1.43

### 5.7 Public-private partnerships

JNKVV has implemented the benefit sharing of the public sector breeds with the private sector. There seems to be a tremendous potential to develop the seed links programme of public/private sector. This helps in developing/strengthening research resources and adequate resource income to University. An MOU has been developed for the purpose. This MOU is as per the guidelines of IPR Management for Agriculture Research Technologies of NARS and approved by Board of Management of University. Seed companies i.e., Vikki Agro Tech, Vibha Seeds, J.K. Agric Genetics, Dhanuka Seeds, Agri. Co. Seed, Spriha Seeds, Sarkar Seeds, Kohinoor Seeds, Amareswara Agritech, Ajit Seed and a dozen of seed companies showed interest for commercialization of early maturing Rice

hybrids on non exclusive basis. Similarly in medicinal and aromatic plants partnerships are being developed through three-party agreement i.e., JNKVV, farmers and industry on mutually agreeable terms and conditions. A Business Planning Development Unit of the University has been established to care of transferable technologies for commercialization of Seed Production, Medicinal & Aromatics, Biofertilizer technologies etc.

### **5.8 Seed quality assurance mechanism**

An in house seed quality assurance system has been developed to regulate the quality of seed and planting material produced at the university. This is being done through field monitoring systems. Later on the seed samples are being drawn for the processed seed of each variety and are being tested at Govt. Seed Testing Lab as well as JNKVV Seed Testing Laboratory of STR. The seed samples are supplied to STR lab for verification of genetic purity of the seed supplied to various agencies through Grow out Test as Post Control Plot. Observation related to genetic impurity in Post Control Plot are being Communicated to seed production centre of the University as well as persons lifted the same seed lots so that corrective measures may be taken up timely to maintain the seed quality.

### **5.9 Marketing strategy and information systems**

Seed is being made available to the indenters as per demand/indents. Quantity of seed available of all the crops, varieties and categories for sale is placed in the university web site along with name of center where seed is available, price list, contact phone numbers etc. this information is made available to all the concerned. The seed purchaser may demand through FAX or e-mail which is confirmed immediately along with the name of centre and

total amount to be paid at the lifting centre and cut of date for lifting etc. The information about cutoff date and quantity of seed is being available at Directorate Farms. The up-to date seed availability is being upgraded in the JNKVV website from time to time to benefit the seed producing agencies.

### **5.10 Innovative seed system**

Several seed system i.e., seed village programme, model seed systems in chickpea at Vidisha and Sagar, Rice fallow chickpea quality seed production in Rewa, Satna, Jabalpur and Damoh livelihood seed system in tribal areas has paid dividends to the farmers and brought self reliance in quality seed availability in M.P.

### **5.11 Quality seed production in tribal area**

Low productivity of crops is the major cause of poverty amongst the tribal farming communities. The technologies developed during the recent past in agriculture are still out of the reach of tribal, small & marginal farmers of Bhariya, Sahariya, Baiga of Mandla, Dindori, Chhindwara, Seopur and Shivpuri of MP. The knowledge management programme of seed systems has paid dividends to tribal farmers by increased productivity as well as livelihood and nutritional security in these districts of Madhya Pradesh.

### **5.12 Rice fallow chickpea seed system**

Early maturing drought tolerant rice hybrids developed by JNKVV have been provided in the Rice fallow chickpea rainfed farming system of Rewa, Satna, Jabalpur, Damoh, fallowed by cultivation of chickpea under rainfed condition with improved technologies. In this model early maturing Rice hybrids JRH-4, JRH-5 transplanted through System of Rice Intensification fallowed by planting of suitable varieties i.e. JG 130(Rewa/Satna), JG 16(Damoh/Jabalpur) with the package of





technologies to ensure the legume nutritional security as well as enhanced farmers income as compared to keeping fallow land after rice. In this system, technology transfer has been managed through knowledge management system and more than 2500 farmers perceived the technologies and spread across the farming community. Now these technologies showed impact through expanding the area of chickpea horizontally as well as increased the production vertically. This has been one of the success stories of knowledge management through seed system to improve the economic returns of the rice fallow chickpea farmers as well as nutritional security compared to the growing rice alone leaving rabi fallows. Certified seed is being produced in the farms of selected farmers fields of the project areas and village seed system were established resulted in increased productivity of chickpea (Table 4). More than two thousand five hundred farmers were trained for quality seed production resulted in the high production and high seed replacement rates with enhanced chickpea production in Rewa, Satna, Jabalpur and Damoh districts of Madhya Pradesh.

