Annual Report

2011 - 2012

JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA
JABALPUR - 482 004 (M.P.), INDIA

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ANNUAL REPORT

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

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

CONTENTS

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FOREWORD

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur established on October 2, 1964 is responsible for conducting higher education, research and extension activities for increasing productivity, profitability and sustainability of agricultural production systems and quality of rural livelihood of Madhya Pradesh. The University is continuously engaged in developing appreciable production & protection technologies for enhancing productivity and production of agriculture sector. The University has contributed a lot to the overall agricultural growth of the State.

Jawaharlal Nehru Krishi Vishwa Vidyalaya has made remarkable progress in achieving excellence in education by imparting quality teaching, number of UG/PG and Ph.D. students in getting fellowship and job increased considerably.

Besides teaching, the research activities of the University has been scale up by mobilizing resources from different finding agencies. Efforts have been made to prepare various projects to address the problems based on feedback received through farmers and extension officials.

Krishi Vigyan Kendra has played a key roll in transferring the technologies among the farmers and extension officials by conducting demonstrations, on farm trails, organizing kisan sangosthies and kishan melas.

Efforts have been made to develop library facility, modernizing the class room facilities, developing the hostel facilities and other infrastructure facilities by the financial help provided by ICAR through development grant.

I compliment Directors, Dean and editorial team of Annual Report 2011-2012 and contributors who have worked sincerely in bringing out this valuable document which gives comprehensive record of achievement and progress made during the year 2011-2012.

(V.S. Tomar)

Dr. O.P. Veda
Director Instruction

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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.

(O.P. Veda)

INTRODUCTION

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 manning research, extension and education in agricultural and allied sciences.

On the recommendation of the University Education Commission under the Chairmanship of Dr. S. Radhakrishnan in 1949 and the two Joint Indo American Teams on Agricultural Research and Education in 1954-55 and 1959-60, it was decided to set up an Agricultural University in the state on the pattern of Land Grant Colleges of the United States of America. Accordingly, Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV) was established by transferring the existing Govt. Colleges of Agriculture (six) and Veterinary Sciences (two) under an Act of Madhya Pradesh legislature passed in 1963. In accordance the Statutes were framed. J.N. Krishi Vishwa Vidyalaya 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, covering 12 agro-climatic zones. Though the Vishwa Vidyalaya was formally inaugurated on 2nd October 1964, most of its constituent colleges and research stations are quite old. The University had three part with the creation of sister universities Indira Gandhi Krishi Vishwavidyalaya (IGKV) at Raipur in 1987, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior in 2008 and Madhya Pradesh Pashu Chikitsa Vigyan Vishwa Vidyalaya, Jabalpur in 2009.

The constituent Agricultural Research Station at Powarkheda (1903) is older than the Agricultural Research Institute (ARI) of Pusa, Bihar (now IARI) which came into being in 1905. The location and year of establishment of the Colleges of JNKVV are presented in Table 1.

Table 1: Location and year of establishment of Colleges of JNKVV

Name of the College and location	Year of establishment
Faculty of Agriculture	
College of Agriculture, Jabalpur	1955
College of Agriculture, Rewa	1955
College of Agriculture, Tikamgarh	2004
College of Agriculture, Ganj Basoda	2007
College of Agriculture, Waraseoni (Balaghat)	2012
Faculty of Agricultural Engineering	
College of Agricultural Engineering, Jabalpur	1966
Other	
Dryland Horticulture Research and Training Centre, Garhakota, Sagar	2006
Horticulture Vocational Education Institute, Rangua, Garhakota, Sagar	2008

PRESENT STATUS

At present, the Vishwa Vidyalaya has five Colleges of Agriculture, one College of Agricultural Engineering, 12 Research Stations and 20 Krishi Vigyan Kendras.

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

The University has a lion's share in the development of human resources. It has so for produced number of graduates, post graduates, Ph.D. and PG Diploma holders, who are rendering services in the field of agriculture and allied sciences not only in the state but in other parts of the country and overseas.

The Indo British operational research project, which was started in 1979 and converted later into watershed project has been a land mark. In the same year the operational research project for tribal area attained creditability.The pioneering research and extension efforts in enhancing the productivity of soybean by the JNKVV Scientists coupled with the enterprising farmers and State Department of Agriculture is obviously a landmark by which the state is now known as "Soya State". The area and production of soybean have tremendously increased. The establishment of Soya-oil extraction plants within the state paves the way for the export of DOC (De-oiled cake). Systematic studies on cultivation and breeding of soybean during late 1960's triggered the oilseed revolution. Its miraculous impact on socio-economic status of farmers and edible oil sector in India is a landmark. The agro-techniques developed under Dry Land Farming Project which was started in 1970, have proved to be a boon to more than 70% of the farmers. In the field of live stock improvement, commendable work has been done on breeding of high yielding cows, buffaloes and pigs. An indigenous hen Krishna-J with better economic viability has been evolved for rural and tribal poultry keeping.

Appreciable effort in the direction of evolving advanced agricultural technologies and its dissemination to the farmers of the State is reflected in the gradual improvement of agricultural production in the State during the past five decades.

Historical Landmarks

1963 Establishment of University as per M.P. Legislative Assembly Act. No. 12 of 1963 and its notification in M.P. Gazette of 25th May, 1963

1964 Padma Bhusan (Late) Dr. J.S. Patel was appointed as first Vice Chancellor in October, 1964

1964 Transfer of six Agriculture Colleges, two Veterinary Colleges and 19 Research Farms of Government of M.P. to V.V.

1966 Establishment of Faculty of Agricultural Engineering

1967 First Convocation of the University, chaired by Dr. J.S. Patel, the then Hon'ble Vice Chancellor, JNKVV and Addressed by Dr. V.K.R.V. Rao, Central Minister for Education and Human Resources on 10th January

1967 Start of College of Agricultural Engineering

1969 Second convocation of the University, chaired by the then Hon'ble Vice Chancellor Dr. L.S. Negi and addressed by His Excellency, the then Vice President of India, Dr. G.S. Pathak on 1st March

1970 Third Convocation of the University, chaired by the then Vice Chancellor Dr. L.S. Negi and addressed by Shri Govind Narayan Singh the then Hon'ble Chief Minister of M.P. on 12th January

1971 Fourth Convocation of the University chaired by the then Vice Chancellor Dr. L.S. Negi and addressed by His

Excellency the then Governor of M.P. Dr. Satya Narayan Singh on 12th April

1973 Fifth Convocation of the University, held at College of Agriculture Indore and chaired by the then Vice Chancellor, Dr. C. Thakur and addressed by His Excellency the then Governor of M.P. and Chancellor Dr. Satya Narayan Singh on 15th April

1984 Establishment of College of Veterinary Science and Animal Husbandry at Anjora district Durg (now with IGKVV)

1987 College of Agriculture at Khandwa and Mandsaur were established

1988 The then Hon'ble Central Minister of State for Agriculture, Shri Harikrishna Shastri visited the Vishwa Vidyalaya

1988 The degree programme in Forestry started in College of Agriculture, Jabalpur

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, His Excellency, the then 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 Sciences & Animal Husbandry, Jabalpur was celebrated.

2000 Golden Jubilee of College of Agriculture, Gwalior was celebrated

2001 Sixth Convocation of the University, chaired by His Excellency the then Governor of M.P., Dr. Bhai Mahavir and addressed by the then Director General, ICAR, Padma Bhusan, Dr. R.S. Paroda on 10th April

2002 Seventh Convocation of the University, presided by His Excellency the then Governor of M.P. and Chancellor of JNKVV, Dr. Bhai Mahavir, Dr. Sompal, Member, Planning Commission delivered the Convocation Address

2002 College of Agriculture, Mandsaur, converted into College of Horticulture

2004 College of Agriculture, Tikamgarh inaugurated by Hon'ble Chief Minister of Madhya Pradesh

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

2005 Niche Area Project on Centre of Excellence on Medicinal and Aromatic Plants, Department of Crop and Herbal Physiology, JNKVV, Jabalpur

2006 Eighth Convocation of the University, presided by His Excellency the Governor of M.P. and Chancellor of JNKVV, Dr. Balram Jakhar

2006 Golden Jubilee of College of Agriculture, Jabalpur was celebrated

2007 Vocational Training Institute for Dryland Horticulture was established at Garhakota, District Sagar

2007 College of Agriculture, Ganjbasoda was established

2007 College of Veterinary Science & A.H. at Rewa was established

2008 In clause 31 under No. 1484850 of trademark "JAWAHAR" has been registered by JNKVV, Jabalpur

2008 Creation of Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya at Gwalior by transferring 4 colleges of Agriculture , one college of Veterinary Science & A.H., few Research Stations and few KVKs under the jurisdiction of JNKVV to new University

2009 JNKVV hosted AGRIUNISPORTS from March 3-6, 2009

2009 Ninth Convocation of JNKVV held on 20th October 2009. Dr. Mangala Rai, Secretary, DARE and DG, ICAR, New Delhi was the Chief Guest

2009 Veterinary University (Madhya Pradesh Pashu Chikitsa Vigyan Vishwa Vidyalaya) created at Jabalpur and College of Veterinary Science & A.H., Jabalpur and Rewa under the jurisdiction of JNKVV, Jabalpur have been transferred to the new University

2010 Tenth Convocation of JNKVV held on 25th June 2010. Prof. Gurdev Singh Khush, World Food Prize Winner, University of California, Davis, USA was the Chief Guest.

Members of the Statutory Bodies

Members, Board of Management

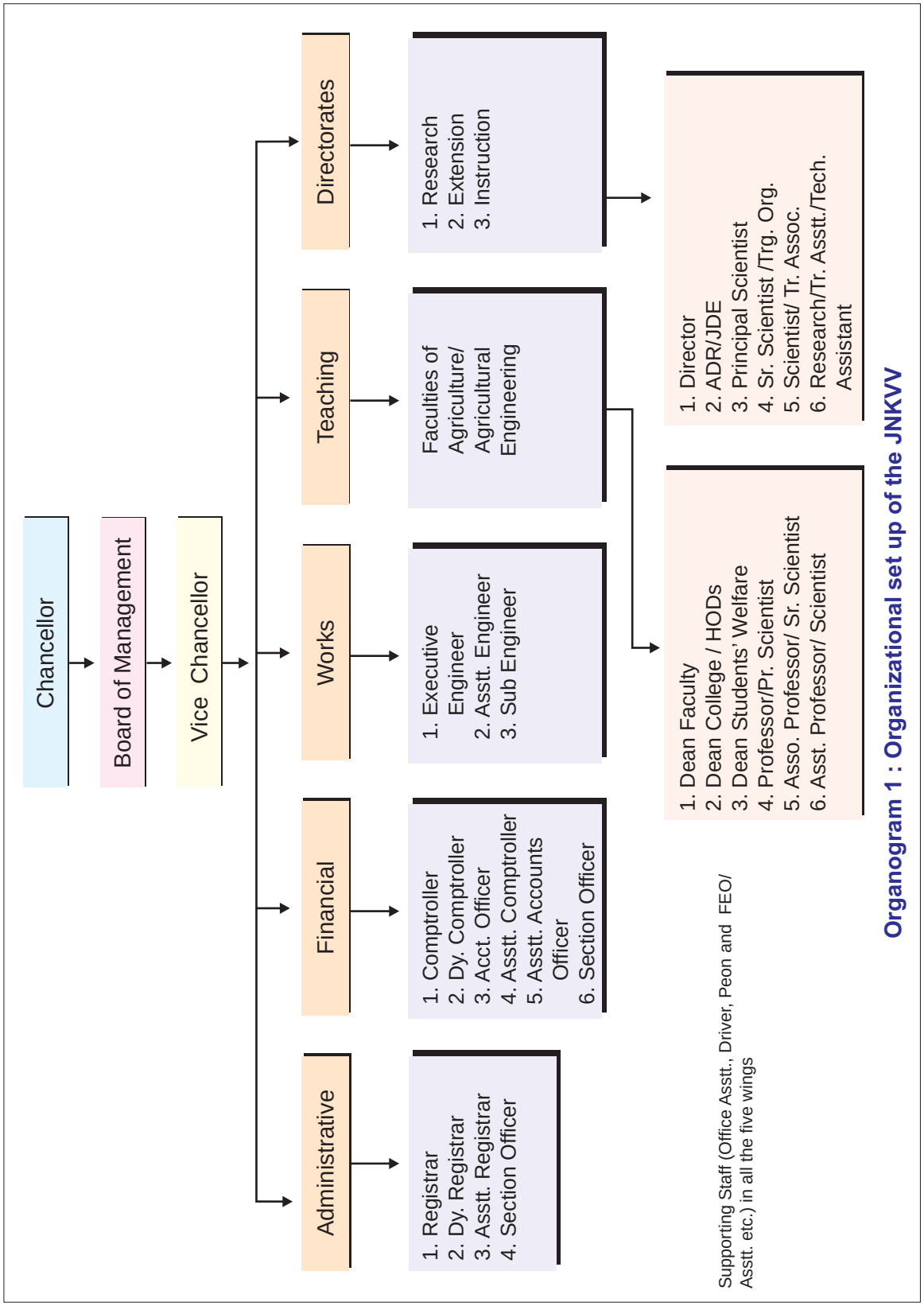
- Prof. Gautam Kalloo, Vice Chancellor, JNKVV, Jabalpur - Chairman
- Shri I.N.S. Dani, Principal Secretary, Farmer Welfare and Agriculture Development Department, Government of M.P., Mantralaya, Bhopal
- Shri G.P. Singhai, Secretary, Department of Finance, Government of M.P., Mantralaya, Bhopal
- Dr. B.S. Chundawat, Ex-Vice Chancellor, Gujarat Agril. University, C/45, Pratap Nagar, Near Royal Academy, Udaipur
- Dr. Yogendrapal Gupta, E-4, Pusa Apartments, Sector 15, Rohini, Delhi
- Dr. Rajpal Singh, 278-A, Durgesh Vihar, JK Road, Bhopal 462041
- Shri Virendra Singh Rana, Rana House, Mohan Nagar, Thatipur, Gwalior 474001 (M.P.)
- Ku. Parveen Saba, H.No. 154, New Devki Nagar, Berasia Road, Bhopal (M.P.)
- Dr. Daya Singh Balain, Ex-Dy. Director General (Animal Science) and Ex-Director, NDRI, 50, Niyaypuri, Near Stadium, Karnal
- Dr. Pitam Chandra, Director, Central Institute of Agricultural Engineering (CIAE), Bhopal (M.P.)
- Shri Kedarnath Shukla, M.L.A., Kamal Kuti, Kotha, Ward No.15, Sidhi, Dist. Sidhi (M.P.)
- Shri Narendra Tripathi, M.L.A., Gandhi Ward, Panagar, Dist. Jabalpur (M.P.)
- Shri Sunil Jaiswal, M.L.A., Shristi 40, Civil Lines, Dist. Narsinghpur (M.P.)
- Shri B.B. Mishra, Registrar & Secretary, JNKVV, Jabalpur

Members, Academic Council

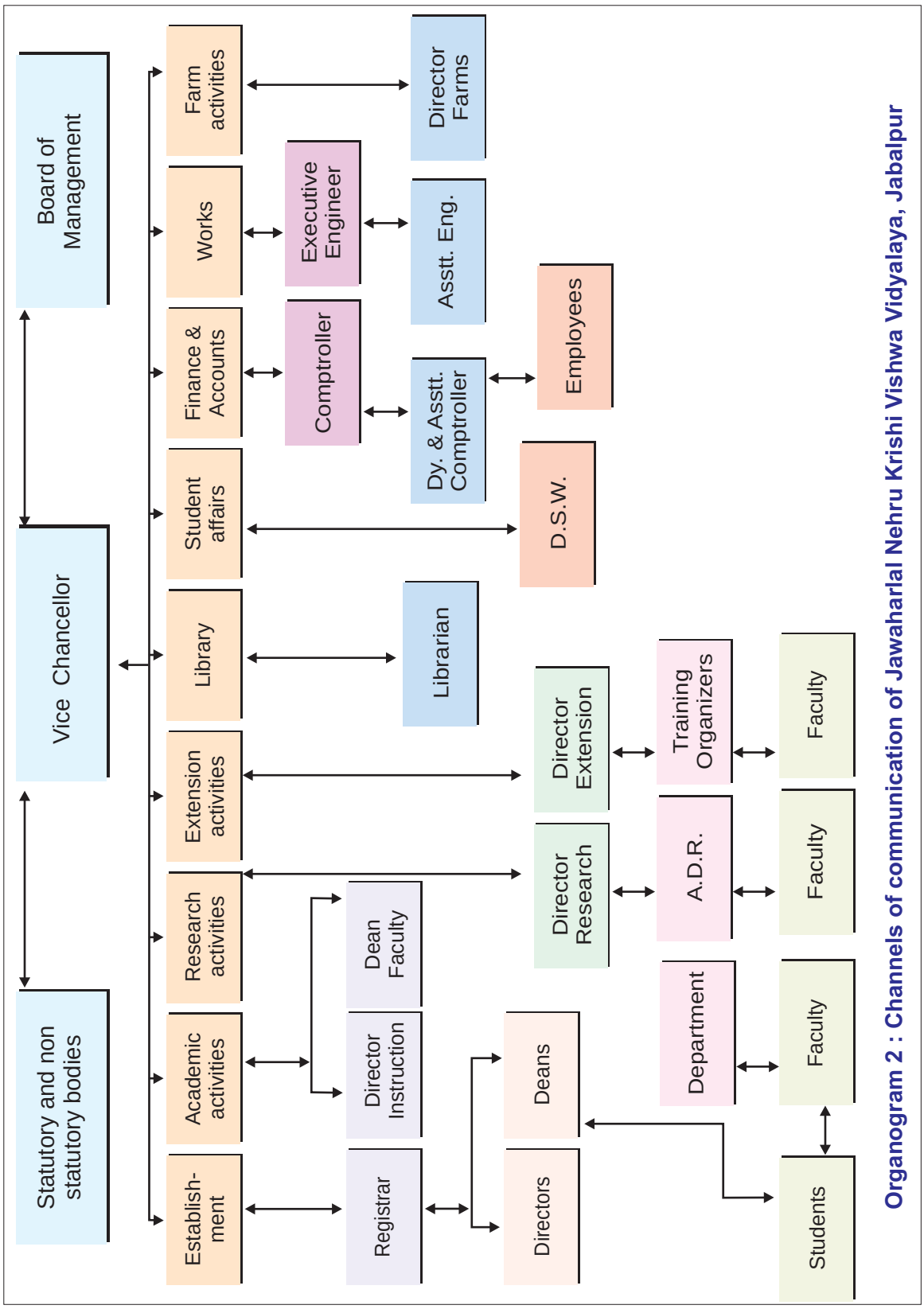
- Prof. Gautam Kalloo, Vice Chancellor, JNKVV, Jabalpur - Chairman
- Dr. S.S. Tomar, Dean, Faculty of Agriculture and Director Research Services, JNKVV, Jabalpur
- Dr. P.K. Jain, Director Extension Services, JNKVV, Jabalpur
- Dr. N.K. Seth, Dean, College of Agril. Engineering, JNKVV, Jabalpur
- Dr. N.K. Raghuwanshi, Professor & Head (Ag. Eco. & FM), JNKVV, Jabalpur
- Dr. K.L. Mishra, Associate Professor, College of Agricultural Engineering, JNKVV, Jabalpur
- Dr. J.M. Nigam, Ex-Dean, Veterinary Sci. & A.H. (JNKVV), Palampur
- Dr. A.S. Tiwari, Retd. Dean Faculty of Agriculture, JNKVV, 5, Saraswati Nagar No.1, Behind AG Off., Gwalior (M.P.)
- Shri B.B. Mishra, Registrar & Secretary, JNKVV, Jabalpur