### 5.13 Farmers participatory seed production



Quality seed at the door step is the basic requirements of the farmers, to make available quality seed at village level and to encourage farmers participation in seed production for self reliance in seed, JNKVV has initiated an ambitious programme of farmers participatory seed production at village level to make farmers self reliant with respect to quality seed requirement and also increase their income by selling of quality seeds. Surplus Breeder seed produced at JNKVV farms was distributed to the farmers to produce their own seed and reduce their dependency on the market. Every year about more than one thousand farmers involved in the production of quality seed under this programme.

During 2013-14 farmers participatory hybrid seed production programme of JNKVV bred rice hybrids namely JRH 5 has been undertaken in 10 acre during Rabi at five villages of Balaghat District of MP .At Seoni district also 5 acre programme of JRH 5 has been undertaken in two villages and also one acre programme has also been initiated of new hybrid JRH 19. The programme was successfully undertaken with the highest productivity of 15.6 q/ha .





#### 5.14 Benefits and beneficiaries

The seed cost has come down as it has been produced where it was needed most by eliminating transport costs and role of middlemen through farmers seed cooperative societies in M.P. The integrity and quality of the seed would be assured, as it is produced under the supervision of competent person. Adoption of improved varieties led to increase productivity by 20-30%. Promotion of local seed enterprise in the cooperative section has also generated employment at the village level. The major beneficiaries are small holder farming families and gain access quality seed of improved varieties.

#### 5.15 Livelihood security through quality seed production

Quality seed of various crops is being distributed in the tribal areas to provide an advantage of increased availability of quality seed. This programme had tremendous positive impact on upliftment of socioeconomic status of the targeted tribal farmers. These programmes are being implemented through KVK of the V.V.

#### 5.16 Special focus on horticulture crops

Seed production programme of spices and fruit-plant saplings was initiated on a large-scale. This resulted in availability of sufficient quantity of seed and planting materials of horticultural crops in the state. Fruits plant nurseries were established in all the centers of V.V.

#### 5.17 Brand management of jawahar seeds

Brand Jawahar seed has been established with a logo to popularize the seed and planting materials. Now Jawahar seed is an established brand as the quality seed planting materials. Research programme were included for the development as well as promotion of hybrid

technologies of maize, rice, castor, pigeon pea. Identification of seed production areas as well as standardization for rice, maize, pigeon pea hybrid production technology along with centers has been the top of the agenda of the management of seed programme.

#### 5.18 New areas of seed production

Several new areas have been identified for hybrid seed production for strengthening of commercial activities.

After having extensive research experimentation on suitability of different areas for hybrid seed production, it has been established that Madhya Pradesh is the most suitable for hybrid seed production of maize (32-35 q/ha) pigeonpea (15 to 20 q/ha), Rice (10-15 q/ha) hybrid seed recovery. This has been a remarkable achievement of JNKVV hybrid seed research promotion. Hybrid paddy seeds can be produced in low rain fall area of Vindhya and Mahakosal region of Madhya Pradesh during kharif season.