Members, Administrative Council

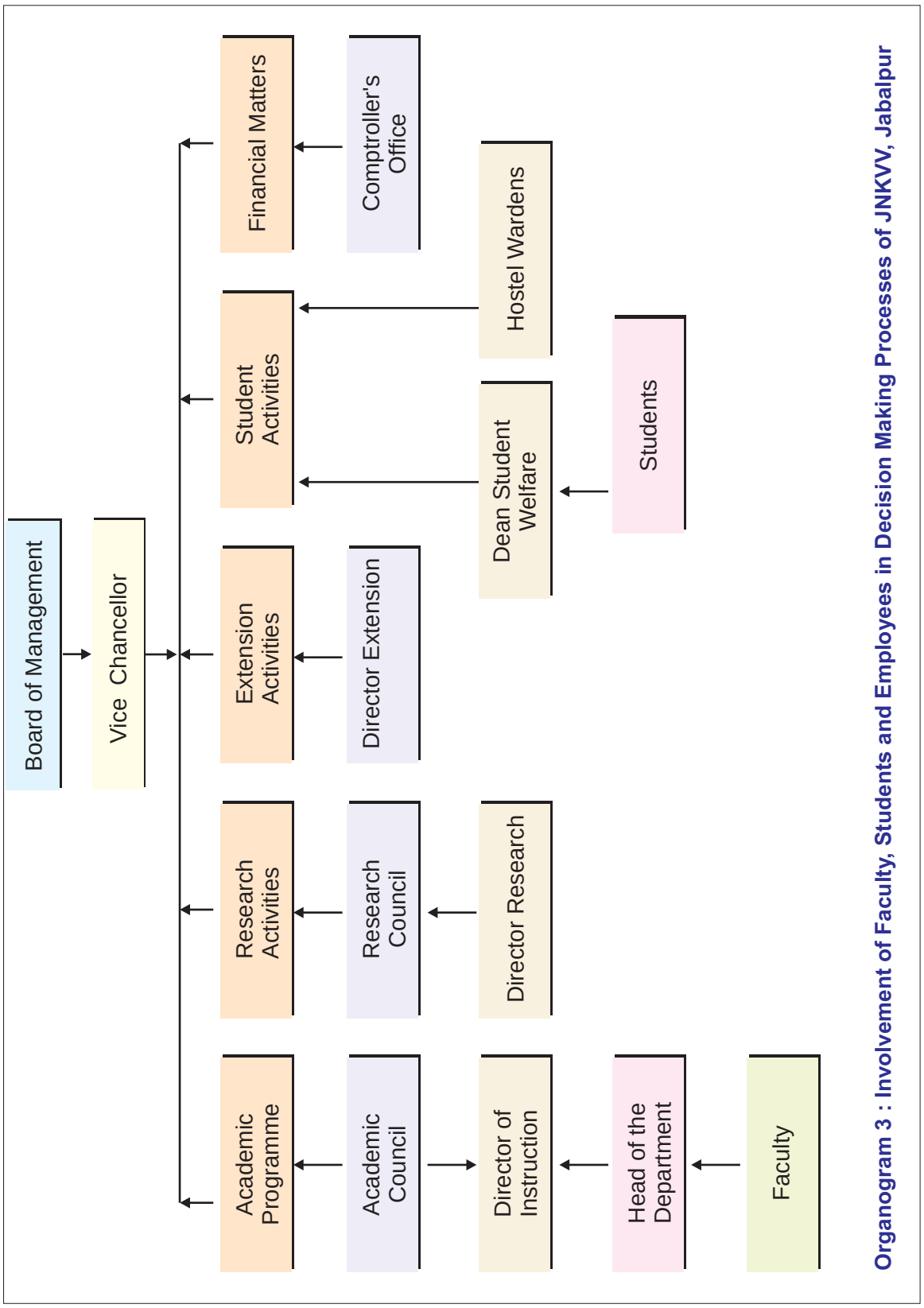
- Prof. Gautam Kalloo, Vice Chancellor, JNKVV, Jabalpur - Chairman
- Shri G.S. Kurveti, Comptroller, JNKVV, Jabalpur
- Dr. S.S. Tomar, Dean, Faculty of Agriculture & Director Research Services , JNKVV, Jabalpur
- Dr. O.P. Veda, Director Instructions, JNKVV, Jabalpur
- Dr. N.K. Seth. Dean, College of Agril. Engineering, JNKVV, Jabalpur
- Dr. P.K. Jain, Director Extension Services, JNKVV, Jabalpur
- Dr. S.K. Rao, Director Farms & Dean, College of Agriculture, Rewa
- Dr. P.K. Mishra, Dean, College of Agriculture, Tikamgarh
- Dr. P.K. Bisen, Dean Students Welfare, JNKVV, Jabalpur
- Dr. D.K. Mishra, Professor & Head (Plant Breeding), JNKVV, Jabalpur
- Dr. Suman Kumar, Professor & Head (Food Science), JNKVV, Jabalpur
- Dr. Deva Kant, Professor & Head (Soil & Water Engg.), JNKVV, Jabalpur
- Shri B.B. Mishra, Registrar & Secretary JNKVV, Jabalpur



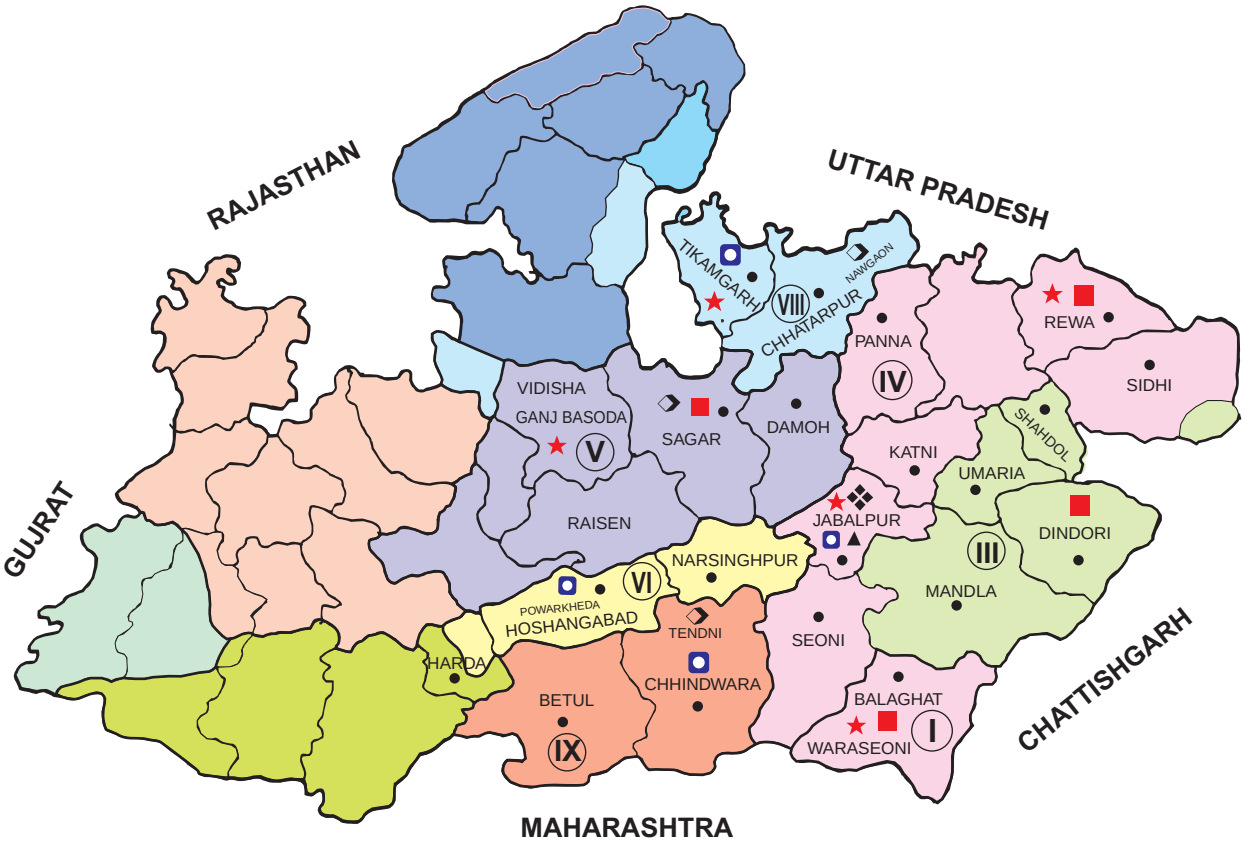
Organogram 1 : Organizational set up of the JNKVV



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



Organogram 3 : Involvement of Faculty, Students and Employees in Decision Making Processes of JNKVV, Jabalpur



RESEARCH STATIONS & COLLEGES

- ❖ MAIN CAMPUS
- ★ AGRICULTURE COLLEGE
- ▲ AGRIL. ENGINEERING COLLEGE
- ■ ZONAL AGRIL. RES. STATION
- ■ REGIONAL AGRIL. RES. STATION
- ◇ SUB-STATION
- ● KRISHI VIGYAN KENDRA

AGROCLIMATIC ZONES

- **I.** CHHATTISGARH PLAINS (Balaghat District)
- **III.** NORTHERN HILLS ZONE OF CHHATTISGARH (Shahdol, Umaria, Mandla & Dindori Districts)
- **IV.** KYMORE PLATEAU AND SATPURA HILLS
- **V.** VINDHYAN PLATEAU
- **VIII.** BUNDELKHAND ZONE
- **IX.** SATPURA PLATEAU

EDUCATION

Jawaharlal Nehru Krishi Vishwa Vidyalaya has been the 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 Waraseoni (Balaghat) and Agricultural Engineering (Jabalpur) with 13 and 5 departments, respectively.

Academic Programmes

The University offers three Bachelor's Degree programmes viz. B.Sc. (Ag.), B.Sc. (Forestry) and B.Tech. 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 available under Agiculture Faculty. Doctoral degree programmes are available in nine departments of Agriculture Faculty and in three departments of Agricultural Engineering Faculty.

Departments in different Faculties

Agriculture	Agricultural Engineering
• Agricultural Biotechnology • Agricultural Economics & Farm Management • Agricultural Statistics • Agronomy • Entomology • Extension Education • Food Science & Technology • Forestry • Horticulture • Plant Breeding & Genetics • Plant Pathology • Plant Physiology • Soil Science & Agricultural Chemistry	• Agricultural Structure & Environmental Engineering • Applied Physics & Agricultural Meteorology • Farm Machinery & Power • Post Harvest Process & Food Engineering • Soil & Water Engineering

In addition the University has also started diploma courses in Horticulture on (1) Seed Production & (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 25 students in each course.

Admission

U.G. Programme

Admission to UG 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 1. Faculty of Agriculture and Agricultural Engineering

Reservation of seats

Fifty per cent of seats are reserved for various reserve categories of candidates, in accordance with the rules laid down by the Government for permanent residents of M.P. State.

Postgraduate Degree programme

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

Theses 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.

Table 1: Availability of seats in different programmes

Programmes	Availability of seats				
	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. (Ag.)	32	7	24	-	63
B.Tech.	60	9	12	3	84
M.Tech.	18	3	18	-	39
Ph.D. (Agril. Engg.)	12	2	12	-	26

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), National Research Center for Weed Science (NRCWS), Bhabha Atomic Research Centre (BARC), Central Institute for Cotton Research (CICR) 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.

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 campii.

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 session) 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, Ganj Basoda and Waraseoni (Balaghat).

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 all historical agricultural events of the state theme wise.

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 programme besides JNKVV trainers, eminent scientists, resource persons from other universities and subject matter specialists from various fields of specialization are invited to deliver lectures.

A national training programme on "Biotic and Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" was organized from October 3-23, 2011 under Centre of Advanced Faculty training,

Department of Soil Science and Agricultural Chemistry, JNKVV, Jabalpur. In this training programme, 23 participants from different states of the country from different disciplines of agricultural science participated.

Instructional material and practical manuals

Question Bank and Practical Manuals prepared by the Teachers / Scientists of the University:

S. No.	Department	No. of Question Bank	No. of Practical Manuals
1.	Soil & Water Engineering	--	02
2.	Plant Breeding & Genetics	01	01
3.	Plant Pathology	01	01
4.	Forestry	01	--
5.	Extension Education	01	--
6.	Agricultural Economics	01	--
7.	Agronomy	01	--
8.	Entomology	02	--
9.	Horticulture	01	--
10.	Agircultural Statistics	01	02
11.	Bio-technology	01	--
12.	Food Science	01	--
13.	Plant Physiology	01	--
14.	Soil Science	01	03

Books & Book Chapters

- Bhale, M.S. and Gaur, A. (2012). Seed Borne Diseases of Field Crops and their Management. Agrobios (India), Jodhpur, India. 445p. (ISBN 978-81-7754-476-3). Rs. 2500.
- Mishra, D.K., Khare, D., Bhale, M.S. and Koutu, G.K. (2012). A Handbook of Seed Certification. Agro bios (India), Jodhpur, India. 249p. (ISBN 978-81-7754-459-6). Rs. 990.
- Sharma, H.L. (2011). Experimental Designs and Survey Sampling: Methods & Applications. Published by Agrotech Publishing Academy, Udaipur.
- Kushwaha, K.S. (2011). Objective Agriculture Statistics, published by New India Publishing Agency, New Delhi.

Audio-Visual aids for Smart e-classroom

E-learning comprises all forms of electronically supported learning and teaching. The information and communication systems, whether network learning or not, serve as specific media to implement the learning process E-learning is the computer and network-enabled transfer of skills and knowledge. E-learning applications and processes include Web-based learning, computer-based learning, virtual education opportunities and digital collaboration.

An amount of Rs. 100 lakh has been allocated by the ICAR to JNKVV for the strengthening of library. Out of this amount, Rs. 50.00 lakh has been allocated for purchase of books for different colleges and Rs. 50.00 lakh allocated for Audio - Visual aids: e-class room items, i.e. Interactive Board, Multimedia Projector, Visualizer, Interactive Panel, Wireless Pad, IT Lecture (Podium) and UPS.

Video Conferencing System: Distance Learning

Video Conferencing is an exciting technology for education. Teachers and students are able to see each other, share documents and discuss topics together in a situation similar to a traditional classroom setting. The main difference being that the teachers and the students may be in different states or even countries.

Multi-point Video Conferencing System (1 Unit) has been installed at JNKVV Headquarter, i.e. at Jabalpur and Single-point Video Conferencing System (3 Units) have been installed at College of Agriculture, Rewa, Tikamgarh and ganjbasoda using ICAR Development Grant.

Efforts made in capacity building and faculty development of teachers / technical/para- professional and administrative staff

Training Programmes attended

- Dr. Praveen Kumar Jaga, (Asstt. Prof.), College of Agriculture, Ganj Basoda attended a training programme on "Climate Change, Carbon Sequestration and Carbon Credits" from 5-18 April, 2011 at Indian Institute of Soil Science. Bhopal.
- Dr. Yogranjan, (Asstt. Prof.), College of Agriculture, Tikamgarh attended a training programme on "Third Teacher / Research Training Workshop" from 2-25 May, 2011 at Indian Institute of Science, Bangalore.
- Dr. P.K. Awasthi (Professor), Agriculture Economics, College of Agriculture, Jabalpur attended a training programme on "Capacity Building Programme on International Trade Towards Enhancement of Competitiveness of Indian Agriculture" from 23-27 May, 2011 at Indian Institute of Foreign Trade, New Delhi.
- Shri Bansilal Sahu, (SMS), KVK, Tikamgarh attend a training programme on "Advances in Bio Processing / Bio Engineering and Quality Assessment Technique" from 1-21 June, 2011 at CIPHET Unit, Punjab Agriculture University, Ludhiana.
- Dr. Vinita Singh, (SMS), KVK, Sagar attended a training programme on "Advances in Bio Processing / Bio Engineering and Quality Assessment Technique" from 1-21 June, 2011 at CIPHET Unit, Punjab Agriculture University, Ludhiana.
- Dr. Sanjeev Kumar, (Asstt. Professor), Plant Pathology, College of Agriculture, Jabalpur attended a training programme on "Molecular and Genomic Tools for Crop Improvment" from 27 June to 6 July, 2011 at Indian Institute of Pulses Research, Kanpur
- Dr. A.K. Sarawgi, (Professor), Agricultural Economics & F.M., College of Agriculture, Jabalpur attended a training programme on "Agriculture Sector in WTO trade regime" on August 8-10, 2011 at Naronha Administrative Academy, Bhopal.
- Dr. Ramfool Ahirwar, (Asstt. Professor), Agricultural Economics & F.M., College of Agriculture, Ganj Basoda attended a training programme on summer school on "Decision Support Systems in Agriculture Using Economic Tools" from 2-22 August, 2011 at National Centre for Agricultural Economics & Policy Research (NCAP), New Delhi.
- Gigi Annee Abraham (Progarmme Asstt. Computer), KVK, Jabalpur participated in "ICT, Computer Course" from 22 August to 10 September, 2011 at UGC-Academic Staff College, Rani Durgavati Vishwa Vidyalaya, Jabalpur
- Dr. A.K. Sarawgi and Dr. P.K. Awasthi, (Professor) Agricultural Economics, College of Agriculture, Jabalpur attended a training on "Participatrory Building Programme" from September 5-9, 2011 at Indian Institute of Foreign Trade, New Delhi.
- Shri P.L. Ambulkar, (SMS), Plant Protection, KVK, Dindori participated in training programme on "Precision Farming and Insect Pest Management" from 7-27 September, 2011 at Centre of Advanced Faculty Training, Department of Entomology, Tamilnadu Agriculture University, Coimbatore. (T.N.).
- Dr. Brajesh Kumar Tiwari, (SMS), Agronomy, KVK, Umariya attended summer school on "Resource Conservation Technology for Enhancing Input Use Efficiency and Sustainable Pulse Production" from 8-28 September, 2011 at Indian Institute of Pulses Research, Kanpur (U.P.).
- Dr. Yogendra Singh, (Asstt. Professor), Biotechnology, College of Agriculture, Ganj Basoda attended training programme on "Molecular Breeding Course" at International Rice Research Institute (IRRI), Philippines during 26 September to 7 October, 2011.
- Dr. Brijpal Bisen, (SMS), Horticulture, KVK, Jabalpur participated training programme on "Biotic & Abiotic Stress Management in Fruit Crops" from 21 September to 11 October, 2011 at Centre

of Advanced Faculty Training in Horticulture (Fruit), Department of Horticulture, Mahatama Phule Krishi Vidyapeeth, Rahuri, Distt. Ahmednagar (Maharastra)

- Dr. Y.M. Sharma (Scientist), Soil Science, College of Agriculture, Jabalpur participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur
- Dr. Raj Kishore Bhatnagar, (Asstt. Professor), Soil Science, Collge of Agriculture, Ganj Basoda participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. Raj Mohan Sharma, (Asstt. Prof.), Plant Breeding, College of Agriculture, Ganj Basoda participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. N.K. Bisen, (SMS), Plant Breeding, KVK, Seoni participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. Anay Kumar Rawat, (Asstt. Prof.), Agronomy, College of Agriculture, Jabalpur participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advance Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Shri R.D. Barpete, (SMS), Plant Protection, KVK, Betul participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. K.P. Tiwari, (Programme Coordinator), KVK, Narsinghpur attended a training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. Alka Singh, (SMS), KVK, Chhindwara attended a training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. Seema Naberia, (Asstt. Professor), Extension Education, College of Agriculture, Ganj Basoda participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. (Smt.) Kinjulck C. Singh, (SMS), Extension Educaiton, KVK, Rewa participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil

Science, College of Agriculture, Jabalpur.

- Dr. S.P. Singh, (Asstt. Prof.), Extension Education, College of Agriculture, Tikamgarh attended a training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. K.C. Shukla, (Asstt. Prof.), Plant Physiology, College of Agriculture, Tikamgarh participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. Vikas Gupta, (Asstt. Prof.), Agronomy, DHRTC, Garhakota, Sagar participated in training programme on "Biotic & Abiotic Resources Management for Eco-friendly and Sustainable Agriculture" from 27 September to 17 October, 2011 at Centre of Advanced Faculty Training, Department of Soil Science, College of Agriculture, Jabalpur.
- Dr. Aparana Sharma, Asstt. Professor, Food Science, College of Agriculture, Ganj Basoda participated in training programme on "Non Thermal and Non-Chemical Processing and Membrane Technology in Food Systems" from October 12-21, 2011 at CIAE, Nabibagh, Bhopal.
- Dr. Ashish Shrivastava, Asstt. Professor, Plant Pathology, College of Agriculture, Ganj Basoda attended a training programme on "Monitoring and Forecasting of Plant Disease Epidemic Under Climate Change Scenario" from 10 October to 1 November, 2011 at Indian Agricultural Research Institute, New Delhi.
- Shri Vikas Singh Baghel, Asstt. Professor, Computer Science, College of Agriculture, Tikamgarh participated in training programme on "Data Mining and Tools Knowledge Discovery in Agricultural Datasets" from November 3-23, 2011 at Indian Agricultural Statistical Research Institute, Library Avenue, Pusa, New Delhi.
- Shri R.P. Dongre, Asstt. Professor, Forestry, College of Agriculture, Jabalpur attended training programme on "Climate Change and Carbon Mitigation" from November 14th to 18th, 2011 at ICFRE, Dehradun.
- Dr. Deepak Rathi, Asstt. Professor, Agricultural Economics, College of Agriculture, Tikamgarh attended a training programme on "Commodity Future Markets" from November 21-22, 2011 at College of Agriculture, JNKVV, Jabalpur
- Dr. Nafees Khan, Associate Professor, Agricultural Economics, College of Agriculture, Rewa attended a training programme on "Commodity Future Markets" from November 21-22, 2011 at College of Agriculture, JNKVV, Jabalpur
- Dr. Ashish Shrivastava, Asstt. Professor, Plant Pathology, College of Agriculture, Ganj Basoda attended a training programme on "Quality Management and Plant Protection for Enhanced Competitiveness in Agricultural Export" from 12 November to 2 December, 2011 at G.B. Pant University of Agriculture and Technology, Pantnagar (Uttrakhand).
- Shri Raj Mohan Sharma, Asstt. Professor, Plant Breeding, College of Agriculture, Ganj Basoda participated in training programme on "Quality Management and Plant Protection Practices for enhanced competitiveness in Agricultural Export" from 12 November to 2 December, 2011 at G.B. Pant University of Agriculture and Technology, Pantnagar (Uttrakhand)
- Er. Pushpendra Sikarwar, Asstt. Professor, Soil & Water Engineering, College of Agriculture, Tikamgarh participated in training programme on "Enhancing Water Productivity in Agriculture" from December 7-27, 2011 at G.B. Pant University of Agriculture and Technology, Pantnagar.

Meetings, Seminars and Conferences attended

- Dr. S.K. Tripathi, Dr. I.M. Khan, Dr. M.R. Dhingra and Dr. P. Perraju of College of Agriculture, Rewa attended 45th Annual Rice Meeting from April 06th to 10th, 2011 at DRR, Hyderabad (A.P.).
- Dr. R.K. Pathak, Dr. S.K. Chourasia, Dr. M.P. Gupta and Dr. G.K. Satpute Principal Scientists of College of Agriculture, Tikamgarh attended the Annual Group Meeting on Safflower & Linseed 2011 from August 27th to 29th, 2011 at DOR, Hyderabad (A.P.).
- Dr. D.P. Dubey attended First interface meeting of Secretary, DARE & DG, ICAR with AICRPDA Network Centers on 7 April, 2011 at NASC Complex, New Delhi.
- Dr. D.P. Dubey attended review meeting of NICRA held at New Delhi on 8 April, 2011 with DDG (NRM and AICRPDA scientists under NICRA.
- Dr. D.P. Dubey attended regional review meeting of AICRPDA-QRT (25-27 August, 2011) at College of Agriculture, Indore.
- Dr. S.K. Chourasia, Dr. M.P. Gupta and Dr. G.K. Satpute attended Annual Group Meeting on Linseed & Safflower at Directorate of Oilseed Research, Hyderabad from August 27-29, 2011.
- Dr. S.N. Shrivastava, Dr. R.A. Sathwane, Dr. S.K. Tripathi, Dr. M.R. Dhingra, Dr. B.S. Dwivedi, Shri O.P. Dhurvey and 15 PG students of College of Agriculture, Rewa attended workshop on "Application of Remote Sensing in Agriculture Science" held in APS University, Rewa.
- Dr. D.P. Dubey attended State level workshop on strategies for enhancing crop production and crop productivity (MP Agriculture seeking new directions and strategies) on June 16-18, 2011 at JNKVV, Jabalpur.
- Dr. D.P. Dubey and Dr. V.D. Dwivedi attended 23rd Biennual Workshop of AICRPDA at Zonal Agricultural Station, Solapur on Dec 19-23, 2011.
- Dr. D.P. Dubey organized the Launching Workshop of NICRA at Village Patauna of Raipur Karchulian Block District Rewa on 26 Sept 2011.
- Dr Gaurav Mahajan attended the Annual Workshop of Small Millets held at RARS Anakapalli (AP) from 13-15 April, 2012.
- Dr. V.K. Singh, (Asstt. Prof.), College of Agriculture, Tikamgarh attended the National Seminar on "Innovative Extension Approaches for Enhancing Rural Household Income" form 27-29 September, 2011 at JNKVV, Jabalpur.
- Dr. Deepak Rathi (Asstt. Prof.), Agricultural Economics, College of Agriculture, Tikamgarh attended the National Seminar on "Innovative Extension Approaches for Enhancing Rural Household Income" form 27-29 September, 2011 at JNKVV, Jabalpur.
- Dr. V.K. Shukla, Dr. A.K. Jha and Dr. B.S. Dwivedi attended the International Conference on "Issues for Climate Change, Land Use Diversification and Biotechnological Tools for Livelihood Security" held on 8-10 October, 2011 at SVPUA&T, Meerut.

Papers presented in Conferences/ Seminars

- Babbar, Anita, Thakur Rashmi., Yadav. S.S. Prakash. V. and Suneeta Pandey (2011). Resistant sources against Fusarium wilt in chickpea grown under normal and heat stress environment, pp6 in National Symposium on Biodiversity and Food Security: Challenges and Devising Strategies, IIPR, Kanpur.
- Bhale, M.S., Usha Bhale, Aasffa Tabassum and Priyanka Dubey (2011). Detection and management of *Alternaria carthamii* associated with *Carthemus tinctorius* L. seeds In National Seed Conference on Quality for Prosperity, January 29-31, 2011, Mahatma Phule Krishi Vidyapeeth, (Rahuri), College of Agriculture, Pune.
- Babbar, Anita, Rashmi Thakur (2011).

Assessment of chickpea promising lines for its Phenology, yield traits and reaction to Fusarium wilt under normal and high temperature condition in International Conference on "Issue for climate change, land use diversification and biotechnological tools for livelihood security (ICLDBT-2011)" at Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (UP) .

- Babbar Anita and Rashmi Thakur (2011). Screening of chickpea genotypes for biotic and abiotics stresses. pp 224 in National Seminar on Contemporary Approaches to Crop Improvement, Sponsored by Indian Society of Genetics and Plant Breeding, IARI, New Delhi and UAS, Bangalore.
- Khare, D., P. Sahu, N. Saini, A.N. Shrivastava, and M.S. Bhale (2011). Soybean seed longevity in National Seed Conference on Quality for Prosperity, January 29-31, 2011, Mahatma Phule Krishi Vidyapeeth, (Rahuri), College of Agriculture, Pune.
- Mishra, D.K. , D. Khare, and Sunil Nayak (2011). Characterization of elite wheat genotypes base upon physiological, quality, and biochemical parameters in National Seed Conference on Quality for Prosperity, January 29-31, 2011 at Mahatma Phule Krishi Vidyapeeth, (Rahuri), College of Agriculture, Pune.
- Mishra Stuti, Babbar, Anita and Mishra, D. K. (2011). Association analysis for yield and its attributing traits in *desi* chickpea under normal and high temperature condition pp.107, In National Symposium Integrated Farming System for Sustainable Agriculture on February 19-21, 2011 at Bundelkhand University, Jhansi (UP).
- Mishra Stuti (2011). Tolerance to heat stress in agricultural crops: step against climate change, pp. 48 in International Conference on Issues For Climate Change, Land Use Diversification, Biotechnological Tools for Livelihood Security (ICLDBT), September 2011 at SVPUAT, Meerut.
- Mishra Stuti (2011). Delivery of edible vaccines via transgenic plants: A Review pp.20, In National Conference on Changing Scenario of Food Science Technology & Agricultural Products at Bundelkhand University ,Jhansi (UP).
- Mishra Stuti (2011). Identification and evaluation of chickpea genotypes under normal and high temperature conditions pp. 250-251, in National Seminar on Contemporary Approaches to Crop Improvement on April 2011 by Indian Society of Genetics & Plant Breeding (ISGPB), UAS, Bangalore.
- Bhale, M.S. (2012). Certification for Vegetable Seed Health System in India pp.6-7. In 3rd Global Conference on Plant Pathology for Food Security, Session: Seed Health in Food Security, January 10-13, 2012. Indian Society of Mycology & Plant Pathology, Maharana Pratap University of Agriculture & Technology, Udaipur (Raj.).
- Babbar, Anita and Rashmi Thakur (2012). Effect of high temperature on morpho-phenological yield related traits in chickpea In National Seminar on Indian Agriculture: Preparedness for Climate Change on March 23-24, 2012 at ICAR, New Delhi.
- Dubey, Priyanka, Bhale, Usha and Bhale, M.S. (2012). Influence of Okra Yellow Vein Mosaic Virus (OYVMV) on the sowing seed quality of Okra pp.42, on 3rd Global Conference on Plant Pathology for Food Security : Seed Health in Food Security, January 10-13, 2012. Indian Society of Mycology & Plant Pathology, Maharana Pratap University of Agriculture & Technology, Udaipur.
- Mishra Stuti, Anita Babbar (2012). Analysis of Growing Degree-Days as a climate impact indicator in Chickpea under Normal and High Temperature Conditions pp. 146-147 in National Seminar on Indian Agriculture: Preparedness for Climate Change, March 23-24, 2012 at ICAR, New Delhi.
- Mishra Stuti, (2012.) GM Crops: Biosafety and Ethical Issues pp.48, in 3rd Global

Conference on Plant Pathology for Food Security, Session: Seed Health in Food Security, January 10-13, 2012, Maharana Pratap University of Agriculture & Technology, Udaipur.

- Nema Ashish , Bhale, M.S. and Garg, D.C. (2012). Pod Blight of Soybean: A Prediction Model for Central Narmada Valley Zone of Madhya Pradesh, India pp.204. In 3rd Global Conference on Plant Pathology for Food Security, Indian Society of Mycology & Plant Pathology, Maharana Pratap University of Agriculture & Technology, Udaipur.
- Sharma, Rajmohan, Satrupa Rao and M.S. Bhale (2011). Impact of quality seeds in increasing production among tribal community of MP in National Seminar on Restructuring of Irrigated Agriculture, status and Strategies , March 15-17, 2011, College of Agricultural Engineering, JNKVV, Jabalpur.
- Sharma, Subrata, J. Patidar and Satrupa Rao (2011). Effect of testing media and temperature on germination and vigor parameters of Ocimum In National Seed Conference on Quality for Prosperity, January 29-31, 2011, Mahatma Phule Krishi Vidyapeeth, (Rahuri), College of Agriculture, Pune.
- Shukla R.S. Participated in Seed Industry Programme for five days (17-21) January, 2011) as organized by Cornell University and Sathguru, Hyderabad.
- Vijay Prakash and D.K. Mishra. 2011. Challenge and Opportunity (IFSSA- 2011)" in National Symposium "Integrated Farming System for Sustainable Agriculture on February 19-21, 2011 at Bundelkhand University, Jhansi (UP) .
- Shukla Niharika, Anita Babbar (2011). Management of abiotic stress for sustainable crop production under of climate change. pp 15 in National Conference on Changing Scenario of Food Science Technology & Agricultural Products held at Bundelkhand University, Jhansi (UP).
- Dr. S.K. Tripathi attended seminar and delivered special invitee lecture on fungicides resistance at New Science College, Rewa on 18 November, 2011.
- Dr. M.A. Alam attended seminar and delivered special invitee lecture on Biological control of insect pest at New Science College, Rewa on 18 November, 2011.
- Dr. P.K. Jaga, Asstt. Professor, Soil Science, College of Agriculture, Ganj Basoda attended the National Seminar and presented a paper on effect of fertilizer, FYM and Azotobacter on growth and yield of mustard and soil feritilty from November 16-19, 2011 at University of Agriculture Science, Dharwad (Karnataka).
- Dr. Namrata Jain, Asstt. Professor, Agronomy, College of Agriculture, Tikamgarh attended a National Symposium on Empowering Rural India Through Space Technology from November 9-11, 2011 at M.P. Council of Science & Technology, Bhopal, M.P.
- Dr. S.K. Gupta, Professor & Technical Officer to Dean Faculty of Agriculture, JNKVV, Jabalpur presented a paper in 71st Annual Conference of Indian Society of Agricultural Economics held at UAS Dharwad, Karnataka from November 3-5, 2011.
- Dr. Yogendra Singh, Asstt. Professor, College of Agriculture, Ganj Basoda attended International Conference on Issues for Climate Change, Land Use Diversification and Biotechnological Tools and Livelihood Security organized by Hi-Tech Horticultural Society, Meerut U.P. from October 8-10, 2011.
- Dr. S.P. Singh, Asstt. Professor, Extension Education, College of Agriculture, Tikamgarh attended the 6th National Extension Education Congress 2011 organized by Society of Extension Education from December 17-19, 2011 at ICAR Research Complex for Goa, Goa.
- Dr. P.K. Tyagi, Asstt. Professor, Agronomy, College of Agriculture, Tikamgarh attended

the 6th National Extension Education Congress 2011 organized by Society of Extension Education from December 17-19, 2011 at ICAR Research Complex for Goa, Goa.

- Dr. O.P. Dhurve, Asstt. Professor, Plant Physiology, College of Agriculture, Rewa attended National Seminar of Plant Physiololgy on Sustainable Crop Productivity through Physiololgical Interventions held at Ramnarain Ruia College, Matunag, Mumbai from November 24-26, 2011.
- Dr. A.K. Shrivastava, Asstt. Professor, Agricultural Meteorology, College of Agriculture, Tikamgarh attended a National Seminar on Agro-meteorological Research and Services to Combat Climate Chage Challenges organized by BCKV, Kalyani, West Bengal from December 9-10, 2011.
- Singh, Rachna Anita Babbar, Sunita Pandey, Shailendra Singh Yadava and Vijay Prakash (2012). Genetic diversity in chickpea grown under late sown condition, pp35-36 in National Seminar on Indian Agriculture: Preparedness for Climate Change March 23-24, 2012, ICAR, New Delhi.
- Shrivastava Arpita, Anita Babbar (2012). Exploitation of chickpea cultivar for rice fallow condition In National Seminar on Indian Agriculture: Preparedness for Climate Change March 23-24, 2012, ICAR, New Delhi.
- Shukla Niharika and Anita Babbar (2012). Breeding of chickpea genotypes against impact of high temperature for sustainable production, pp 90-91 in National Seminar on Indian Agriculture: Preparedness for Climate Change March 23-24, 2012, ICAR, New Delhi.
- Dr. Gaurav Mahajan attended seminar and delivered lecture on Biodiversity conservation in Agriculture at APSU, Rewa on 23 March, 2012.
- Dr. A.K. Jain and Dr. Ashish Kumar attended 3rd Global Conference on Plant Pathology for Food security at MP UA&T Udaipur on Jan 2012.
- Dr. Atul K. Shrivastava, Professor, College of Agriculture, Tikamgarh attended 46th Annual Convention of ISAE from February 27-29, 2012 at GBPUA&T, Pantnagar.
- Dr. V.K. Singh, Asstt. Professor, College of Agriculture, Tikamgarh attended 14th Indian Agricultural Scientists & Farmers Congress on "Diversificaiton in Agriculture and Agripreneurship" from February 18-19, 2012 at Bioved Research Institute of Agriculture & Technology, Allahabad U.P.
- Dr. Amit K. Sharma, Asstt. Professor, College of Agriculture, Tikamgarh participated and presented a paper in the 8th International Conference on Safflower Conference at Direcotrate of Oilseeds Research, Hyderabad from January 19-23, 2012.
- Dr. Sanjeev Kumar, Scientist, Plant Patholoigy, College of Agriculture, Jabalpur attended 3rd Global Conference of Indian Society of Mycology and Plant Pathology from January 10-13, 2012 at Rajasthan College of Agriculture, MPUAT, Udaipur.

National Talent Scholarship (NTS)

Students of JNKVV perform well in various competitive examinations and are awarded fellowships. During the year 2011-12, the National Talent fellowship was awarded to 48 students of various under graduate degree programmes.

Rural Agricultural Work Experience (RAWE) & Forestry Work Experience (FWE)

- The University has implemented the RAWE Programme as per the recommendation of 4th Dean's Committee (ICAR) for Final Year students of B.Sc. (Ag.) in the First Semester. As per guidelines manual has been prepared for the students for their work to be taken up in the villages. Before leaving for their placement students have been briefed about the programme.

- Rural Agricultural Work Experience 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. 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 level.
- The programme was implemented in all the College of Agriculture viz Jabalpur, Rewa, Tikamgarh, Ganjbasoda and Department of Forestry, Jabalpur. During the year, total 257 final year students of B.Sc. (Ag.) & B.Sc. (Forestry) have been placed in various Krishi Vigyan Kendra & Zonal Agriculture Research Station of the Vishwa Vidyalaya. The details of the placement of students are as follows:-

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

- Book bank facility is being provided to all the students including students belonging to weaker sections in students placement cell for ready reference.
- A tutorial Cell is created by the V.V. in Dean Students Welfare office for the students of SC/ST and weaker sections. Presently Hon'ble Vice Chancellor of this Vishwavidyalaya inaugurated the newly constructed Tutorial Cell on September 9th, 2011. Main object 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 literature and large number of CD's containing matter on Agriculture sciences.
- English and General knowledge coaching started at all the Colleges of Agriculture for

Placement of students for RAWE /FWE programme 2011-12

Name of the College	Total No.	Placement Centre	No. of Students
College of Agriculture, Jabalpur	81	1. ZARS, Chhindwada	14 Girls
		2. KVK, Betul	14 Girls
		3. KVK, Seoni	15 Boys
		4. KVK, Dindori	18 Boys
		5. KVK, Mandla	20 Boys
College of Agriculture, Rewa	76	1. KVK ,Panna	20 Boys
		2. KVK, Sidhi	16 Girls
		3. KVK, Shahdol	20 Boys
		4. KVK, Umariya	20 Boys
College of Agriculture, Tikamgarh	43	1. KVK, Navgaon	03 Girls
		2. KVK, Sagar	40 Boys
College of Agriculture, GanjBasoda	32	1. KVK, Powarkheda	15 Boys
		2. KVK, Harda	17 Boys
Department of Forestry, Jabalpur	25	1. KVK, Seoni	15 Boys and 10 Girls
Total	**257**		

Activities performed by RAWE and FWE students during 2011-12

Sowing of vegetable crop (tomato, brinjal)

Preparation of nursery bed

Interaction of RAWE students with sarpanch Rajakhedi

Demonstration of proper threshing by RAWE students

Field operations (spraying)

Filed operation

Trimming of clones

Planting of clones in root trainers

personality development of students belonging to weaker sections and SC/ST/OBC for carrier building and for preparation of competitive examination and to develop entrepreneurship.

- Debate/Script writing competitions are organized at all the Colleges of Agriculture for promoting the students for the skill development.

Innovations/improvements made in examination cell/education technology cell / placement cell and allied facilities.

- Examination Cell & Education Technology Cells 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 in all the class rooms and the conference hall 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 & tools were purchased under development grant in various colleges.
- Examination evaluation cell and academic cell established in all the colleges.
- Use of multimedia viz. LCD for PG teaching and conduction of the seminar of M.Sc. students in all the colleges.
- The Placement cell counsels students on the availability of scholarship and avenues for higher studies.
- Books for general knowledge and competitive examination are purchased for SC/ST and weaker section students for different interviews at Jabalpur in the placement cell.
- Placement cell and counseling cell established and students were benefitted through placements in various organizations viz. Bank of India, Union Bank of India, Private organization and Semi Govt. organizations.
- Entrepreneurship skills developed under Experiential learning and the impact they have created in real professional lives of the students.
- A Plant Tissue Culture Lab for Large-scale planting material production has been established at newly constructed Seed Technology building. Students will produce TC 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 were already 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-pesticids.

Experiential Learning Programme

As per the guidelines of IVth Deans committee of ICAR, the courses on Experiential Learning

College wise and module wise number of registered students for Experiential Learning Programme

Name of Module	Jabalpur	Rewa	Tikamgarh	Ganj Basoda
Crop Production	13	25	11	16
Crop Protection	02	26	13	16
Horticulture	07	25	17	--
Post Harvest Technology & Value Addition	25	--	--	--
Agri Business Management	25	--	--	--
Basic Science	09	--	--	--
Total	**81**	**76**	**41**	**32**

for UG students of Agriculture and Forestry has been started from 2nd semester of the academic session 2011-2012 in all the colleges of JNKVV. The module wise and College wise number of students are given below.

Experiential Learning Programme for Forestry

In this programme, 25 students of B.Sc. (Forestry) IVth year IInd semester, participated.

Sanction of two new experiential learning units

Two new experiential learning units are sanctioned by the ICAR, New Delhi from the financial year 2011-12 for JNKVV, Jabalpur:

1. Visual & Graphic Communication Rs. 47.07 lakh
2. Commercial Horticulture Rs. 32.16 lakh

Seminars / Symposium / Conferences / Trainings / Workshops organized

- A three day National Seminar on Innovative Extension Approaches for Enhancing Rural Household Income was held in a gracious manner at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur from September 27-29, 2011. This seminar was organized in collaboration with Indian Society of Extension Education, Indian Agriculture Research Institute, New Delhi, Madhya Society of Agriculture Extension Education, Jabalpur and Zonal Project Directorate, Zone VII, Jabalpur
- A National Symposium on Vegetable Biodiversity was held on April 4-5, 2011 at JNKVV, Jabalpur. The Symposium was organized by Indian Society of Vegetable Science, Varanasi in collaboration with JNKVV, Jabalpur and Indian Institute of Vegetable Research, Varanasi. The Symposium was inaugurated by Dr. Kirti Singh, Ex-Chairman, ASRB, New Delhi
- KVK State Level Workshop - Front Line Demonstration on pulses and oil seeds was organized at College of Agriculture, Rewa from April 20-22, 2011.
- (iv) A State Level Workshop on "Strategies for Enhancing Crop Production and Productivity - Madhya Pradesh Agriculture: Seeking New Directions, New Strategies" was jointly organized by Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur and Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior at JNKVV, Jabalpur from June 16-18, 2011. The Chief Guest of the function was Dr. Panjab Singh, Former Director General, ICAR, New Delhi.
- An employment generating training on bag making was organized for rural women at KVK, Jabalpur from 7 August to 25 September, 2011. Thirty rural women / school dropout girls participated in the training. The participants were trained in making luggage bag, school bag, makeup bag, bangle bag, mobile cover, shopping bag, suitcase etc.
- A training programme on "Production package of practices of horticultural, medicinal and aromatic plants" was organized under the MPWSRP from 17-22 October, 2011 at JNKVV, Jabalpur. Participants from Department of Agriculture and Horticulture, Govt. of M.P. attended the training.
- A training programme was organized on Seed Business Management - Seed Production Technologies of Field Crops at Directorate of Farms, JNKVV, Jabalpur on July 9, 2011.
- A training programme was organized on Seed Business Management - vVrietal Characterization, GOT and Post Control Plots at Directorate of Farms on July 11, 2011.
- A training programme on "Agropedia" was organized by Directorate of Extension Services in collaboration with the Indian Institute of Technology, Kanpur on November 2, 2011. Thirty five scientists, research scholars and programme assistants of KVKs participated.