#### 5.19 Alternate areas for hybrid seed production

Crop	Season	Area
Maize	Rabi	Kymore plateau, Satpura hills, Vindhya plateau and Mahakaushal region of Madhya Pradesh
Rice & Wheat	Rabi	Balaghat, Seoni
Pigeonpea	Kharif	Jabalpur, Rewa
	Kharif	Malwa, Kymore plateau, Satpura hill, Vindhya plateau
Castor	Rabi	Kaymore plateau, Satpura hill 1

**List of different crops and varieties for which breeder seed is produced**

S. No.	Crop	No.	Name of Varieties
1	Soybean	06	JS 93-05, JS 97-52, JS 95-60, JS 20-29, JS 20-34, JS 335
2	G. Nut	02	TG 37A, TAG 24
3	Rice	32	MTU-1010, Kranti, IR-64, PS-4, JR-201, PS-5, IR-36, WGL-32100, PS-3, JR-503, JR-75, JR-353, JR- 345, JR- 504, P-1460, Mahamaya, Danteshwari, MTU-1081, NPT-65, NPT-29, NPT-13-10, BVD-109, Sahbhagi, JRH-5 A, B & R Line, JRH-8 A, B & R Line, JRH-19 A, B & R Line
4	Arhar	04	ICPL 87-119, ICPL 87, TJT 501, TT 401
5	Wheat	28	JW 3288, JW 3020, JW 3269, Malav Shakti, GW 366, GW 273, GW 3211, HD 2932, Lok 1, GW322, HD 2864, Sujata, JW 3173, C 306, JW 17, GW-173, JW 1106 (D), JW 1142, JW 1215 (D), JW 1202, JW 1203, JW 1201, WR 544, WH-147, HI 8627, MP 3336, DL 803-3, Raj 3765
6	Gram	16	JG 130, JG 11, JG 63, JG 74, JG 315, JG 322, JG 14, JAKI 92-18, JG 16, JGG 1, JGK-1, JGK-2, JGK-3, JG 12, Vijay, Vishal
7	Pea	06	Arkel, JM 6, IPF 99-25, JP 885, PSM 3, IPF 99-13
8	Linseed	05	JLS 27, JLS 9, JLS 67, PKDL 41, JLS 66
9	Lentil	02	JL-1, JL-3
10	Mustard	01	Pusa Tarak
11	Berseem	02	JB-1, JB-5
12	Oat	02	Kent, JO 1
13	Moong	12	Ganga-8, PDM 11, TJM 3, PDM-139, TM 99-37, HUM-1, LGG-460, P. Vishal, SL-668, JM-721, HUM 12, HUM 16
14	URID	10	LBG 20, T 9, PU 30, PU-35, PU 19, JU-3, PDU-1, TU 98-14, TAU-2, TU 94-2
15	KODO	06	JK 48, JK 439, JK 41, JK 13, JK 65, JK 106
16	KUTKI	02	JK 8, JK 36
17	NIZER	03	JNC 6, JNC 1, JNC 9
18	SESAME	07	JT 7, TJT 308, TLG 22, TKG 21, TKG 55, TKG 306, JTS 8
19	BARLEY	02	JB 58, JB 1
20	MAIZE	11	JM 216, HKI 163, HKI 161, HKI 193, JM 8, JM 12, Chandan Makka-1, Chandan Makka-2, Chandan Makka-3, Jawahar Pop 11, A.Tall(F)
21	Sugarcane	08	COC 671, COJN 86-141, COO 6027, CO 94008, COO 403, CO 99004, CO 86032, COJN 86600
22	Cotton	02	PKV 081/ Suraj / NH615, AKA 7/ AKA 8
23	Sunhemp	01	K-12 Yellow

### Quality seed production during 2012-13 Summary

(In quintals)

Particulars	Kharif 2012				Rabi 2012-13			
	In Institute/University farm		In Farmer's Field		In Institute/University farm		In Farmer's Field	
Field Crops	Target	Achievement	Target	Achievement	Target	Achievement	Target	Achievement
Breeder Seed	16340.00	8170.55	-	-	15342.75	7943.90	-	-
Foundation Seed	-	-	20000.00	20180.00	-	-	8000.00	7838.50
Certified Seed	-	-	-	-	-	-	-	-
Truthfully labeled Seed	-	-	-	-	-	-	-	-
Planting Material	-	-	-	-	-	-	-	-
<b>Total</b>	<b>16340.00</b>	<b>8170.55</b>	<b>20000.00</b>	<b>20180.00</b>	<b>15342.75</b>	<b>7943.90</b>	<b>8000.00</b>	<b>7838.50</b>