- A training programme on "Post harvest process, storage of agricultural produce and value addition" was organized under MPWSRP, at JNKVV, Jabalpur from September 19- 24, 2011.
- A field day on "Early maturity Hybrid Rice" was held on October 3, 2011 at JNKVV, Jabalpur. Participants are from ICAR, seed industry and JNKVV faculty.
- A Video Conferencing Seminar on "Inspiring agri-business startups" held on October 12, 2011 at Vice Chancellor's meeting hall. The seminar was on-line video conferencing with all BPD units of India. The seminar was lead by BPD unit ICRISAT, Hyderabad for delivering a number of recent topics.
- A review meeting on "Strategies for increasing wheat production and rust management in central zone" was jointly organized by Ministry of Agriculture and Cooperation, Government of India, New Delhi, State Department of Farmers Welfare and Agriculture Development, Bhopal and JNKVV, Jabalpur on October 24, 2011 at JNKVV, Jabalpur.
- 6th National Conference on KVK-2011 and National Exhibition of Secondary Agriculture was organized at JNKVV, Jabalpur from December 3-5, 2011. The theme for the conference was "Enabling Farmers for secondary Agriculture". The Union Agirculture Minister Hon'ble Shri Sharad Pawar, inaugurated thieconference. Dr. S. Ayyapan, DG, ICAR, New Delhi was also present on this occasion.
- A two day second training programme on Commodity Futures Market was organized under the banner of Department of Agricultural Economics & FM, JNKVV, Jabalpur on November 21-22, 2011 which was sponsored by Forward Market Commission, Ministry of Consumer Affairs, Food & Public Distribution, Mumbai. Nearly, 100 participants from M.P. & Chhattisgarh participated.
- A National seminar was organized on "Thoughts of Thakur Rabindra Nath Tagore on Agricultural Development" jointly by the Maathru Bhoomi Foundation (MBF), New Delhi & JNKVV, Jabalpur on January 30-31, 2012.
- A two day "Regional Workshop of Western Region on Cost of Cultivation scheme" was organized on February 9-10, 2012 at JNKVV, Jabalpur. It was jointly organized by Directorate of Economics & Statistics, Ministry of Agriculture, Govt. of India, New Delhi and Department of Agricultural Economics & Farm Management, JNKVV, Jabalpur .

Scientists visited Abroad

- Dr. S.K. Rao, PI, BPD Unit attended International Conference on business incubation held at San-Jose, USA from 7-15 April, 2011 and completed a certificate course on Management of Business Incubators.
- Dr. S.S. Tomar, Director of Research Services JNKVV, Jabalpur attended the training programme (JICA Tranining & Dialogue Programme) titled "Counter part training for the study of policy and practice Developed Agriculture Technology Extension System and Rural Infrastructure in Japan" under M.P.-JICA Collaborative Soybean Project, organized by Japan International Co-operation Agency, Japan from 26 November to 4 December, 2011.
- Dr. S.S. Tomar, Director of Research Services and Dr. S.K. Rao, Director of Farms & Dean, College of Agriculture, Rewa, JNKVV, Jabalpur attended the Global Launch of the Maize & Wheat CGIAR Research programme at Maxico from January 16- 20, 2012.
- Dr. A.N. Shrivastava, Principal Scientist, Plant Breeding & Genetics, AICRP on Soybean visited Brazil under M.P. JICA

Project entitled "Mximization of Soybean Production in Madhya Pradesh" during January 16-29, 2012. The visit was aimed to know the recent cultivation trends of Soybean in Brazil.

- Dr. Sunil Nahatkar, Principal Scientist (Agricultural Economics) and Co-PI of BPD Unit attended International Training Programme on "Food and Agri-Business Management" at Ithaca (USA) from July 6-14, 2011. This programme was sponsored by NAIP-ICAR, New Delhi.
- Dr. Yogendra Singh, (Asstt. Prof.), Biotechnology, College of Agriculture, Ganj Basoda attended training programme on "Molecular Breeding Course" at International Rice Research Institute (IRRI), Philippines from 26 September to 7 October, 2011
- Dr. Yogranjan Singh, Assistant Professor, Biotechnology, College of Agriculture, Tikamgarh attended training programme on "Biotechnology in Agricuture in a World of Global Environmental Changes" from 6 February to 5 April, 2012 at Hebrew University of Jerusalem's, Faculty of Agriculture, Israel.

Admission of Foreign Students

- Under Nepal Aid fund, Ms Aruna Parajuli (Nepal) admitted in M.Sc. (Ag.) Department of Agricultural Economics & Farm Management, College of Agriculture, Jabalpur during the session 2011-12.

PG courses started at other campii

- From Academic session 2011-12 M.Sc. (Ag.) in Entomology and Ph.D. in Plant Breeding & Genetics started at College of Agriculture, Rewa.
- M.Sc.(Ag.) in Agronomy, Agricultural Economics, Agricultural Extension Education, Entomology, Plant Pathology, and Vegetable Sciences started at College of Agriculture, Tikamgarh from academic session 2011-12.

Students Educational Tour organized by the College

S.No.	Name of College and places visited by the students
1.	**College of Agriculture, Rewa (February 7-14, 2012)** • Fodder Research Station Jhansi, UP • RVSKVV, Gwalior • Commercial beekeeping, Morena • CS Azad University of Agriculture & Technology, Kanpur • National Sugarcane Research Station & CIMAP, Lucknow • Agra Agriculture University, Agra • IVRI, Izzat Nagar, Bareli • G.B. Pant University of Agriculture and Technology, Pant Nagar, • NDUAT, Faizabad
2.	**College of Agriculture, Tikamgarh (March 26-31, 2012)** • Central Institute of Research on Goat, (ICAR), Farah, Mathura (U.P.) • Directorate of Rapeseed and Mustard Research, Bharatpur (Raj.) • Indian Grassland and Fodder Research Institute, Jhansi • National Research Centre of Agro-forestry, Jhansi • RVSKVV, Gwalior
3.	**College of Agriculture, Ganj Basoda (March 14-21, 2012)** • College of Agriculture, Indore • IARI Regional Station, Indore • Directorate of Soybean Research, Indore • College of Horticulture, Mandsaur • MPUAT, Udaipur

Awards received by the teachers / Scientists / Students

- Abhishek Sharma, student of College of Agriculture, Rewa awarded University Gold Medal in B.Sc. (Ag.) in 2011.
- Puneet Tiwari, student of College of Agriculture, Rewa received cash prize of Rs. 5000/- from JNKVV, Jabalpur for ranking first.
- Dr. S.P. Singh, Asstt. Professor, Extension Education, College of Agriculture, Tikamgarh received Young Scientist Award-2011 during National Seminar on Innovative Extension Approach for Enhancing Rural Household Income, held at JNKVV, Jabalpur September 27-29, 2011.
- Dr. G.K. Koutu, Principal Scientist, Plant Breeding & Genetics awarded the Best Worker Award in the field of Agriculture Research on January 26, 2012.
- Dr. Dinkar Sharma, Programme Co-ordinator, KVK, Jabalpur received the Award for best KVK in Zone -7.
- Dr. T.K. Singh, Scientist, Horticulture, College of Agirculture, Rewa awarded Young Scientist award 2012 by Bioved Research Institute, Allahabad on 19 February 2012 for outstanding contribution in horticulture.
- Dr. (Smt.) Usha Bhale, received the best poster presentation award during the National seminar on Vegetable Biodiversity at JNKVV, Jabalpur in April 2011.
- Prakash, Vijay, Anita Babbar, Prakash Tiwari awarded first prize for poster presentation entitled "Evaluation of indigenous and exotic large seeded accession of Kabuli chickpea (Cicer arietinum L.) for yield attributing traits".

Placement Cell

There is a well established placement cell exist in the office of Dean Students Welfare. This cell is responsible for organizing campus interviews for placement of Agriculture Graduates, Post Graduates, MBA, B.Tech and M.Tech pass outs.

Visits of dignitaries

- Dr. S. Ayyapan, DG, ICAR visited the ongoing experiments being conducted under AICRP on chickpea on 4 Dec. 2011.
- Dr. R.L.Pandey, Ex-Head of the Department, IGKVV, Raipur visited the ongoing experiments being conducted under AICRP on chickpea on 5 December 2011 and gave valuable suggestions for further improvement
- Dr. M.P. Pandey, Vice Chancellor, BAU, Ranchi visited the ongoing experiments under AICRP on chickpea, on 5 December, 2011.

Dr. Thomas Lumpkin, DG, CIMMYT Inaugurated the MEGA SEED Storage GODOWN at BSP Unit

Field visit by dignitaries

- Dr. A.K. Singh, DDG, Education visited the ongoing experiments under AICRP on chickpea on 23 January, 2012.
- Dr. Thomas Lumpkin, DG CIMMYT along with other CIMMYT scientist, visited the ongoing experiments under AICRP on chickpea on 4 December 2011 and 29 Jan 2012.
- Dr. H.S. Gupta, Director, IARI, visited the ongoing experiments under AICRP on chickpea on 29 March 2012.
- Dr. H.S. Gupta, Director, IARI, visited the hybrid seed production programme of maize collaboration with CIMMYT.

Library

- The Central Library of JNKVV is catering to the need of all constituent colleges of JNKVV (Agriculture, Forestry and Agricultural Engineering), KVK's and research stations. The e-granthalaya software has been installed in the library. The library is well equipped with data capturing unit, bar code scanners, thermal power printer, laser printer and photocopier. Eight computers have been installed in the library for students consultation. Internet facility is provided trough LAN/Ethernet. There are 100+CD database on different disciplines of Agriculture and Biology. All CABI-CD from 1972 onwards are available for consultation. Presently, the library is in possession of CD Rom databases viz, AGRIS, AGRICOLA, CURRENT CONTENTS, CROP, CABPEST, GENE, Agricultural Economics and Soil CD, Biological Abstracts, Annual Reviews and CAB Abstracts. Open e-journals are available to users JNKVV has become partner of CERA (Consortium for e-resources in Agriculture) NAIP, ICAR project under which the JCCC, Springer collection, Annual Review & CSIRO Australian Journals are accessible in Central Library ARIS lab.
- At present, the library is subscribing for 40+Indian Journals besides a wide range of journals received under exchange programme. The Central Library is linked with 30 International & 60 National Institutes / Universities under exchange programme. There are more than 87,000 entries representing 62,000 general books, text books, teachers reference books and 16,308 back and current volumes of foreign and Indian journals, about 6200 (PG / Ph.D.) theses and 8632 pamphlets, bulletins and reports and etc. Every year, approximately 4000 new entries of literature are added.
- Library of Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), Jabalpur is designed and devoted to serve the educational, research and extension needs of the faculty members, staff and students. Central Library was established with a view of collecting, organizing, analyzing agricultural information and making it available for its users. Library supports the curriculum, research and extension needs of the University through the development of pertinent collections and the provision of services designed to facilitate access to easy information retrieval and learning. The library is catering the need of all constituents' colleges (Agriculture, Forestry and Agricultural Engineering), KVK's and research stations of JNKVV.
- An amount of Rs 50.00 Lakh was received under the budget head C-2(Res.) ICAR P-384- Library Strengthening under development grant for purchase of books during the financial year 2011-2012. Important books related to agriculture and allied subjects (Agronomy, Agricultural Economics, Soil Science, Medicinal and Aromatic Plants, Plant Pathology, Entomology, Food Science, Biotechnology, Plant breeding and Genetics, Seed Technology, Extension, Horticulture, Pomology, Plant Physiology,

Head	Central Library College of Agriculture, Jabalpur	College of Agricultural Engineering, Jabalpur	College of Agriculture, Rewa	College of Agriculture, Tikamgarh	College of Agriculture, Ganjbasoda	Total
Allotment (Rs. In Lakh)	12.00	12.00	10.00	08.00	08.00	50.00
No of Books Purchased	792	3189	1943	1479	1191	8594

Management, Agricultural Engineering, Forestry, Statistics, Environmental Science, Processing etc) were purchased through open tender process. The distribution of funds was as mentioned below. In total 8594 books were purchased.

Publications

- Awasthi, P.K., D. Rathi and Raghuwanshi, N.K. (2011). Rural development planning in Central India - A case study of MNREGA in Sagar district of Madhya Pradesh. Paper presented in Indian Journal of Agricultural Economics, 66 (3) pp. 324.
- Awasthi, P.K.. Rathi, D. and Raghuwanshi, N.K. (2011) MNREGA and its impact on distress migration: Some facts and Emerging Issues. Agricultural Economics Research Review Vol. 24 (conference number), pp 557.
- Dhurvey, O. P. and Khan, I. M. (2011) Identification of upland rice genotypes for tolerance to moisture stress and photosynthetic characters in Kymore Plateau sub zone of MP. In National Seminar on Plant Physiology (ISPP) at RNR College, University of Mumbai, 03-27 (0), pp 61.
- Jha A. K., Kewat M.L., Upadhyay V.B., Vishwakarma, S.K. 2011. Effect of tillage and sowing management on productivity, economics and energetics of rice-wheat cropping system for Kamore Plateau and Satpura hill zone of Madhya Pradesh. Indian J Agronomy. 56 (1) : 35-50
- Jha S.K., Sharma A.K. and Jha A.K. 2010. Influence of sowing dates and time of fertilizer application on nutrient uptake in soybean crop for Malawa region of Madhya Pradesh JNKVV Res. J 44 (2):143-145
- Jha A.K., Dwivedi, B. S. and Jha, S.K. 2012. Agriculture research and good government policy for development of the socio-economic status of the farmers. Search and Research (Special Issue):26-33.
- Kewat M. L., Jha A.K. and Nayak Siddarth 2011. Efficacy of combi against weeds in non- cropped land and microbial properties of soil. Journal of Tropical Forestry 27 (2) : 72-73
- Khan, I. M., et al. (2011) Leaf senescence and dry matter partitioning in relation to grain yield in early rice breeding lines under upland environment. JNKVV Res. J. 45 (1) 122-124.
- Khan, I. M. and O. P. Dhurve (2011) Effect of high temperature on spikelet sterility, heat susceptibility and grain yield in rice genotypes . Paper presented in National Seminar on Plant Physiology (ISPP) at RNR College, University of Mumbai, 07-02 (0), pp 131.
- Kumar A., Singh, T. K., Singh Rajesh, Singh, J., Jain, A. K. and Tripathi S. K. (2012). Studies on varietal performance of mango germplasm for incidence of mango malformation" Paper presented in 13th Global conference on Plant Pathology and Food Security. January 10-13, 2012 at MPAU & T, Udaipur (Rajasthan) pp-53.
- Kumar A., Singh, T. K., Singh, J, Jain, A. K. and Tripathi, S. K. (2012). Performance

and management of mango hybrids against incidence of malformation, powdery mildew and anthracnose. Paper presented in National seminar on new frontiers frontiers and future challenges in Horticultural crops' NFFCHC 2012, 15-17 March, 2012, PAU, Ludhiana.

- Kushwaha K.S., Agrawal K.K. and Jain Sanjay 2011. Analysis and estimation of soybean yield using ANCOVA technique. JNKVV Res. J., 45 (2) : 228-230.
- Rao, P. R., B. Sailja, D. Subramanian, D. Vijay, S. C. Sakhdhar, I. M. Khan, R. Beena and S. R. Voleti (2011) Variation in radiation use efficiency in rice cultivars grown at different location. Paper presented in National Seminar on Plant Physiology (ISPP) at RNR College, University of Mumbai, 01-01 (0), pp 3.
- Shrivastava, A. N., Shivastava, M. K. And Manjayya, J. G. (2011). "Significance of four seeded pod trait in soybean yield improvement " Soybean Research (9): 53-61.
- S ingh, T. K., Dwivedi, Dwivedi Vandana and Singh, D. B. (2011). Integrated Nutrient Management in Guava. Mysore J. Agric. 45 (4) 923-925.
- Singh, T. K., Dwivedi, Singh, J. and Singh, D. B. (2011). "Screening of mango germplasm against malformation. Global conference on Augmentating production nad utilization of mango biotic and abiotic stresses" June 21-24, 2011 pp-15.
- Singh, T. K., Singh, J., and Singh, D. B. (2011). "Performance of mango varieties in Kymore plateau of Madhya Pradesh" Global conference on Augmentating production nad utilization of mango biotic and abiotic stresses" June 21-24, 2011 pp-16
- Singh, T. K., Singh, J., Singh Rajesh and Singh, D. B. (2011). "Effect of N P K on growth and yield of mango (Mangifera india L.). Paper presented in Global conference on Augmentating production and utilization of mango biotic and abiotic stresses. June 21-24, 2011. The Society for Development of Sub-Tropical Horticulture, CISH, Lucknow (U.P.) pp-67.
- Singh, T. K., Kumar A., Singh, D. B. and Singh, J. (2011) Effect of N P K on growth and yield of Guava. Paper presented in 14th IASFC on Diversification in Agriculture and Agripreneurship 18-19, Feb 2012 pp 1.
- Singh, T. K., Kumar, A. And Singh J. (2012). Performance of guava gemplasm in Vindhya Region of Madhya Pradesh. Paper presented in National Seminar on new frontiers and future challenges in Horticultural crops' NFFCHC 2012, 15-17 March, 2012, PAU, Ludhiana.
- Soni Monika, Upadhyay V.B., Vishwakarma S. K . and Singh Poonam 2012. Productivity and sustainability of rice based cropping systems for Kymore Plateau and Satpura hills zone of Madhya Pradesh as influenced by diversification and intensification. Indian J. Agronomy.57 (1): 27-32
- Thakur, R., Sawarkar S. D., Vaishya, U. K. and Singh, Muneshwar (2011). Impact of continuous use of inorganic fertilizers and organic manure on soil properties and productivity under soybean-wheat intensive cropping of Versisol. Indian Society of Soil Science 59 (1): 74-81.
- Tripathi, S. K., Singh, J. And Singh, T. K. (2011). Performance of mango hybrids against malformation, powdery mildew, anthracnose and their management. Paper presented in Global conference on Augmentating production and utilization of mango biotic and abiotic stresses. June 21-24, 2011. pp:132.
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and Tiwari, S. (2011). Assessment of Genetic Diversity among Rhizoctonia root rot resistant soybean genotypes. Food Legumes 24(4):267-272.

- Upadhyay V.B., Mehra N. and Vishwakarma S.K. 2011. Efficient Alternative Cropping Systems for Kymore Plateau and Satpura Hills Zone of Madhya Pradesh" Efficient Alternative Cropping Systems. Book published by Project Directorate for Farming System Research Indian Council of Research Modipuram Meerut.
- Upadhyay V.B., Jain Vikas, Vishwakarma S.K. and Kumhar A.K 2011. Production potential, soil health, water productivity and economics of rice (Oryza sativa)-based cropping system under different nutrient sources. Indian J. Agronomy.56 (4) : 18-22
- Verma, R. K. and Anil Pathe (2012). Morohological and cultural variability of Rhizoctonia bataticola causing charcoal rot of soybean (Glycine max (L) Merrill)" JNKVV Res. J. 46 (1) 2012
- Verma, K., Patel and S. D. Sawarkar (2012). Effect of fertilizer doses on the intensity of aerial blight (Rhizoctonia solani) of soybean. JNKVV Res. J. 46 (1) 2012
- Technical Data Book on "Web based information system on production technologies with marketing strategies, genetic resource of vegetable crops of central India. Bharati Das, A.K. Rai, Ankur Khare, Abhay Bisen, S.K. Sengupta and Chandan Kushwaha.

RESEARCH

Multi disciplinary research of applied nature is conducted on Natural Resources Management, Crop Improvement, Crop Protection, Post Harvest Technology, Farm Machinery and Livestock Production and Management at four Zonal Agricultural Research Stations, Regional Research Stations, and Agricultural Research Stations, respectively after the formation of RVSKVV, Gwalior.

Well-equipped and mechanized farms, workshops, laboratories, Agro-met Center, glass and nethouses, library, ARIS Cell with latest information and communication technology strengthen are the major facilities of the University. As on date All India Coordinated Research projects, ICAR Network Projects (40), NAIP, *Ad-hoc* Research Projects (58), State Plan and Non-Plan Projects, Madhya Pradesh Mandi Funded Projects, other externally funded projects (BARC, MSSRS, MAPCOST etc.), Government of India projects (Agro-Economic Research Center, CCS etc.) are in operation to carry out the research work in agriculture and allied fields. Besides it, University is extending services as Product Testing facility for the corporate sector.

Research station functioning under JNKVV are:

Zonal Agricultural Research Station

- Jabalpur
- Powarkheda
- Tikamgarh
- Chhindwara

Regional Agricultural Research Station

- Rewa
- Sagar
- Dindori
- Waraseoni

Agricultural Research Station

- Betelvine Research Centre, Navgaon (Chhattarpur)
- Dryland Horticultural Research Centre, Ranguan, Garhakota (Sagar)
- Tendni (Chhindwara)
- Sausar (Chhindwara)

The thrust of research in the University continues to be on the evaluation of improved crop varieties having resistance/tolerance to biotic and abiotic stresses and development of need based location specific improved technologies. New research programmes are also formulated to match the changed scenario of new economic policies and climate change and are being implemented. The Vishwa Vidyalaya is concentrating on frontier areas of research bio technology and molecular biology,

agro forestry, bio-energetics, organic farming including biological control of pest and diseases, bio fertilizers, plasticulture, natural resources management, crop improvement, cropping system, food processing and post harvest technology, Hi Tech horticulture, medicinal and aromatic plants, agricultural machinery and allied aspects of integrated farming system approach besides organic farming and conservation agriculture.

Crop varieties developed

Wheat MP 3336 : Newly developed wheat variety MP 3336 has been 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 nutrient, tolerant to terminal heat and disease of wheat. Gives 48 to 52 q ha^{-1} yield, suitable for irrigated late sown condition of Central zone covering Gujrat, Madhya Pradesh, Chhattisgarh, Kota and Udaipur districts of Rajasthan and Jhansi district of Uttar Pradesh.

JRB J05-2 (Raj moong): It 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 280-310 q ha^{-1}, 55-63 q ha^{-1} DMY and 14.8 % crude protein. The seed yield is about 5-6 q ha^{-1}. This variety has been identified by CVRC in 2011. It is a potential fodder crop/variety for lean period.

Kodo millet- DPS 9-1: It 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 27-30 q ha^{-1}.

Oat : JO2003-91: It has been developed from a cross between OS6 x JHO822 and has performed well in different locations of India with production potential of 350-375 qha^{-1} green fodder and about 70-75 q ha^{-1} dry matter yield. it also showed resistance to powdery mildew and other major diseases. The seed yield is about 14-16 q ha^{-1}. This oat variety has been identified and released by CVRC in 2011.

CROP IMPROVEMENT

Soybean

- Total 286 (229 general + 57 mutants) germplasm lines were evaluated for different purposes.
- In Root Rot Screening Nursery, 160 soybean entries screened against root rot. out of which, 148 entries showed resistance.
- In YMV Screening Nursery, out of 55 entries 46 entries were found resistant.
- Twelve entries were found resistant against RAB screened from different nurseries and trials.
- Thirteen entries were identified as multiple resistant.
- Out of 16 entries, seven entries viz; JS 20-29, JS 20-35, JS 20-36, JS 20-64 and JS 97-52 were found better regarding longevity after 9 months of storage

Promising entries of soybean: Among two entries highest yield (3259 kg ha^{-1}) was recorded by JS 20-29, a medium duration (100 days), bold seeded (12-13 g/100 seed weight), multiple resistant including Charcoal rot, YMV and insect pests followed by JS 20-34 (3111 kg ha^{-1}), an extra early (88 days), resistant to charcoal rot and tolerant to insect -pests, medium seed (10-11g/ 100 seed weight) higher than best check, JS 97-52 (3000 kg ha^{-1})

Entries Promoted in AVT-I: JS 20-41: Medium duration (100 days), high yielding, resistant to charcoal rot and YMV and insect-pests.

JS 20-29

JS 20-34

- During 2011, 47 bulks and 1018 single plants have been selected from segregating generation and same have been isolated.
- Short duration lines developed and identified: JS 20-71, JS 20-69, JS 20-77, JS 20-78, JS 20-83, JS 20-84.
- High germination and longevity were found in JS 20-29, JS 20-35, JS 20-36, JS 20-64 and JS 97-52.

Chickpea

- High yielding lines of chickpea are identified as JGK 2005-301 and JGK 2003-304 (Kabuli), JG 923974 (late sown desi)
- In Chickpea Special Elite Nursery (CSEN), the maximum yield and Fusarium wilt resistant (Score 3) was obtained in the following entries FLIP05-157C (600 kg ha-1), FLIP 01-29C followed by FLIP 03-100C, FLIP 06-110C, Flip 03-138C.
- JG 2004-3 and JG 2000-14, identified as stable resistant against wilt based on three years data in multi-location trials.
- MP JG 2001-04 and JG 2000-7, found R/MR at 3 locations out of 5 locations
- JG 2003-14-16 was found as wilt and dry root rot resistant in multi-location.
- JG 2003-95, JG 74, JG 2001-80, JG 2-125 and MP JG 2001-04 found resistant against dry root rot.
- DNA isolation and marker polymorphism test on parental genotypes for the above mentioned crosses with Fusarium Wilt flanking SSR markers on LG 2 also have been confirmed at JNKVV.
- Based on grain yield under heat stress conditions, several heat tolerant genotypes were identified. The top heat tolerant genotypes included 8 breeding lines/released varieties [ICCV 2, ICCV 06302, ICCV 07118, ICCV07109, ICCV96970 (JG 160), ICCV93952, (JAKI 9218, ICCV 92311, and two germplasm lines (ICC 8474, ICC 9942).

Hybrid Rice

- Under hybrid rice improvement project, 210 test crosses were made using 6 CMS lines. These test crosses will be evaluated next year for identification of superior hybrid cross combinations, maintainer and restorer lines.
- Five superior hybrid combinations identified for yield and quality viz. 25A x IR 79253-55-1-4-6, 97A x IR 79648-35-2-1-1, 25A x IR 78554-145-1-3-2, 25A x IR 79247-107-1-2-1, 31A x IR 80694-44-1-2-2
- Five superior hybrid combinations with medium bold grain 3A x IR 80694-44-1-2-2, 86A x PSBRC-18, 3A x IR 7954-65-1-3-2, 97A x PSBRC-18, 3A x PSBRC-18
- Five suitable identified lines to be used as maintainer, TOX-3867-19-1-2-3-3, IR73546-66-1-1-1, IR79648-35-2-1-1, IR77721-93-2-2-1-2-2, IR81310-25-3-2-2
- Five Identified lines to be used as restorer: IR 79253-55-1-4-6, IR 79648-35-2-1-1, IR 78554-145-1-3-2, IR 79247-107-1-2-1, IR 80694-44-1-2-2
- For fertility restorer gene analysis, molecular marker based identification study was done, lines NPT 15, NPT 65 and NPT 20, NPT 18 were better and could be efficiently used in the hybridization programme

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 (2011).
- **MP 3353:** A semi dwarf wheat promoted from NIVT- 3 to AVT (IRLS)
- **Genetic stock:** 750 lines maintained as genetic stock covering new, old and various lines for different traits.
- **BISA collaborative research:** 154 lines covering 106 from CIMMYT and 48 different lines from various zones tested under zero tillage for their yield performance.

Hybrid wheat research: Twenty eight BC3F1 cross combination were planted and back crossed under conversion of maintainers lines. 550 crosses were made belonging to 15 cross combination

Millets

- Amongst the varieties tested of little millet, DLM - 4 (1066 kg), RLM-43 (996 kg ha^{-1}), RLM-30 (924 kg ha^{-1}) and RLM 4-1 (916 kg ha^{-1}) were stood best and found promising for Dindori district in Madhya Pradesh
- Amongst the varieties tested of kodo millet, RK-98, DPS 9-1, JK-48, TNAU-72, RK-286, DPS 368 and RBK -155 were stood best and found promising for Dindori district in Madhya Pradesh.

Mutation Breeding in Kodo millet: A new programme was initiated at Dindori centre to create variability in Kodo millet during 2010-11. Four varieties of KM (JK 439, DPS 48-10, JK 48 and JK 41) are exposed to Gamma irradiation in four doses viz., 500 Gy, 600 Gy,

Hybrid Wheat Research

700 Gy and 800 Gy. Doses 700 Gy and 800 Gy were found lethal for Kodo millet. The individual plants were selected in M2 Generations in 2011-12 for further evaluation in M3 during 2012-13.

Barnyard mini core collection received from ICRISAT: 96 Barnyard Mini Core Collection of Barnyard millet Germplasm were received from ICRISAT and observations on 22 different morpho-agronomical characters were recorded and high yielding entries will be utilized in breeding programme.

Sesame

TKG 352: Completed three years of multiplication testing, release proposal will be submitted after testing of agronomical performance.

Important Traits	TKG-352	TKG-22 (NC)	RT-54 (NC)
Seed Yield (kg ha^{-1})	662	634	627
% increase in yield over best check	4.5		
Oil Content (%)	48	48	40
Oil Yield (kg ha^{-1})	320	307	259
% increase in yield over best check	4.1		
Days to flowering (50%)	40	39	38
Days to Maturity	83	84	82
Plant height (cm)	107.0	106.3	90.9
Productive Branches/ plant	3.1	3.1	3.4
Productive Capsules/ plant	44	45	48
1000 Seed Weight (g)	2.9	3.0	2.9

Resistant to Antigastra at harvest, Macrophomina stem/root rot and phyllody

TKG 301: AVT-II

Important Traits	TKG-301	TKG-22	RT-54
Seed Yield (kg ha^{-1})	572	486	479
% increase in yield over best check	17.8		
Oil Content (%)	48.2	48.1	38.1
Oil Yield (kg ha^{-1})	276	271	213
% increase in yield over best check	1.7		
Days to flowering (50%)	40	41	38
Days to Maturity	85.5	85.5	82.5
Plant height (cm)	104.1	110.5	95.2
Productive Branches/plant	3.1	3.3	3.2
Productive Capsules/plant	41	43	45
1000 Seed Weight (g)	2.9	3.0	2.9

Resistant to Cercospora leaf spot

varieties registered under NBPGR and notification

S.No.	Accession No.	Varieties	Notification Num.
1	IC-574252	PKDS 12 JT 12	SVRC/CVRC 18.03.2010 SD. 33
2	IC-574253	PKDS 8 JT14	SVRC / CVRC 18.03.2010 SD. 32

Jawahar Til 12 (PKDS 12)

- white seeded variety and has completed 3 years testing. It has white seed coat and oil content 50-52%, free fatty acid 2.15 and moderately resistant to capsule borer and leaf roller.
- It matures in 75-80 days and with an yield 900 - 1200 kg ha^{-1}.
- This variety state released year 2008 and notified in 2011 for whole of M.P.

Jawahar Til - 14 (PKDS-8)

- Black and bold seed variety maturing in 75 - 80 days and yield of 900 - 1300 kg ha^{-1}.
- It is suitable for summer cultivation. It is doing well in zone II and zone III under AICRP trial for central and southern zone.
- This variety released and notified for whole of M.P.
- It has medicinal uses.

Jawahar Til 16 (PKDS 41)

- White seeded varieties suited for Summer cultivation .
- It has an Yield of 900 kg ha^{-1}
- It is tall, profusely branched, more capsules /plant It mature within 90 days.
- It is resistance to Phylloidy disease & insect pest (White Fly).

Jawaher Til 15 (PKDS 55)

- This variety is brown seeded & suited for Summer cultivation.
- It has an yield of 600-950 kg ha^{-1}
- It is tall plant type, profusely branched, and more capsules/plant It matures under 90 days. It is resistance cercospora leaf spot disease and capsule borer/leaf roller.
- Varieties in pipeline PKDS 62, 71, 72, 82, 90, 91, 100, and 101.

PKDS 41 (JT 16)

Maize

- Collection and maintenance of 216 new maize inbred lines received from DMR, Hyderabad.
- Collection and maintenance of 18 newly released public hybrids.
- Identification of 144 inbred lines for disease tolerance and high yield potential.
- Development of 132 new cross combinations.

Utilization of Germplasm received from DMR Hyderabad. 124 inbred lines were utilized for the development of 132 single cross hybrids of different duration groups during the period under report (2011-12 Rabi).

Seed Technology Research

- Kymore plateau and Satpura hills and Bundelkhand agro-climatic zones identified for Hybrid seed production of pigeonpea in MP.
- As the recovery of processed seed is higher (79.92%) in FIBR system than (71.63%)under control condition, the FIBR system should be followed for high multiplication rate of quality seed in soybean.
- Kymore Plateau and Satpura hills and Northern hills of Chattisgarh are identified for commercial production of hybrid seed of rice in MP .
- Ridge and furrow as well as raised bed methods are suitable for soybean production providing significantly higher yield of quality seed (high vigour) in comparison to the conventional method.
- Studies on farmers saved soybean indicated that widespread association of *Macrophomina phaseolina, Colltotrichum dematium* and *fusarium oxysporum* with soybean.
- Deep freeze blotter method is standardized for detection of *Colletotrichum dematium* and *Macrophomina phaseolina* and Standard blotter method for detection of Fusarium oxysporum in accordance of ISTA protocols on seed of Moong bean , Urid bean, Sesame and Safflower.
- Nucleus and breeder seed production of Kabuli chickpea is a profitable venture in MP with the cost benefit ratio of 1:2.74.
- Significant differences existed as effect of the packaging materials, and among treatments of polycoated seeds had the maximum germination and vigour index.
- Seeds of mungbean variety Hum 1 and chickpea variety JG 14 were given hydro priming treatment. Priming of moong seeds helped in increasing the plant stand and seed yield marginally.
- Referral Seed Testing Laboratory in Madhya Pradesh is established under RKVY.

PRODUCTION TECHNOLOGY

Intensification and Diversification of Need Based Cropping System Research for Different Agro-Climatic Zones of Madhya Pradesh

In Jabalpur Hybrid rice(JRH-5)-Gobhi saron-

Okra cropping system had the highest Rice equivalent yield(REY) of 160.4q $ha^{-1}yr^{-1}$,net monetary returns(NMR) of Rs. 88,430 $ha^{-1}yr^{-1}$ and B:C ratio of 3.30.

In the skeletal soils of Dindori district six years rotations of Kodo millet-Soybean cropping system gave higher Kodo millet grain yield equivalent (KMGYE- 1149 kg ha^{-1}) over kodo millet - niger for two years rotations (1041 kg ha^{-1}).

Six years pooled grain yield data revealed that application of 40 kg N ha^{-1} gave highest yield (1399 kg ha^{-1}) of kodomillet grain followed by 20 kg N ha^{-1} (1121 kg ha^{-1}) as compared to that (715 kg ha^{-1}) without Nitrogen.

Integrated nutrient management with application of 5.0 t FYM ha^{-1} in addition to RDF in little millet gave significantly highest grain yield (1097 kg ha^{-1}), net monetary return (Rs. 5,147 ha^{-1}) and B:C ratio (1.64).

Management of cropping systems for resource conservation and climate change

Combination of minimum tillage in rice - wheat cropping system with mulching and application of 125 per cent RDF resulted in highest REY (131.7 q $ha^{-1}yr^{-1}$), NMR (Rs. 62246 $ha^{-1}yr^{-1}$) and B:C ratio of (2.44).

The productivity of component, NMR and B:C ratio under rice - wheat, rice - berseem (fodder and seed), maize - wheat and sorghum - wheat cropping systems were maximum under conventional tillage with mulching and application of 125 per cent recommended dose of fertilizer (RDF).

Response of NPK on the yield under soybean-wheat cropping systems in rainfed/irrigated conditions

In Seoni district ,application of 20:60:20 ha^{-1} + Zn (in soybean)and 120:60:40 kg N, P_2O_5, K_2O $ha^{-1}yr^{-1}$ + Zn (in wheat) resulted in highest WEY (70.4 q ha^{-1} yr^{-1}), NMR (Rs. 58,438 ha^{-1} yr^{-1}) and B:C ratio (2.97). It was 64.0 ha^{-1} yr^{-1}; Rs. 51,050 $ha^{-1}yr^{-1}$; 2.76 respectively with 20:60:20(in soybean) and 120:60:40 kg N,P_2O_5 ha^{-1} (in wheat).The above treatments produced 99.9 and 70.5 per cent higher total productivity than the control, respectively.

Response of NPK on the yield in predominant cropping system under irrigated production system

Application of 120:60:40 N,P_2O_5, K_2O ha^{-1} + Zn to rice and wheat, respectively produced the maximum yield of entire cropping system as WEY (70.4 q ha^{-1} yr^{-1}), NMR (Rs 37,218 ha^{-1} yr^{-1}) and B:C ratio (2.95) closely followed by that RDF (64.0 q ha^{-1} yr^{-1}; Rs 32,506 ha^{-1} yr^{-1}; 2.74).

INM in Rice-wheat cropping system

Application of 50% NPK through fertilizer + 50% N through green manuring to rice and 100% NPK to wheat had the highest productivity (Rice 60.4 q ha^{-1}, wheat 30.6 q ha^{-1} and Wheat equivalent yield(WEY) 69.3 $ha^{-1}yr^{-1}$) but NMR (Rs. 44,877 $ha^{-1}yr^{-1}$) and B:C ratio (2.17) was highest with 100% NPK to both the crops.

Development of organic farming package for system based high value crops

Application of 100% NPK through fertilizers + Zn as per soil test value produced the highest REY (101.96 q $ha^{-1}yr^{-1}$) and NMR (Rs 58,355 $ha^{-1}yr^{-1}$) in the Pusa basmati rice -wheat cv. MP1106 cropping system. In case of 50% NPK through fertilizer + 50% N through FYM to both crops (96.6 q $ha^{-1}yr^{-1}$ and Rs. 32.670 $ha^{-1}yr^{-1}$). The total uptake of nutrients was higher under 100% NPK through fertilizers along with zinc.

Studies on comparative efficiency of organic, chemical and integrated nutrient management practices on soil health and crop productivity under various cropping system

The highest REY (56.01q ha^{-1}) was obtained with application of 100% RDF in Basmati Rice-Pea (Vegetable) - Sorghum (Fodder) cropping

system where as maximum NMR for Rs. 70,145 ha^{-1} and B:C ratio 2.19 under organic sources.

Agronomic evaluation of biodynamic product and panchgavya for organic calculation of important cropping system

Rice-Berseem cropping system with application of FYM+NEOC+VC (1/3 each) + Panchgavya had the highest REY, NMR and B:C ratio of 80.65 q ha^{-1}, Rs. 93,690 ha^{-1} yr^{-1}; 2.45 respectively.

Performance and Evaluation of Important Crops / Cropping Systems under Organic Farming

Nutrient Management in Organic Farming

- Cropping systems Rice-Gobhisarson-Okra and Rice-Potato-Groundnut produced higher REY (160 and 158 q ha^{-1} yr^{-1}) and found to be more remunerative (Rs. 88430 and 77784 ha^{-1} yr^{-1}) than the existing cropping systems of Rice-Wheat and Rice-Chickpea. The crop sequence Rice-Wheat gave higher system productivity (55.9 kg $ha^{-1}day^{-1}$) while the water use efficiency (101.7 kg $ha^{-1}cm^{-1}$) was maximum under Rice-Chickpea sequence.
- Treatment receiving 50% NPK through fertilizer + substitution of 50% N through GM to rice and 100% NPK through fertilizer to wheat crop was found to be more remunerative in comparison to the 100-100% NPK through fertilizer to both crops.

Long Term Follow up Trial on Rice - Wheat Cropping System

(a) Kharif 2011 : Paddy (var. MR-219)

Based on soil tests, the fertilizer doses were calculated for paddy using following Fertilizer Adjustment Equations

$FN = 4.25\,T - 0.45\,SN$
$FP_2O_5 = 3.55\,T - 4.89\,SP$
$FK_2O = 2.10\,T - 0.18\,SK$

The grain yield was increased by 33%, if the nutrient supplement was complemented with application of FYM 5 t ha^{-1}.

The above equation with the TY 4 t + FYM 5 t ha^{-1} responded best for cost response, cost of fertilizers, profit, B:C ratio and yard stick value of paddy.

Rabi 2011-12 wheat crop (var. GW 273)

The soil test values were used for calculating fertilizer doses for the wheat crop using two targets viz., 4.5 and 6.0 t ha^{-1}.

Fertilizer Adjustment Equations for wheat crop

FN = 4.40 T - 0.40 SN
FP2O5 = 4.00 T - 5.73 SP
FK2O = 2.53 T - 0.16 SK

Higher TY 6 t + FYM @ 5 t ha^{-1} increased significantly higher grain and straw yields with the maximum profit of Rs. 40,638.

Verification Trials

On-farm verification trials at JNKVV, Jabalpur were conducted each on soybean, onion, garlic and chandrasur. The surface soils samples were collected before sowing and the available nutrient contents were low, medium and high with respect to nitrogen, phosphorus and potassium, respectively.

Fertilization based on soil tests was performed adopting the following fertilizer adjustment equations with fixed targets for the respective crops.

Soybean

$FN = 5.19\,T - 0.48\,SN$
$FP_2O_5 = 5.20\,T - 4.10\,SP$
$FK_2O = 3.90\,T - 0.22\,SK$

Onion

$FN = 9.11\,T - 0.37\,SN$
$FP_2O_5 = 3.60\,T - 0.75\,SP$
$FK_2O = 4.66\,T - 0.13\,SK$

Garlic

FN = 7.45 T - 0.67 SN - 0.80 ON
FP_2O_5 = 2.73 T - 0.65 SP - 1.50 OP
FK_2O = 5.74 T - 0.28 SK - 0.51 OK

Chandrasur

FN = 8.03 T - 0.25 SN - 0.96 ON
FP_2O_5 = 11.35 T - 3.11 SP - 0.65 OP
FK_2O = 16.45 T - 0.37 SK - 1.54 OK

The yields of the different crops were achieved comfortably ranging from ± 6.17 to 134.80 per cent from affixed targets.

Economic performance of STCR vis-a-vis IPNS of these crops were also reckoned and they are as follows:

Soybean

B:C ratio: GRD (4.39) > TY 25 q ha^{-1} (3.40) > TY 30 q ha^{-1} (3.10) > TY 35 q ha^{-1} (2.83).

YSV (kg per kg of nutrient): GRD (5.16) > TY 25 q ha^{-1} (3.99) > TY 30 q ha^{-1} (3.58) > TY 35 q ha^{-1} (3.27).