Planting Material (K & R)	10000	1291684	-	-	-	-	-	-
Tissue Culture plantlets(K & R)	1000	200	-	-	-	-	-	-
<b>Total</b>	<b>11000</b>	<b>1291884</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

## STUDENT WELFARE

### 6.1 Inter collegiate sports meet

Inter collegiate sports & games tournament of JNKVV was held at Jawahar Stadium, College of Agriculture, Jabalpur on 18th and 19th January, 2013. The trophy of Best Athletes women and men was awarded to Ku. Deepika Bhalawi and Kailash Bamniya, respectively. College of Agriculture Jabalpur was winner in kabaddi, kho-kho, Volleyball and runner was college of Agriculture Rewa. College of Agriculture, Jabalpur won overall championship in the Inter collegiate sports and games tournament 2012-13.



### 6.2 Inter collegiate cultural competition

Inter college cultural competition "Youth Festival" of JNKVV, Jabalpur was organized at university campus on 16-17 January, 2013. Total number of 120 students (boys and girls) from five campus, participated in 18 events of five segments namely fine arts, music, theatre, dance and literary. Students of college of

Agriculture, Jabalpur have secured first position in debate, extempore, elocution, quiz, poster making, collage, mono acting, one act play, skit, group dance while second position in mime, rangoli, on spot painting, cartooning, solo song and third position in clay modeling. With this fabulous performance, the team of college of Agriculture, Jabalpur also won the Shiromani (Championship) trophies in music, theatre, dance & literary events and the "over all championship award" of JNKVV Youth Festival -2013. College of Agriculture Rewa won the runner-up championship in the same event.



### 6.3 XIII Agriunifest

Under the sponsorship of ICAR New Delhi, 13th All India Agricultural Universities Youth Festival AGRUNIFEST 2012-13 (24-28 February, 2013) was successfully organized by Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur at University Campus. In this mega event more than 1000 students participated



from 38 Agricultural / Veterinary / Fisheries and Horticulture State and Central Universities across the country. In this mega youth festival total 18 different events were organized.

Dr. Ramkrishan Kusmaria, Minister, Farmers Welfare and Agricultural Development, Government of M.P. has inaugurated the Agriunifest. Dr. Ajay Vishnoi, Minister, Animal Husbandry, Govt. of M.P. and Dy. Director General (EPD) Dr. Arvind Kumar, were the

special invitees.

Closing ceremony was held on 28th Feb., 2013 in the gracious presence of chief guest Dr. Ramkrishna Kusmaria, Minister for Farmers Welfare and Agricultural Development, Govt. of M.P. and Guest of Honour Dr. G. P. Mishra, Hon'ble Vice-Chancellor, of Nanaji Deshmukh Madhya Pradesh Pashu Chikitsa Vigyan Vishwa Vidyalaya, Jabalpur, in presence of thousands of spectators. This successful event





was appreciated by the local media and students.

The JNKVV cultural team has secured first position in group song Indian, group dance and debate, second position in patriotic group song, on spot painting and debate, third position in clay modeling, mono acting, one act play & skit and fourth position in rangoli, cartooning and mime. With this splendid performance the JNKVV cultural team also won the Shiromani (Championship) trophies in music, theater and dance events. On the basis of number of prizes and Shiromani awards won by the JNKVV team and ranked first in total points tally, therefore the "Over All Championship" trophy of AGRUNIFEST-2013 was awarded to JNKVV Team.

#### 6.4 National Cadet Corps(NCC)

**1MP Battalion** - During 2012-13 total 53 students enrolled and participated in various camps. Two student of College of Agriculture Jabalpur participated in army attachment camp from 27.12.2012 to 9.1.2013. Six students of Battalion participated in NIC camp held at Indore from 23.11.2012 to 4.12.2012.10. Students also participated in

Annual Training Camp at Pipariya from 4-13 May, 2012. Total 27 cadets passed "B" certificate and 14 cadets passed "C" certificate.