Response (kg ha^{-1}): TY 35 q ha^{-1} (1011) > TY 30 q ha^{-1} (851) > TY 35 q ha^{-1} (666) > GRD (516).

Chandrasur

B:C ratio: GRD (3.55) > TY 12 q ha^{-1} (2.09) > TY 10 q ha^{-1} (1.99) > TY 8 q ha^{-1} (1.73).

YSV (kg per kg of nutrient): TY 8 q ha^{-1} (1.49) > GRD (1.48) > TY 10 q ha^{-1} (1.43) > TY 12 q ha^{-1} (1.35).

Response (kg ha^{-1}): TY 12 q ha^{-1} (458) > TY 10 q ha^{-1} (382) > TY 8 q ha^{-1} (294) > GRD (192).

Onion

B:C ratio: TY 20 t ha^{-1} (15.46) > TY 30 t ha^{-1} (11.88) > GRD (10.86) > TY 40 t ha^{-1} (9.57).

YSV (kg per kg of nutrient): TY 20 t ha^{-1} (23.55) > T. Y. 30 t ha^{-1} (17.70) > GRD (15.68) > TY 40 t ha^{-1} (14.30).

Response (kg ha^{-1}): TY 40 t ha^{-1} (7960) > TY 30 t ha^{-1} (6780) > TY 20 t ha^{-1} (4930) > GRD (3450).

Garlic

B: C ratio: TY 20 t ha^{-1} (15.46) > TY 30 t ha^{-1} (11.88) > GRD (10.86) > TY 40 t ha^{-1} (9.57).

YSV (kg per kg of nutrient): TY 20 t ha^{-1} (23.55) > TY 30 t ha^{-1} (17.70) > GRD (15.68) > TY 40 t ha^{-1} (14.30).

Response (kg ha^{-1}): TY 40 t ha^{-1} (7960) > TY 30 t ha^{-1} (6780) > TY 20 t ha^{-1} (4930) > GRD (3450).

Frontline Demonstration Based on Soil Test Crop Response

The fertilizer adjustment equations used for the application of fertilizer based on soil test values for fixed targeted yield of different crops of kharif and rabi seasons were as follows:

Soybean

FN = 5.19 T - 0.48 SN
FP_2O_5 = 5.20 T - 4.10 SP
FK_2O = 3.90 T - 0.22 SK

Rice

FN = 4.25 T - 0.45 SN
FP_2O_5 = 3.55 T - 4.89 SP
FK_2O = 2.10 T - 0.18 SK

Pigeonpea

FN = 4.87 T - 0.37 SN
FP_2O_5 = 5.34 T - 3.47 SP
FK_2O = 3.61 T - 0.16 SK

Chickpea

FN = 3.73 T - 0.18 SN
FP_2O_5 = 5.00 T - 2.50 SP
FK_2O = 3.80 T - 0.17 SK

Niger

FN = 11.80 T - 0.17 SN
FP_2O_5 = 11.17 T - 3.52 SP
FK_2O = 10.52 T - 0.16 SK

Wheat

FN = 4.40 T - 0.40 SN
FP_2O_5 = 4.00 T - 4.58 SP
FK_2O = 2.53 T - 0.16 SK

The targeted yields were achieved within ± 2.0 % to ± 9.0 % variation range from affixed target. In thirty per cent cases the targets were achieved within ±10% deviation. When the fertilizer recommendation based on targeted approach coupled with 5 t FYM ha^{-1} i.e., IPNS mode was achieved in 30% cases.

Micronutrient, Secondary Nutrients and Pollutant Elements in Soil and Plants (MN)

Effect of Zn and FYM levels on maize yield in maize-wheat sequence

Maize

Application of 2.5, 5 and 10 kg Zn ha^{-1} successively and significantly increased the maize grain yield. While the 2.5 and 5 t FYM ha^{-1} also significantly increased the maize grain yield. Application of 10 t FYM exhibited at par effect to that of 5 t FYM application. Increasing levels of Zn (2.5, 5 and 10 kg ha^{-1}) and FYM levels (2.5, 5 and 10 t ha^{-1}) successively and significantly increased the yield.

Wheat

The residual effects of increasing levels of FYM and Zn and their interaction effects significantly increased the wheat grain yield. However, the residual effect of 5 t FYM application was found significantly superior to 2.5 t FYM. The combined application of 5 t FYM and 5 kg Zn gave the maximum grain yield of 7.31 t ha^{-1} which was significantly superior to residual 2.5 t FYM and 5 kg Zn ha^{-1} application.

Effect of N, Zn and B on maize yield in maize-wheat sequence

Maize

Successive application of increasing levels of N @ 60, 120 and 180 kg N ha^{-1} increased the maize grain yield with significant superiority with 180 kg N ha^{-1}. While the applications of 10 kg Zn and 1 kg B also increased the maize grain yield but their combined application was found significantly superior. The interaction between N and Zn/B exhibited significant effects on grain yield. Boron @ 1 kg B with 60 or 120 kg N produced significantly higher grain yield of maize.

Wheat

Application of increasing levels of N significantly increased the wheat grain yield exhibiting statistical superiority with 120 kg N over either 60 or 180 kg N ha^{-1}. However, 180 kg N significantly increased the straw yield over all N levels. The residual effect of 10 kg Zn, 1 kg B and their combined application significantly increased the wheat grain and straw yield. The residual effect of 1 kg B was found superior to 10 kg Zn.

Effect of P, S and Mo on soybean - chickpea sequence.

Soybean

The maximum grain yield of soybean 2.39 t ha-1 was recorded with applications of 80 kg P_2O_5 + 60 kg S (SSP) and 1 kg Mo.

Chickpea

Application of 80 kg P_2O_5 + 60 kg S (SSP) and 0.5 kg Mo increased the chickpea grain yield, but the superior effect was observed with the combined application producing 3.2 t ha^{-1} chickpea grain yield. The interaction among the treatments was found non-significant.

Optimizing Zn salt conc. for rice productivity

Application of 0.5, 1.0 and 1% salt + 0.5% lime application of zinc sulphate, zinc chloride, zinc phosphate, zinc oxide and zinc EDTA significantly increased the rice grain yield over control.

Direct and residual effect of Zn levels on wheat and soybean yield in wheat-fallow and wheat-soybean sequence.

Wheat

Zn application @ 5 kg ha^{-1} was found significantly superior for wheat grain yield while the 20 kg Zn ha^{-1} application significantly reduced the yield.

Soybean

The maximum yields of grain (2.73 t ha^{-1}) and stover (4.69 t ha^{-1}) were observed at 10 kg Zn ha^{-1}.

Under wheat-soybean sequence, the wheat grain yield (3rd crop) was found significant at 2.5 kg Zn. However, 5 kg Zn ha^{-1} significantly increased the straw yield.

Front Line Demonstration

Under tribal support plan (TSP) 14 FLDs (2 in gram and 12 in wheat crop) were conducted in the farmers' fields of Kundam Tehsil of Jabalpur to demonstrate the effect of S and Zn and their combined effect on gram and wheat crop.

Wheat

The recommended dose of fertilizer 120 N, 60 P_2O_5 and 40 K_2O kg ha^{-1} significantly increased the wheat grain and straw yield over farmer's practice (32-23-0). However, the application of 5 kg Zn or 40 kg S alone significantly increased the wheat grain and straw yield over the recommended dose of fertilizer. The combined application of 5 kg Zn + 40 kg S ha^{-1} also found significantly superior to their individual applications.

Chickpea

The recommended dose of fertilizer (20 N, 80 P_2O_5 and 20 K_2O ha^{-1}) increased the grain and straw yield of chickpea by 50 and 26.9 % respectively over farmer's practice (9-23-0). However, the application of 5 kg Zn and 40 kg S ha alone increased the 17 and 11% grain yield over RDF. While the combined application of 5 kg Zn + 40 kg S ha^{-1} gave 1.55 t ha^{-1} which was 16 and 12% higher grain yield than the respective individual treatment of 5 kg Zn and 40 kg S.

Long Term Fertilizer Experiments (LTFE)

Effect of nutrient supplements on grain and straw yields of soybean (var. JS 97-52)

The results indicated that even if 50% of recommended optimal dose is applied it is much beneficial (1450 kg ha^{-1} grain yield) in comparison to the control (750 kg ha^{-1}) and the application of 100% recommended dose of N alone. Application of recommended optimal dose of NPK resulted in grain yield of 1831 kg ha^{-1} but exclusion of sulphur (i.e. 100% NPK-S) dose had reduced yield by 7%.

The data clearly indicated that addition of FYM with 100% NPK (1994 kg ha^{-1}) was proved better for soybean-wheat cropping system even over 150% NPK supplement. Application of P and K in addition to N fertilization (875 kg ha^{-1}) increased the grain yields by 74% and K application in addition to NP fertilization (1525 kg ha^{-1}) increased it by 20%. The importance of P nutrition in controlling productivity of soybean grown especially in black soil is emphasized.

Field Trials

Under the programme eight sites of Jabalpur and Seoni district were identified and 29 soil samples were analyzed for initial nutrient contents. The soils were poor to medium in available N, medium to high in available P and K, and low to medium in available S. Further, the DTPA-Zn of these soils was sufficient. The farmers have been applying organic manures (FYM). Finally, two sites each from Jabalpur and Seoni district were selected for FLDs.

Analysis of wheat yield data indicated the highest mean yield of 4906 kg ha^{-1} in treatment 100% NPK+FYM followed by 150% NPK (4772 kg ha^{-1}). Balance dose of 100% NPK resulted in 4452 kg ha^{-1} which was quite higher over use of

100% NP (4134 kg ha^{-1}) and 100% N (1655 kg ha^{-1}). A cut dose of 50% NPK doubled the yield 3394 kg ha^{-1} over sole N (1655 kg ha^{-1}) and control (1255 $kgha^{-1}$). 100% NPK - S reduced the yield by 6.51 percent over 100% NPK.

Forage crop

Irrigated condition

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^{-1} yr^{-1}) and net monetary returns of Rs. 57443 ha^{-1} yr^{-1}. Per day productivity (4.83 q ha-1) of green fodder is also higher under this crop sequence as compared to other crop sequences.

- This experiment consisted of ten treatment of maize baby corn inter cropped with cowpea and combination of oat and berssem in rabi forage / maize baby corn / green cobs in summer along with remunerative food forage base system i.e., rice - berseem - moong. The results of the cropping sequence have been presented in table data indicated that the sequence maize (BC) + cowpea (fodder) - berseem - maize (fodder) + cowpea (fodder) gave significantly higher net return of Rs. 88,007 ha^{-1} yr^{-1} than other crop sequence.
- The experiment conducted on performance of dual purpose forage crops under different cutting management system under AICRP on Forage crops at Jabalpur during rabi 2011-12 and it was found that the dual purpose fodder wheat (cv VL-616) at cut 50 ,60, and 70 DAS was gave average 100 -120 q ha^{-1} green fodder yield and 75-80 ha^{-1} grain yield.

Rainfed condition

- Growing of Sorghum chari as an intercrop in pigeonpea provided the maximum gross (Rs. 46,268) as well as net returns (Rs. 30,268) when two rows of fodder sorghum was sown in between two rows of pigeon pea sown at 75 cm apart.

Growing of Jowar Chari as an intercrop in pigeon pea gave the maximum gross (Rs. 46,268) as well as net returns (Rs. 30,268) when two rows of fodder sorghum was sown in between to rows of pigeon pea sown at 75 cm. apart.

Diversification and intensification of cropping systems

Rice based cropping systems

Jabalpur

- Rice - onion - green gram sequence was best in relation to REY (176.1ha^{-1}), NMR (Rs. 81588 ha^{-1} yr^{-1}) and B:C ratio (2.38).

Rewa

Rice - garlic - green gram was on top with regard to total productivity in terms of REY (291.5 ha^{-1} yr^{-1}), NMR (Rs. 164908 ha^{-1}) and B:C ratio (3.41).

Soybean based cropping systems:

Soybean - vegetable pea - sugarcane system topped in respect of SEY (154.1 ha^{-1}), NMR Rs. 243194 ha^{-1}) and B:C ratio (5.91).

Nutrient Management

Integrated nutrient supply system in rice - wheat cropping system.

- The results of a continuous cultivation for 26 years on the same site in rice - wheat system at Jabalpur indicated that nutrient management with 50 % NPK + 50% N as GM to rice and 100 % NPK to wheat was optimum for the maximum productivity as well as also improving the fertility status of the soil.

Long term effect of cropping and manuring on soil fertility and productivity under rice - wheat cropping system.

- After continuous experimentation for 33 years, the results indicated that manuring with 120 kg N ha^{-1} + 80 kg kg P_2O_5 ha^{-1} + 40 kg K_2O ha^{-1} to both the crops proved optimum for maximum productivity of the entire cropping system in terms of WEY.

Development of Organic Farming package for different cropping sequence

Rice -Potato System

- On the basis of 8 years experimentation application of 100 % NPK through fertilizer + Zn as per soil test or 1/3 N through each of FYM, VC and neem cake 1/3 N through each of FYM, VC and neem cake to both the crops was found to be productive and remunerative.

Rice-wheat system: Results of seven years experimentation at Rewa revealed that addition of 50% recommended NPK + 50 % N through FYM to both the crops was found more productive and remunerative.

Soybean - Wheat system : Results of five years experimentation revealed that the combination of 100 % NPK + secondary and micronutrients based on soil test to both the crops was found more productive and remunerative.

Water Management

- In rice the system of rice intensification (SRI) gave maximum seed yield of 45.55 q ha^{-1} which was 11.45 % higher over the yield (35.37 q ha^{-1}) obtained under farmers practice along with higher monetary return (Rs. 54,110 ha^{-1}), B.C. ratio (3.32) and water expense efficiency (108.45) were also higher with SRI.
- The coriander gave 1046.6 kg ha^{-1} seed and 4173.2 kg ha^{-1} green leaves yield as against 4852 kg ha^{-1} of wheat yield under assured irrigation. However, net return (Rs. 65,062 ha^{-1}) and B.C. ratio (4.50) were considerably higher with coriander as compared to wheat (Rs. 47,046.4 ha^{-1}).
- The system of broad bed furrow gave maximum seed yield (1000 kg ha^{-1}) with higher (35%) net monetary return (Rs. 6,500 ha^{-1}), B.C ratio (1.39) and water use efficiency (18.37) were higher in broad bed furrow system in comparison to normal planting (740.2 kg ha^{-1}).
- In potato drip irrigation at 0.8 PE gave significantly higher tuber yield (20544 kg ha^{-1}). Tuber yield was minimum (19014 kg ha^{-1}) in surface irrigating at 60 mm CPE. Potato sowing on ridge and furrow system gave significantly higher yield (19387 kg ha^{-1}) in comparison to flat bed sowing (17809 kg ha^{-1}). In drip irrigation at 0.8 PE water use efficiency (592.1 kg ha^{-1} cm^{-1}), net income (Rs. 62,457 ha^{-1}) and B.C ratio (1.61) were maximum.
- In vegetable pea, the maximum and significantly higher green pod yield (12338 kg ha^{-1}) was obtained with irrigation applied at 1.0 IW/CPE ratio. Application of 60 kg P_2O_5 ha^{-1} gave higher green pod yield (11150.7 kg ha-1) as compared to 40 kg P_2O_5 ha^{-1} (10043.4 kg ha^{-1}). The maximum net return of Rs. 92,330 ha^{-1}, B.C. ratio 3.47 and WUE 430.67 kg $ha^{-1}cm^{-1}$ were found with irrigation applied through sprinkler at 1.0 IW/CPE.
- In tillage system the yield of wheat after soybean was 2781 kg ha^{-1} which was significantly higher than wheat after paddy (1851 kg ha^{-1}). FIRBS gave the highest yield of 3198 kg ha^{-1} in soybean - wheat

crop sequence. Wheat yield (20381 kgha^{-1}) under irrigation schedule of 1.2 IW/CPE ratio was significantly higher than irrigation schedule of 0.8 IW/CPE ratio. The water use efficiency 120 kg ha^{-1} cm^{-1} was maximum in FIRBS cultivation under soybean - wheat crop sequence.

- Study conducted on chemical properties of soils under command area (Rohna minor-I) indicates that pH value ranges from 7.82 to 7.92 in surface soil. Which was found to increases with soil depth up to 90 cm ranging between 7.90-7.92 Soluble salt content of soils ranged 0.11 to 0.15 with average value of 0.113 mm hos/cm, while available status of nitrogen, phosphorous content was found to be low and potash content medium at all soil depths (0 - 150 cm).
- The maximum seed yield 3623 kg ha^{-1} and 3550 kg ha^{-1}, net monetary return Rs. 35703 ha^{-1} and 35735 ha^{-1}, B.C. ratio 2.60 and 2.70 were recorded under one hand weeding followed by Butachlore alongwith Taichu gurma respectively. Maximum WEE obtained with irrigation applied at 1 DADPW (76.61 kg ha^{-1} cm) as compared to farmers practice (50.02 kg ha^{-1} cm) in continuous submergence.
- Seed yield of winter maize (Sweet corn) under irrigation at 0.8 IW/CPE ratio gave maximum and significantly higher seed yield (3264 kg ha^{-1}) as compared to 0.6 IW/CPE ratio and at par with other irrigation treatments. In fertility levels, 100% and 75% RDF gave significantly higher seed yield 34034 kg ha^{-1} than under irrigation at 1.0 IW/CPE ratio as compared to other irrigation levels. Whereas, water use efficiency was maximum (1120 kg ha^{-1}) and with irrigation applied at 0.6 IW/CPE ratio.

PLANT PROTECTION

Insect Pest Management

Crop	Effective insecticides
Soybean	Metaflumizone 22 % SC (Verismo) @ 750 g a.i. per ha and HGW86 10% OD or Cyazypyr (Cyantraniliprole) @ 60 g a.i. per ha were highly effective in reducing incidence of insect pest complex without any phytotoxic effect Microbials, Bacillus thuringiensis var. kurstaki @ 1013 spores per ha or PDBC isolate aqueous formulation and Heterorhabditis indica -@ 2 billion infected juveniles per ha recorded lowest larvae count of Lepidopteran foliage feeders viz. Chrysodeixis acuta and Spodoptera litura and registered highest soybean grain yield.
Pigeon pea	Spinosad 45% SC @ 73 g a.i. ha^{-1} and Chlorpyriphos 20EC @ 0.4% recorded lowest grain damage by pod infesting insect pest complex (viz. pod fly, gram pod borer, pod bug and pigeonpea plume moth, respectively) but highest grain yield. Acetamiprid 20SP @ 20 g a.i. ha^{-1} recorded lowest grain damage by pod fly and pod bug, and highest grain yield.
Chickpea	Emamectin benzoate 5%SG @ 200 ml ha^{-1} found to be highly effective in reducing the gram pod borer infestation on chickpea without phytotoxic effect
Egg plant	Emamectin benzoate 5% SG @ 10 g a.i. ha-1 , Rynaxypyr @ 0.3 ml L-1 and Pyriproxyfen 5% EC + Fenpropathrin 15% EC @ 500 ml ha-1 were found effective against shoot and fruit borer and also registered highest fruit yield

Bio-pesticides, Beauveria bassiana @ 1.5 kg ha^{-1} and treatment sequence comprising of NSE 5% suspension + B. thuringiensis@ 1 kg ha^{-1} (NSE+ NSE+Bt+NSE+NSE+Bt) recorded lowest damage due to brinjal shoot and fruit borer and also registered highest fruit yield.

Capsicum Emamectin benzoate 5%SG @ 200 ml ha^{-1}, XLC 425 (Profenofos 40% + Fenpyroximate 2.5% EC ready mix formulations) @ 817.5 mlha^{-1} and Pyriproxyfen 5% EC + Fenpropathrin 15% EC @ 500 ml ha^{-1} were most effective against insect pest complex of chili

Okra Pyriproxyfen 5% EC + Fenpropathrin 15% EC @ 500 ml ha^{-1} found to be most effective against insect pest complex of okra and tomato and also registered highest fruit yields.

Microbials, Beauveria bassiana, Metarrhizium anisopliae, Verticillium lecanii and Hirsutella thompsonii all @ 2 X 107 conidia /ml were ineffective against insect pest complex of Capsicum

Small Millet Seed treatment with imidachloprid @ 3 ml/ 10 litre of water was most effective treatment as the incidence of shoot fly reduced from 11.11 % to 2.68 %.

Sugarcane One application of phorate 10 G @ 1.5 kg ha^{-1}, a light earthing and release of Pyrilla ecto parasite,

Promising /less susceptible varieties of pigeonpea

Early maturing entries AL-1495, GT-101, BRG-10-2, BRG-10-1 and H-2000-47	Least preferred by pod fly, gram pod borer, pigeonpea plume moth and pod bug with no physiological disorder
Early maturing entry- SKNP-0718	Promising as it recorded maximum grain yield of 1320 Kg ha^{-1}
Medium maturing entries RVSA-81, JKM-189, WRG-114, BDN-2 and BSMR-853	Least preferred by pod fly, gram pod borer, pigeonpea plume moth and pod bug with no physiological disorder
Medium maturing Genotype RVSA-68	Promising with highest grain yield of 1482 Kg ha^{-1}

Disease Management

Nematode surveillance

Crop	Treatments	Results
Chickpea	*Pratylenchus thornei*	Found in 38 samples from 13 localities of Guna district. Three samples from Guna and Ashoknagar (8) showed population of *P. thornei* above ETL (475 to 1475 N/200 cm3 soil)
Banana	Root knot and *Helicotylenchus multicinctus*	Predominant in Badwani district
	R. semilis	Confined to Narmada river bank and localities of Khargone district
	Pratylenchus spp	Recorded from Dharpuri village of district Dhar
Citrus	*Tylenchulus semipenetrans*	Recorded in Sounser, Pandurna and Chawalpani localities of Chhindwara district
Ginger	Ginger rot and root knot	Cohabitated in most the rhizome samples from vegetables growing areas of district Katni and adjoining villages of Sehora in Jabalpur district

E. melanoleuca @ 1000 live cocoons ha^{-1} reduced 6.48 and 47.43 per cent Early shoot borer and Pyrilla population respectively also increased NMC, Brix and yield by 6.45, 5.70 and 6.91 per cent, respectively.

Nematode pest management

Tomato

Integrated management of root knot nematode in tomato nursery through organic cakes and solarization /non solarization of nursery bed of tomato

Solarized and nonsolarized treatment nursery coupled with carbofuran significantly reduced the root knot gall index (RKI) 3.11 and 3.40, with an increase in yield of 65.21 and 68 per cent respectively in comparison to neem cake application

Evaluation of bio pesticides for management of root knot nematodes in Tomato

Paecilomyces lilacinus (cuf 2x106) @ 50g/m^2 nursery, *Trichoderma harzianum* (cuf 2x106) @ 50 g/m^2 nursery and *Carbofuran* @ 10 g / m^2 nursery treatments were at par for the reduction of *M. incognita* (53 N/200 cm^3) at the harvest of the tomato. The RKI was lowest (2.25) in *T. harzianum*. The per cent decrease in RKI was highest (55) with C*arbofuran* followed by *T. harzianum* (50). There was an increase in 33.92 per cent yield over control with C*arbofuran*.

Effect on non host crops / resistant varieties on population dynamics of root knot nematode in vegetable based cropping system

Final population of root knot nematode along with RKI declined shortly in plots where onion was transplanted. Eighty per cent decreased in RKI was recorded in such plots where non host were grown. Similarly significant higher yield was also recorded in non host crop over against susceptible host (Pusa Ruby).

Okra

Evaluation of bio pesticides for the management of root knots nematode in Okra

Seed treatment with bio-agents, *P. lilacinus* + *T. harzianum*, as well as soil application of bio-agents coupled with FYM @ 2.5 ton ha^{-1} reduced the root knot population. Minimum (150N/200cm^3) final soil population of Meloidogyne incognita was noticed in *P. lilacinus* @ 2.5 kg ha^{-1} + *T. harzianum* @ 2.5kg ha^{-1} (cuf 2x108) + FYM/ vermicompost @ 2.5 ton ha^{-1}.

Bottle gourd

Management of root knot nematode infesting cucurbits through use of organic amendments

Seeds of bottlegourd planted in soil with oil cakes were compared with Carbofuran @ 10g/ plot exhibited superior result over rest of treatments. A reduction in final soil population of 55 per cent , lowest RKI (2.25) and an increase yield of 19.45 per cent with carbofuran was observed. Among the oil cakes, neem cake was superior and gave 53.4 per cent RKI and 8.16 per cent increased yield of bottle gourd.

Black gram

Biological control of Rotylenchulus reniformis and disease complex in black gram

Decrease in *R. reniformis* was observed in treatment were combination of both the bio agents were applied together at the time of sowing followed by *T. harzianum* (67.52) and *P. chlamydosporia* (57.26) alone. Final count of adult females were 14 to 25.2 plant 1 at the time of harvest.

Chickpea

Biological control of plant parasitic nematodes and disease complex in pulse crop

T. harzianum treated plot had minimum (156.25 N/200cm^3) nematodes in soil at harvest followed by *T. harzianum* + *P. chlamydosporia* (218.75), *Carbosulfan* (321.25) and *P. chlamydosporia* (331.25), whereas final root population was minimum in (56.25) *T. harzianum.* Maximum (20.33) yield was observed in *P. chlamydosporia* treated plot which was at par with *Carbosulfan* (20.33 ha^{-1}). Per cent (24) increased yield was also recorded in *Pochonia chlamydosporia* @ 20 kg ha^{-1} talc (2x108) as well as in Seed treatment with *Carbosulfan* 3 % ai w/w.

Integrated management of phytoparasitic nematode in pulse crops by incorporating organic compounds

Highest reduction in soil population and (63.23% & 63.80%) in neem cake + *T. viride* followed by *Carbosulfan* (58.92% &40.95%). Nodulation was highest (92 %) in neem cakes + *T. viride* followed by jatropha cake + *T. viride* and *T. viride*. Increased yield was highest (84.49%) in neem cake + *T. viride* followed by carbosulfan (20-27%).

Management of Phytoparasitic nematodes in pulse crops by seed treatments

Reduction of *Pratylenchus thornei* was highest (216.66) in seed treatment of chickpea (JG 11) with *Carbosulfan* (3 % a.i .w/w) over control followed by NSKP + *T. viride* (220.83), NSKP (345) and *T. viride* (375) while the soil population by 67.34, 48.97 and 44.53 per cent respectively.

Citrus

Management of citrus nematode infecting citrus using bio-control agents

P. lilacinus and *P. chlamydosporia* were applied in 15 years old citrus plantation showing apparent citrus decline symptoms *P. lilacinus* showed minimum decline than *carbofuran, P. chlamydosporia*. Maximum yield (333.75 q) was observed in *P. lilacinus*.

Vegetables

Demonstration of promising vegetables based cropping system for management of root knot nematode by adopting cropping sequence

The performance of Okra in okra- onion -cluster bean cropping sequence was better(137.66 q ha^{-1}) than (122.66 q ha^{-1}) in okra - brinjal - okra cropping sequence. Onion plantation in root knot infested field reduced final soil population along with minimum RKI.

Mungbean

Demonstration on efficacy of bio-agents as seed treatments in mungbean

Seeds of mung were dressed with Pseudomonas fluorescence + Trichoderma viride @ 5g /kg each showed reduction (62.5%) in nematode population and improving nodulation and yield (47.8 %)

Cowpea

Demonstration on efficacy of bio-agents as seed treatments in cowpea

There was improvement in growth parameters after dressing of cowpea seed with P. fluorescens and T. viride (each 5g/kg seed). The total nodulation / plant was maximum (225) in treated over untreated (85). Treatment also showed increased yield (62.1%).

Chickpea

Demonstration on efficacy of bio-agents as seed treatments in chickpea

Chickpea seeds treated with *Pseudomonas fluorescens* (5g/kg) harboured maximum reduction (70.06) of P. thornei with lowest root population (7.55 N/5g) along with highest yield (18.39q ha^{-1}).

Disease Management

Rice

Evaluation of new fungicidal formulation against leaf blast

New fungicidal formulation Kresoxim methyl 40% + Hexaconazole 8% WG (RIL- 068/F 1.48 WG) @1 g /l significantly reduced the leaf blast severity (10.2%) and increased the grain yield (57 ha^{-1}) over untreated check (39 ha^{-1}).

Evaluation of bio pesticides against leaf blast

Pf1 liquid formulation (TNAU) @5ml/l was found significantly superior in reducing the leaf blast severity (30.3%) and increasing the grain yield (53 ha^{-1}) over untreated check (42 ha^{-1}).

Association of fungal flora

Optimum association of fungal flora was recorded in Pusa Basmati, Tulsi, Dehula and Bhanta Phool where as minimum was recorded in hybrids. Among the isolated flora Fusarium sp.(13.26%), Cercospora eragrstis (12.96%), Fusarium moniliforme (12..70%), Curvularia lunata (10.25%) and Trichoconis padwiki (8.63%).

Control of false smut of rice in PS-5

Nativo 75 WG (50% PE) was found highly effective for controlling the false smut (2.10 infected /panicle) followed by Tilt or Result 50% PE (7.50 infected /panicle) over untreated check (21.70) and increased the grain yield significantly

Pesticide compatibility Trial

Hexaconazole (Contaf) @2ml/l along with effective insecticide Flubendamide 20 WG (Takumi) @ 0.35g/l gave excellent result for controlling the insects pests(stem borer , leaf folder , WBPH , Case worm) and diseases (leaf blast and brown spot)and found compatible .Infestation of both white backed plant hoppers and brown spot on Paddy reduced when Insecticide Token (20 SG)+ fungicide Contaf 5Sc and Token(20 SG) + fungicide Baan75 WP was applied. A yield of 56.92ha^{-1} and 59.97ha^{-1} respectively was harvested. Both the combinations were compatible.

Acephate is also compatible with both fungicides was applied with Contaf and Baan fungicides the grain yield was 58.88 ha^{-1} (Contaf) and 61.22 ha^{-1} (Baan).

Host Plant Resistance under Eight National Screening Nursery of advanced breeding lines Initial varietal Trial, Advanced varietal trial, hybrid evaluation trial and donor screening trial

The following entries showed highly resistant reactions against leaf blast and brown spot of rice

NSN-1: IET IET No. 21785,21786, 222433, 22137, 2095,21411, 21801,21782, 21341, 22113, 22222, Dinesh, 22116, 22069, 21346, PA 6129, 22083, Pusa Sugandha 5, 22168, 22117, 21801, 22163, 22226, 22243, 21405.

Tested Entries :193 LSI:4.7

NSN-2 : IET 21886, 22597, 22017, 22653, 22824, 22436, 22313,22504, 22577, 22581, 20328,22610, 22618, 22523

Tested Entries :560 LSI:4.5

NHSN- US 344, Pusa RH 41,,27P61, CRHR 33, NK 9422, TNRH 241, XRA 07928, Sighet 5051, US 383, CRHR 36 , BISCO -407, KSL 210011H,JKRH 2044

Tested Entries :117 LSI:4.0

DSN - TNRH 192, RP Patho-11, RP Biopatho-3, RP Patho-12, IR 64, Tetep, HRP 2745, RP 4342-669, RP Patho-9, RP Biopatho-4, RP Patho-5, RP Patho-2, RP Patho-3, C101 LAC, RP Patho-7, RP RP Patho -9, C 101 A 51, RP Patho -2, CB 09 -123, RP Patho -7, RP Patho - 1. CB 05 - 022. RP Patho -6. HPR 2745. CB 09-153.. CB 08- 534. HPR 2720. CB 05 - 031, CB 09 - 123, RP Patho -5, HPR 2722, TN1

Tested Entries :69 LSI:4.1

Glume discolouration: RP Patho-1,RP Patho -2, RP Patho-3, RP Patho-4,RP Patho-6,RP Patho-7, RRP Patho-8 , RP Patho-9, RP Patho-10 , RP Patho-11, RP Biopatho-3, 4 and B95-1.

Sesame

Host Plant Resistance

PKDS-212 was found to be tolerantly resistant to powdery mildew disease in the uniform disease nursery.

Medicinal and Aromatic Plants

- The herbal garden has 1100 Medicinal and aromatic plant species that belongs to 450 genera and 110 families of which 60 are rare, endangered and threatened categories of the IUCN.
- The garden serves as a centre for education, demonstration, references for entrepreneurs engaged in the pharmaceutical preparations and trade of Indian system of medicines.
- Total 96 germplasm of different species of medicinal and aromatic plants were evaluated for their morpho physiological and bio chemical performance in this ecosystem.
- Agro technologies for cultivation of 10 medicinal plants developed viz., Ashwagandha, Aloe vera, Kalmegh, Coleus, Brhami, Chandrasur, Buch, Lemon grass, Palmarosa and Tulsi

Seed testing procedures of Ashwagandha, Kalmegh, Isabgol, Tulsi, Muskdana and Ajwain have been standardized.

Post harvest processing technology of Ashwagandha, Sanay and Aloe vera have been standardized.

Protocols have been standardized for the preparation of aloe vera gel and juice.

Isolation, purification and characterition of active ingredients of Coleus forskohlii (Forskolin 85%), Andrographis paniculata (Andrographilide 85%), Acorus calamus (?-asarone 85%) and Aloe barbadenis (Aloin 64%) have been completed.

Modified protocols by HPTLC for estimation of active ingredients of safed musli (Saponin),

Medicinal and Aromatic Plants & Betelvine

Crop	Experiments	Results
Gurmar	Evaluation of germplasm to identify a genotype having high leaf yield with gymnamic acid	Accession JBPGS8-9-105 had highest number of fresh leaves per plant (271.33)while accession JBPGS8-9-107 highest fresh leaf yield per plant (19.11g) .
Betelvine	Demonstration of disease management technology at farmers field	Per cent disease intensity due to Phytopthora foot and leaf rot, bacterial leaf spot and overall mortality of vine was very less on following Pre-monsoon -Proper sanitation + Bordeaux mixture (1%) application followed by an application of *Trichoderma viride* @ 5kg +250kg FYM ha^{-1} after a month finally second application of Bordeaux mixture after two months
Ashwagandha	Management of Alternaria leaf spot	Three Foliar sprays of mancozeb (0.25%) immediately after the appearance of Alternaria Leaf spot usually 55 DAS and spray schedule reduces the disease incidence (12.6%) incomparison to copper oxychloride (16.0%), or control (33.3%)

Brahmi (Bacoside), Tulsi (Eugenol). Mulethi (Glycyrrhizin), Coleus (Forskolin) and Buch (asarone) have been standardized.

Modified protocols for estimation of active ingredient of Aloevera (aloin), Ashwagandha (Withaniferin A, Withanolide A&B), Kalmegh (Andrographolide), Coleus (Frosklin), Buch (?-asarone) and Chandrasur (Sinapic acid) have been developed through HPLC.

Single component value added products of 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 of Madhunashini powder, Jwar nashak powder, Herbal anti dandruff hair oil, Aloevera powder, Herbal tea (with and without natural sweetner), Arjun tea (with and without natural sweetner) and Laxative powder also popularized as brand material.

Under capacity building programme Ten M.Sc. (Ag.) students successfully completed their thesis on medicinal and aromatic plants.

HORTICULTURE

High Density Plantation: The High density orchard of mango (cv Amrapali) at the distance of 2.5 x 2.5, 5.x 2.5 and 5 x 5 m and guava (cv Allahabad Safeda) at 2.5 X 2.5 m has been established with the objective to assess the performance of variety in relation to production and productivity per unit area. Mango flowered and partially fruited in the 2nd year while guava fruited well the 2nd year with a mean of 4-5 kg fruits (20-22 fruits) per plant.

Vegetable Hybrids in pipeline

Jawahar Brinjal Hybrid -1

An early maturing variety, high yielding (80-90 tonnes ha^{-1}), deep purple long elliptical, shining fruits with cluster bearing, associated with field tolerance to phomopsis blight. Plants are branched with purple stem, leaf and mid rib. Leaves are druping, long and narrow.

Jawahar Tomato Hybrid-1

An indeterminate type, very high yielding hybrid (80-90 tons ha^{-1}) with field resistant to TLCV. The fruits are medium round, dark red with cluster bearing leaves are small to medium with serration.

Jawahar Lauki Hybrid -1

Avery high yielding round (tumba type) fruited hybrid suitable for winter and summer cultivation. Fruits are large with average fruit weight of 2.0 kg soft, fleshy and whitish green with are big deep green and shining leaves. The average yield of 45-50 tons ha^{-1}

Jawahar OkraHybrid -1

Mean yield of 105.0 q ha^{-1} during kharif with high degree of field tolerance to yellow vein mosaic virus tested at Seed breeding farm. Fruits are long, soft, five loculer, dark green with pointed tip.

Onion and Garlic

Various trials were conducted under different aspects i.e. crop improvement, crop production and crop protection of onion and garlic during 2011-12.

AGRO-FORESTRY

- In provenance trial of babul, (Acacia nilotica) seeds of 30 provenance were collected from different places (viz; MP (17), Maharashtra (07), UP (02), Bihar (01), Chhatisgarh (02), and Punjab (1) during 2010. 3 month old seedlings were planted in the field. At the age of 21 months Firojpur provenance recorded significantly higher plant height (217cm) and collar diameter (28 mm). Whereas Bilaspur provenance recorded higher number of branches (13) per plant. Provenance T19 Shyampur,

View of High Density Orchard of mango cv Amrapali

High Density Orchard of guava cv Allahabad Safeda

Vegetable Hybrids in pipeline

Jawahar Brinjal Hybrid-1

Jawahar Tomato hybrid-1

Jawahar Lauki hybrid -1

Jawahar Okra hybrid -1

Various trials of onion and garlic

Crop	Treatments	Results
Onion	**Crop improvement**	Of the 39lines, JAC - 17 line had highest marketable yield, lowest thrips population and minimum disease intensity and incidence
Garlic		Of the 56 lines, JAC -27 had highest marketable yield, lowest thrips population and minimum disease intensity and incidence
Onion and Garlic	**Crop production**	Application of Oxyfluorfen 23.5 EC @ 1.6 ml/l at before planting and Quizalofop Ethyl 5% EC @ 3.0 ml L^{-1} at 30 DAT was su perior for maximum marketable yield and highest weed control efficiency. The best INM module for onion and garlic was found in 110:40:60:40 kg NPKS + 7.5t FYM + 2.5 t VC ha^{-1}
	Crop protection	Four sprays of Mancozeb @ 0.25 % at 15 days interval from 30 d ays after transplanting effectively controlled Stemphylium blight and purple blotch . Foliar application of Profenofos 50 EC @ 1ml/l and Fipronil 5 EC @ 0.50 ml/l had lowest thrips population and highest marketable yield.
Cowpea, (CP-4)	**Recommended Agro technique for Kymore plateau and Satpura hills of Madhya Pradesh**	Highest mean pod yield of 77.18 ha^{-1} with maximum net return of Rs 14240 ha^{-1} and BCR 1.52 was obtained with Vermicompost @ 5t ha^{-1} + 50% recommended dose of NPK i.e. 30:40:37.50 kg ha^{-1}

Sehore (M.P.) recorded significantly lowest plant height (80cm), collar diameter (9 cm) and branches (3) per plant.

- In provenance trial of Shisham (Dalbergia sissoo) seeds/seedling of seven provenances collected from different places [(viz; Jhansi (02), Faijabad (01), Nagpur (01), Raipur (1), Samastipur, Bihar (1) and Jabalpur (01)], were collected, raised seedling and planted in the field under RBD design. At the age of 12,15,18 and 21 months after planting provenance received from NRC Jhansi (T7 & T8) recorded higher plant height (118 & 119 cm) and collar diameter (12 mm) as compared to others provenance. Provenances showed no significant effect on number of branches/plant however provenance T7 and T8 recorded higher number of branches/plant. Provenance T2 (RAU, Samastipur, Bihar) recorded significantly lowest plant height and number of branches/plant in all the observation recorded during the year.
- Under 13 year old agrisilviculture system (Dalbergia sissoo+ paddy) in which 5 treatments i.e. one open and four pruning treatments (viz; no pruning, 25%, 50% and 75% pruning) were carried out in main plot with three verities of paddy (IR- 36, MR-219 and WGL- 32100) in sub plot. Significantly higher grain yield of paddy was recorded in open condition (29.17 q ha^{-1}) where as no pruning recorded the lowest grain yield (11.45 q ha^{-1}).
- Paddy variety MR-219 recorded significantly higher grain yield 26.49 q ha-1 and was significantly superior to variety IR-36 (23.28 q ha^{-1}) and variety WGL-32100 which recorded significantly lowest yield (22.37 q ha^{-1}).
- Managed agroforestry system (pruning +crop) is more profitable (Rs. 34,509 ha^{-1}) than unmanaged agroforestry system i.e. no pruning crop (Rs. 33,274 ha^{-1}), crop alone i.e. without tree (Rs. 22,999 ha^{-1}) and tree alone without crop (Rs. 17943 ha^{-1}). Under managed agroforestry system i.e.

growing of crop with different pruning intensity, paddy + sissoo in 25% pruning is more profitable (Rs. 43,657 ha^{-1}) as compared to 50% pruning (Rs. 34,516 ha^{-1}) and 75% pruning's (Rs. 25,354 ha^{-1}).