#### 2 MP Girls Battalion

- | In Combined annual training camp-III held at DPS Nagpur Road Jabalpur from 3rd August 13th 2013. Among more than 600 cadets, JNKVV cadets of 2 MP girls received maximum awards in various competitions held during camp.
- | Neha Shukla in Best cadet, Drill, Turnout and Dance
- | Anima Kishware in Poster
- | Shreya Lodh in Dance
- | Khsibu Namdev in Anchoring
- | Manisha Mishra in Anchoring
- | Neha Choudhary in Guard mounting

#### Other activities

Medical training camp held at Military Hospital, Jabalpur from 1st Sept. 2012 to 12th Sept. 2012. Twelve cadets from JNKVV participated in this camp. Republic day celebration 2013. "Guard of Honour" was given to Hon'ble Vice Chancellor , Dr V.S.





Tomar, JNKVV. For this vigorous training of Guard of honour and rifle drill was given to NCC cadets for period of one week. Cadet Neha Shukla of 2 M.P girls Battalion and Anurag Thakur of 1 M P Battalion received best cadet award from Honourable Vice Chancellor on 26th Jan 2013. Total 53 cadets of 2 M.P girls battalion attended different camps and appeared for B- certificate and C certificate exams.

### 6.5 National Service Scheme (NSS)

A special camp on National Service Scheme was organized at village Umaria Choubey, Panagar, Jablapur between 17 and 22 Nov, 2012 by the NSS unit College of Agriculture, Jabalpur. Seventy under graduate students (boys and girls) actively participated in the camp. During the camp, a number of activities including sanitation of village, school, hospital, temple, panchayat bhavan, anganwadi premises etc. were conducted by students and villagers jointly. A special programme for awareness of villagers through writing of slogans was also undertaken by participants, and more than 25 slogans were used to create awareness among the villagers. Other activities undertaken in order to create awareness about the Matdata Jagarukta Abhiyan, Balika Bachao Abhiyan, Jal sanrakshan & Sudhi karan, Plantation, Jaivik Kheti etc. Rallies were also organized for the purpose at village Umaria, Panager and Bhedaghat. Five large scale programmes for the people of the area were organized in relation to animal health, human health, Yoga, AIDS awareness as well as Krishak Sangoshthi at the site of the camp. With these

programme a large group of people were made aware about Jal, Jangle, Jameen, Janseva & Jan swasthya. About 2000 people of the adjoining villages also participated in the programmes of awareness and cultural events.

### 6.6 Employment generation through placement cell

The university has a full fledged placement cell under the Dean Students Welfare to arrange for campus interviews for the placement of graduate and post graduate students. The placement cell has been successfully organizing campus interviews and more than 92 students have been absorbed in various reputed companies during 2012-13. The cell also counsels students on the availability of scholarships and avenues for higher studies.

#### Students selected for agri-business management

- NIAM, Jaipur
  1. Miss Garima Maywad
  2. Anirudha Singh Tomar
- NAARM, Hyderabad
  1. Keshav Naik
  2. Anirudha Singh Tomar
- Manage, Hyderabad
  1. Akshay Meshram
- (ii) IIT, Roorkee - 2 students
- (iii) Indian Institute of Sciences, IISC, Bangalore: 1 student

#### Tutorial Cell

Question banks of various departments were made available for preparation of competitive exams and students visit the counseling cell in the office of Dean Students' Welfare very frequently to get the benefit of facilities.



## New Construction / Infrastructure Development

### Repair and renovation works of JNKVV and allied campus

S. No.	Particulates of work	Estimated cost	Physical status
	<b>(A) College of Agriculture, Jabalpur</b>		
1.	Renovation of roof treatment of P.G. Girls Hostel at College of Agriculture, Jabalpur.	1,70,000.00	Work in progress
2.	Renovation of cycle stand and Choukidar hut that at U.G. Girls Hostel.	1,06,000.00	Work in progress
3.	Renovation of roof of U.G. Girls Hostel at Jabalpur.	4,85,000.00	Work in progress
4.	Providing crusher Dust of approach Road from main entrance gate to entrance of U.G. Boys Hostel.	41,075.00	Work in progress
5.	White washing of tribal Girls Hostel.	14,000.00	Completed
6.	White washing and repairing of tribal Boys Hostel.	25,000.00	Completed
7.	Renovation of tribal Girls Hostel.	1,45,000.00	Completed
8.	Renovation of Electrification work on PVC wiring system at U.G. Hostel.	7,80,700.00	Work in progress
	<b>(B) Deptt. of forestry.</b>		
1.	Renovation of Electric work at forestry Building (Mains only)	74,381.00	Work order issued
2.	Replacement of existing window with alluminium window in forestry Deptt. JNKVV, Jabalpur.	1,50,000.00	Work order issued
	<b>(C) Dean Faculty office at J.N.K.V.V., Jabalpur</b>		
1.	Renovation of Dean, Faculty office at J.N.K.V.V., Jabalpur	2,50,000.00	Work under progress
	<b>(D) Renovation of Director Extension Service Office</b>		
1.	Renovation of D.E.S. Chamber / Office at J.N.K.V.V., Jabalpur	2,53,000.00	Work order issued
	<b>(E) College of Agriculture Tikamgarh</b>		
1.	Fencing with PCC pole & chain link mesh around Agriculture College & Boys Hostel, Building.	9,43,500.00	Work under progress
	<b>(F) College of Agriculture, Rewa</b>		
1.	Putty emulsion painting (Inside) of all the corridors of College of Agri. Rewa.	3,70,000.00	Work under Progress
	<b>(G) J.N.K.V.V., Main Campus</b>		
1.	Electrification of computer Room of Library at JNKVV Jabalpur	95,000.00	Work Completed
	<b>(H) College of Agriculture Engineering, Jabalpur</b>		
1.	<u>U.G. Hostel</u> (a) Vitrified tiles in dining hall. (b) Kota stone work of kitchen and other Granite work of dining table. (c) Replacement of Doors & windows of both the hostel.	68,181.00 98,422.00 1,44,860.00	Work in progress
2.	Renovation of toilet of Girls Common Room at College.	1,39,903.00	Work under

S. No.	Particulates of work	Estimated cost	Physical status
3.	Renovation of meeting hall.	2,10,965.00	Work in progress
4.	Renovation of toilet of Ground floor & first floor at college.	1,12,258.00	Work Completed
5.	Renovation of ladies toilet at College.	54,602.00	Work completed
6.	Vitrified files flooring in Deans meeting hall.	89,266.00	Work in progress
7.	Complete Electrification of B-Tech Hostel No.1	3,11,079.00	Work order issued

**(a) Civil Works (Ongoing Works)**

S. No.	Particulars of works	Physical status of works
1.1(A)	Construction of Girls Hostel at College of Agriculture, Tikamgarh	Completed and handed over for use
1.1(B)	Construction of Boys Hostel at JNKVV Jabalpur (Rewa)	Lay-out given
1.2	Construction of Girls Hostel at JNKVV Jabalpur	G. Floor finishing work in progress F. floor RCC Roof work in progress
1.3	Construction of International hostel at JNKVV Jabalpur	G. Floor finishing work in progress F. floor RCC Roof work in progress
1.4	Educational Museum	90 % Completed
1.5(a) (b)	Examination Hall Construction of swimming pool	Completed Foundation work & Const. of filtration plant in progress
1.6	Establishment of Zonal Sports Complex at H.Q.	60 % work completed

## Newly Constructed & Renovated Infrastructure



Renovated D.E.S. Meeting Hall



Renovated D.R.S. Meeting Hall



Renovated Dean Student Welfare Meeting Hall



Newly Constructed Examination Hall



Inside View of Newly Constructed Examination Hall



Experiential Learning Building



## Newly Constructed & Renovated Infrastructure



Experiential Learning Class Room of Audio Visual and Graphic



Newly Constructed Museum Building



Renovated P.G. Hostel at JNKVV Jabalpur



Renovated B-Tech Hostel at JNKVV Jabalpur