- In 14 years old agrihorticulture system (Guava + Mustard), four pruning treatment viz; (no pruning, pruning (deheading) at 1m, 1.5m, 2m height) and one open (no tree) in main plot and 4 mustard varieties (viz; Pusa tarak, Pusa agadi, Jaikishan and Menthol) in sub plot. Open condition recorded significantly higher grain yield of mustard (580.2 kg ha^{-1}) where as no pruning recorded the lowest yield (203.7 kg ha^{-1}).
- Among pruning intensity, pruning (deheading) at 1.0m height recorded higher yield (421 kg ha^{-1}) whereas Pruning (deheading) at 2.0m height recorded significantly lowest yield (303.7 kg ha^{-1}).
- Variety Pusa tarak recorded significantly higher yield (517.5 kg ha^{-1}) and was significantly superior to variety menthol which recorded the lowest yield (313.08 kg ha^{-1}).
- Managed agrihorticulture system (pruning in Guava + mustard crop) is more profitable (Rs. 11,195 ha-1) than unmanaged (no pruning) agroforestry system (Rs. 9750 ha^{-1}), fruit tree alone i.e. orchards (Rs. 8,000 ha^{-1}) and crop alone (Rs. 11,109 ha^{-1}). Under managed Agroforestry system i.e. growing of mustard with different pruning intensity in Guava, mustard + Guava in 1.5 m pruning (deheading of main shoot from ground level at 1.5 m height) is more profitable (Rs. 12,737ha^{-1})
- Under hortimedicinal system (fruit trees +turmeric) turmeric crop was planted with fruit trees (viz; Aonla (Emblica officinalis), Bel (Aegle marmelos) and without fruit trees (open) in two methods of planting viz; ridge bed method and flate bed method. Significantly higher fresh yield of turmeric was recorded under open condition (118 q ha^{-1}) and was significantly superior to yield recorded with bel (103 q ha^{-1}) and at par with Aonla (114 q ha^{-1}).
- Ridge bed method of sowing gave higher fresh yield of turmeric (114 q ha^{-1}) as compared to flate bed (109 q ha^{-1}).
- Hortimedicinal system (Rs. 1,17,200 ha^{-1}) of agroforestry is more profitable than growing of crop alone (Rs. 1,09,000 ha^{-1}). Higher monetary returns was recorded when turmeric crop was grown with bel (Rs. 1,22,400 ha^{-1}) followed by Aonla (Rs. 1,12,000 ha^{-1}) and Turmeric alone (Rs. 1,09,000 ha^{-1}).
- Ridge bed method of sowing was more profitable and gave higher monetary returns (Rs. 1,18,000 ha^{-1}) as compared to flate bed method of sowing (Rs. 1,11,000 ha^{-1}).
- Under Agrisilviculture system (Dalbergia sissoo+ wheat) 5 treatments i.e. one open and four pruning treatments (viz; no pruning, 25%, 50% and 75% pruning) were carried out in main plot with three late sown wheat varieties (viz MP 3020, GW-273 and GW-266) in sub plot. Significantly higher grain yield of wheat crop was recorded in open condition (2967 kg ha^{-1}) where as lowest yield of wheat was recorded under no pruning (1699 kg ha^{-1}).
- Among different pruning intensities, 75% pruning recorded significantly higher yield (2709 kg ha^{-1}) at par with other pruning treatments.
- Wheat variety GW-273 recorded significantly higher grain yield (2722 kg ha^{-1}) closely followed by MP-3020 (2457 kg ha^{-1}) but superior to variety GW-266 (2132 kg ha^{-1}).
- Agrisilviculture system gave significantly higher monetary return (Rs. 32920 ha^{-1}) than growing of crop alone (Rs. 32739 ha^{-1}) or tree alone (Rs. 15,199). Managed agroforestry system, wheat+ D. sissoo in 25% pruning gave higher monetary returns (Rs. 36749 ha^{-1}) at par with other pruning

treatments but significantly superior to no pruning.

- Among varieties GW-273 recorded higher monetary return (Rs. 35581 ha^{-1}) as compare to variety MP 3020 (Rs. 32707 ha^{-1}) and variety GW-266 which recorded significantly lowest monitory return (Rs. 23940 ha^{-1}).
- In another agrisilviculture experiment where normal sown wheat varieties were grown with D. sissoo in different pruning intensities i.e. four pruning treatments viz; no pruning, 25%, 50% and 75% pruning) + one open (no tree) were taken in main plot and 3 wheat varieties (viz; Sujata, MP-3173 and MP-3288) in sub plot,. Open condition recorded significantly higher grain yield (2720 kg ha^{-1}) whereas no pruning recorded significantly lowest yield (1774 kg ha^{-1}).
- Among different pruning intensities, 75% pruning recorded significantly higher grain yield (2440kg ha^{-1}) as compared to 50% pruning (2127 kg ha^{-1}) and 25% pruning (1947 kg ha^{-1}) which were at par Wheat variety MP-3173 recorded significantly higher grain yield (2328 kg ha^{-1}) at par with MP-3288 (2191kg ha^{-1}) but significantly superior to variety Sujata (2086 kg ha^{-1}).
- Managed Agrisilviculture system, wheat + D. sissoo in 25% pruning gave higher monetary return (Rs. 32051 ha^{-1}) and were significantly higher to no pruning (Rs. 24981 ha^{-1}), tree alone (Rs. 15199 ha^{-1}) and crop alone (Rs. 14042 ha^{-1}).

On Farm Trials

- Under Agrisilviculture system on farm trial was laid out in old plantation (1999) at Khamaria village of BNWSP. Six MPTs viz. Safed Siris (Albizia procera), River Red Gum (E.camaldulensis), Soobabul (leucena leucocephala) sissoo, (Dalbergia Sissoo). Australian Babul (Acacia auriculiformis) and babul (Acacia nilotica) were transplanted on farm bunds in the year 1999. Wheat (Lok-1) crop was taken in the field. Trivial reduction in crop yield was noticed by the farmers which was ultimately compensated from the tree biomass i.e. 4028 kg ha^{-1} yr^{-1} from stand biomass + 17500 from pruned biomass as fuel + main trunk as timber wood. The result revealed that at the age of 12 years, agrisilviculture system of Agroforestry will be economical than growing of pure agricultural crops because tree + crop gave higher net monetary return Rs. 31728 ha^{-1} i.e. (Rs. 4028 from stand biomass + 17500 from pruned biomass + timber wood and 10200 from crop), whereas agriculture crops alone (without tree) gave net profit of nearly Rs. 19800 ha^{-1}.
- Another field trial was also conducted at village Jodhpur Tola under Agrihorticulture system where wheat crop was sown with 11 year old Guava (10 x 5 m) under irrigated condition. Guava + wheat gave higher monetary return (Rs. 27,000 ha^{-1}) as compared to wheat alone (Rs. 21400 ha^{-1}).
- A field trial was conducted at village Jodhpur Tola under Agrihorticulture system where wheat crop was sown with 11 year old fruit trees (Mango+Citrus+Anar) and in open condition under irrigated condition. Agri-horticulture system gave higher monetary return (Rs. 9800 ha^{-1}) as compared to wheat alone (Rs.19000 ha^{-1}).
- On farm trial conducted at village Shahajpur under Agrihortisilviculture system of Agroforestry where Aonla and Eucalyptus were planted in field bund and paddy (Mahamaya) and wheat (GW-273) crop sown in the field). Agrihortisilviculutre system was found more profitable (Rs.63000 ha^{-1}) as compared to growing of arable crop i.e. paddy + Wheat alone (Rs.60000 ha^{-1}) under irrigated condition.
- A field trial was conducted at village Kheri under Agrihortisilviculture system (Mango + Sissoo + wheat) of Agroforestry and found that agrihortisilviculture system was

more profitable (Rs.32800 ha^{-1}) as compared to agrisilviculture system (Sissoo in field bund + wheat) of Agroforestry (Rs.19800 ha^{-1}).

- A field trial was conducted at village Mazitha (Bheraghat) were paddy and wheat crop was grown with Eucalyptus during initial stage (under agrisilviculture system) and without crop (as pure block plantation of Eucalyptus). Paddy and wheat crop was also sown in open condition (without trees). Result showed that Agrisilviculture system (Eucalyptus + crop) was more profitable and gave return of Rs. 80,350 $ha^{-1}yr^{-1}$ as compared to arable cropping (paddy + wheat) ie.Rs. 65350 $ha^{-1}yr^{-1}$ and growing of eucalyptus alone ie. Rs. 70,500 $ha^{-1}yr^{-1}$.

FOOD SCIENCE AND TECHNOLOGY

- For diabetic persons sugar free aonla candy could be developed with 10% aspartame with good acceptability.
- The shelf-life of guava fruits could be enhanced for 10-15 days through coating of fruits with alove vera gel.
- The acceptable flavored tofu could be made with 3% cumin/ajowan and 4% lemongrass.
- Fibre rich pizza base developed from wheat flour 70 gm, sugar 3 gm, fat 5 gm, salt 2 gm, water 25 ml with 30 % fenugreek leaves/carrot shreds.
- The good quality sugar free biscuits prepared using sucrose 2.5gm, fat 14gm, and baking powder 0.65gm.
- The low cost supplementary food for children developed from roasted wheat flour and roasted soy flour (80:20) along with 10 % skimmed milk powder. The product named as panjiri which was good in nutritional as well as sensory qualities.
- The utilization of microbial pigments safely used without any adverse effect in fruit jam and tuty fruity.
- The nutritious atta developed from wheat flour and processed soy flour (90:10) at commercial and/or home scale level. The product has a great potential in solving malnutrition problem of the society.
- Dried mahua flower being a excellent source of many nutrients utilized in the formulation and development of mahua toffee with moderate acceptability.

Process standardization for development of sugar free aonla candy

The best quality of sugar free aonla candy was made with 10 % artificial sweetener aspartame and aonla segments. The sugar free candy contained acidity 0.76%, ascorbic acid 85.4 mg/100mg, tannins 1.60% in comparison to sugar candy (acidity 0.61%, ascorbic acid 230mg/100 and tannins 1.48%). Ascorbic acid, tannin, colour and texture were decreased on storage. However, moisture, acidity and microbial load were increased. The shelf life of the product was good for the period of 4 months in polyethylene bags at ambient conditions. Thus, it was concluded that low calorie candy could be developed with 10% aspartame for diabetic patients.

Effect of edible coating for shelf-life extension of guava

The guava fruits were coated with aloe vera gel, whey protein and corn starch. The result showed that 100 % aloe vera gel was most effective coating followed by 40 % whey protein and then 8 % corn starch. The appearance, firmness and overall acceptability of guava fruits were good and they could be stored up to 15 days without deterioration of nutritional quality. Thus, aloe vera gel could be considered the safest coating material for shelf-life extension of guava fruits.

Development, optimization and quality evaluation of flavored tofu

JS 97-52 was found to provide good quality of milk and tofu in terms of yield, total solids and organo-leptic qualities. The taste, flavour and overall acceptability of tofu were improved on addition of cumin, lemon grass and ajowan.

The best quality of tofu was developed at 3% cumin and ajowan and 4% lemongrass. The citric acid was used as a coagulant. The shelf-life of the product was observed for 60 days at refrigeration conditions.

Optimization of processing variables for the development of high fibre pizza base

Pizza base were developed using fenugreek leaves/carrot shreds in different combinations. The product had maximum sensory score for pizza base containing 70 g wheat flour, 3 g sugar, 3 g yeast, 5 g fat, 25 ml water, 2 g salt and 30 g fenugreek leaves/carrot shreds per 100 g of base. The thickness, weigh, diameter, volume, specific volume were decreased with the increasing level of fenugreek leaves/carrot shreds.

Formulation, development and nutritional evaluation of paustik atta

The results showed that good qualitiy of chapaties were made from wheat flour fortified with 10 % processed soy flour. All the sensory attributes were rated good and comparable to unfortified chapaties. The paustik atta contained higher amount of protein (15 to 16%) as compared to unfortified wheat flour. Other nutrients viz, minerals and fibres were also higher. Regarding storability, the flour could be well stored in polyethylene bags for the period of three months without any deterioration of quality. Thus, it was concluded that paustik atta could be developed from wheat flour and 10 % processed soyflour at commercial and/or house-hold levels for combating the malnutrition problems of the society

Studies on preparation of toffees from mahua flower

The organoleptic quality characteristics of mahua toffees were evaluated with different levels of mango pulp, sugar, butter, skimmed milk powder and salt. The moisture, TSS, acidity, reducing sugar and total sugar content in the above products ranged from 8.73 to 80 %, 85.10 to 83.70 %, 0.22 to 0.28 %, 35.33 to 38.00 and 74.64 to 76.30 %, respectively. The overall acceptability score of toffee exhibited significant differences among the treatment. The storage study of mahua toffee reveals that nutritional qualities of toffee were remain intact after 90 days of storage period. Hence, it is concluded that sundried mahua flowers could be the excellent source of various nutrients in the form of toffee.

Formulation and development of low cost supplementary food for children

The best quality of product was made from wheat:soy flour (80:20). It contained higher amount of protein along with other nutrients and comparable to chickpea based product. Fortification of 10% skimmed milk powder did not change the sensory attributes of the product. However, it enhanced the protein and important essential minerals viz., calcium and phosphorus. The shelf-life of the product was also good for the period of 3 months. Thus, it was concluded that the panjiri made in the ratio of 80:20 (wheat:soy flour) with 10 % skimmed milk powder was considered the best from protein, calcium and phosphorus points of view.

Low cost production technology of microbial pigments for incorporation in food products

The optimization of blending carbon sources such as groundnut, rice bran and rice grit and nitrogen sources such as mustard oil cake, cotton seed oil cake and niger oil cake were mixed in the ratio of 1:1 to 2:1 for production of microbial pigments. These pigments were also tasted in processed products. The results revealed that rice grits and cotton seed oil cake in the ration of 2:1 was considered the best in both solid state and submerged fermentation for highest yield of microbial pigments. The sensory quality characteristics of processed food products viz, mixed fruit jam and tutty fruity using microbial pigments were good and acceptable. The shelf-life of the products did not show any adverse effect and remained

acceptable during the storage period of 4 weeks.

Optimization of baking ingredients for development of sugar free biscuits using sucralose

The results showed that the best quality of sugar free biscuits could be made by using sucralose 2.5 g, fat 14 g, baking powder 0.65 g and water 12-13 ml in refined wheat flour. The sensory attributes of sugar free biscuits were comparable to the control.

AGRICULTURAL ECONOMICS

Study on Agri-Insurance

IFPRI in collaboration with the centre for Insurance and Risk Management CIRM and HDFC ERGO insurance company are implementing an index based weather insurance project in the State of M.P. The overall goal of this project is to evaluate the demand for new weather index-based insurance products (weather securities) by small farmers in India for hedging against rainfall uncertainty and study the impact of access to these products on farmers consumption and production decisions. These securities will be provided by HDFC ERGO in Madhya Pradesh, (MP) a State of India characterized by high rainfall risks. One intervention that will help identify and encourage the demand for such products is the random allocation of price discounts. Randomly selected farmers will be given price discount vouchers that can be used toward purchasing these securities.

Rural Service Hubs: Business Catalysts for Rural Competitiveness and Inclusiveness

- Most striking is that state and coop stores sell only 19% of their wheat seed and 26% of their soy seed to small/marginal farmers- despite the latter forming more than half the farmers in the sample. This is contrary to the conventional view that state/coop stores are there to serve - and subsidize - the poor farmer. The obvious implication is that policymakers should work to make these stores more accessible to the poor.
- Contrary to conventional wisdom, the poor are deeply involved in seed markets -some 79% of the poor (small/marginal farmers) buy wheat seed, and 67% buy soy seed. Small/marginal farmers who buy seed rely 92% on the market.
- The most important reason why farmers chose a specific retail outlet for fertilizer purchases is related to the close distance of the outlet or the timely availability. Modern retail is a preferred buyer in almost one-third of purchases because of the assured quality.
- Contrary to conventional wisdom, few farmers chose fertilizer retailers for quality reasons or for access to credit. Most of the fertilizer purchases are spot transactions: 86% of transactions are paid for immediately and in cash.
- A retail types - state/ coop, modern retail, and traditional shops, sell a minor share of their fertilizer to small/marginal farmers: state/coop stores sell 28% of their urea to small/marginal farmers; ITC sells 18% of its urea to these; and traditional shops, 23% to the small/marginal. This is contrary to the conventional view that state/coop stores mainly are focused on serving- and subsidizing - the poor farmer. The obvious implication is that policy makers should work to make these stores more accessible to the poor.
- Small farmers have approximately twice the fertilizer use rate per ha as compared with large farmers. We found that the small/marginal farmers also used much more seeds and pesticides than the medium/large farmers.
- The poor farmers reported problems of getting quality chemicals, and issues of fraud and adulteration. The main recommendation we observe from key informants and our data, is the need to have more effective testing and inspection.

- Many respondents from input shops complained that there are many inspections, but that often the purpose of the visit often is "not for inspection".
- Application rates of pesticides by small farmers are much higher than are those of large farmers - raising issues of potential toxicity, waste, and ineffectiveness.
- 30% of the farmers in the study areas reported using any credit (for any purpose) in the 12 months prior to the survey. Those who did not mainly said that this was because they did not feel need for credit.
- Most of the credit (for any purpose, farming or non-farm or consumption) that is used is formalized credit through Kisaan Credit Card (KCC). Unfortunately, we found a strong relationship between farm size and acquiring a KCc - 20% of the marginal farmers (<1 ha) hold a KCC, versus 81% for the large farms (10 hectares and above). While only 16% of the marginal farmers used credit, this is an high as 57% for the large farmers.
- Thus, KCC has been a strong credit initiative, and strengthening it further is our main recommendation, as it far exceeds in importance other credit channels - but still can go much further in penetrating to the level of the poor farmers.
- The nationalized banks were responsible for nearly 90% of the KCC credit- and about three-quarters of all credit farmers took in 2009 in the sample in MP.
- There are seemingly no major difficulties with access to agricultural extension delivery services in MP, especially when compared to its neighboring state UP (see the companion report). Only 90% of the farmers indicated that when extension was needed, it was not available. (This was 16% in the Eastern zone which always scored lower on services access in the survey.) On the other hand, 88% of the farmers reported that agricultural extension was always or usually available. Non-use seems mostly driven by low farmer demand and less by delivery problems in the West and Central zones-but in the East zone we found it more driven by delivery and quality problems. This mirrors the relative paucity of services that we found in the east compared with the other two zones. 96% of farmers were found to be pleased with the quality of extension services that they received.
- We found small/marginal farmers engaged heavily in product markets.
- We found small farmers less diversified out of grains than are medium farmers. The implication is that horticulture programmes are not necessarily self-targeting to the poor just because the latter have more labour and less capital.
- The RBH is a small player even in its own catchments area in the Malwa Plateau with market shares of 9% in wheat 24% in soy. The farms supplying it tend to be concentrated in the more developed west and center zones, and very concentrated among the large and medium farmers (with very few small/marginal farmers selling to ITC).

Policy constraints to the modernization of rural services from the view point of the RBH company

- They see the need to restrict usage of essential commodities Act to only very exceptional situations, and to not apply it in the case of routine annual supply variations.
- They see the need for full implementation of the model APMC Act, with the issuance of one national license to operate under APMC.
- They see the need for making taxation uniform and limited to incidence at one point in the chain.

INSTRUMENT DEVELOPMENT & SERVICE CENTRE

Patent : Patent has been granted for the developed invention entitled "A sensing

devicde for use with a tractor" in accordance with the provision of the patent Act 1970. Application No. 746/ DEL/ 1977. Patent filed through the funding agency i.e. Secretary, Department of Electronics, Government of India, New Delhi. Inventors are A.K. Rai, K. Shivdasan, and S.N. Murty. Patent No. 232368.

1. Database Generation & Evaluation of Production Technologies for Medicinal & Aromatic Plant

- The system designed is modular, sub-modular and dynamic in nature. Information needed for the creation of the database for the Safed Musli, Kalmegh, Vanilla, Stevia, Guggal, Bael, Lemon grass, Jesmine, Brahmi, Isbagol, Pam Rosa, Opium Poppy Aonla, Kewada, Aswagandha, Kalihari, Sanaye, Sarpagandha, Tulsi crops obtained and incorporated in the system.
- Visuals of the aromatic plants on various aspects of their growth have been taken from the fields and nearby forest areas. The major aspect of crop production incorporates crop information, field information, varieties, nursery management details, climate and soil, irrigation, intercultural operations, weed management, insect management, disease management, nutrient management, harvesting, post harvesting processing & value addition, marketing management.
- Development of the software is in progress using popular web developing tools, languages and image editing tools like: Microsoft windows, Macromedia Dreamweaver, php, Javascript, MySQL (for data base), Adobe Photoshop. Snapshot of the project as follows:

2. National Information System on Agricultural Education Network in India (NISAGENET)

- This is being maintained at central server of IASRI, New Delhi and accessible at http://www.isari.res.in/Nisagenet to provide country/state/university/college level reporting on agricultural education in India.
- Collection and compilation of data from various colleges/departments in six schedules containing academic information, infrastructural facilities, budget information, manpower information, faculty profile, R & D activities.
- Regular data entry/updating to NISAGENET central server is being uploaded.
- Independent User ID and Password have been provided to the Coordinator of all the colleges.

3. Strengthening Statistical computing for NARS

Statistical Analysis Software (SAS) has been installed in all the Colleges and Departments of JNKVV.

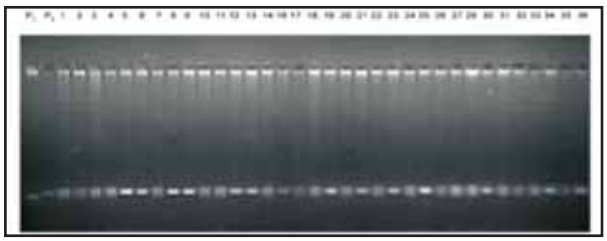
BIOTECHNOLOGY

Introgression of quality protein opaque2 gene into maize using marker assisted selection: The study entitled "Introgression of quality protein opaque2 gene into maize using marker assisted selection" was conducted for the objectives of - Identification of markers for background selection for developing Quality Protein Maize and Analysis of genome recovery of recurrent parent in BC1F1 using SSR markers. Two non QPM lines i.e. HKI1126 and HKI287 were selected for conversion to QPM lines using HKI161 and HKI193 as donors under DBT sponsored QPM Network project. For background selection three specific primers namely phi057, phi112 and umc1066 were used. 36 plants in BC1F1 1126 and 24 plants in BC1F1 287 were used for foreground selection using 30 SSR markers for each. Homozygosity and genome recovery of recurrent parent in BC1F1 generation was calculated and a dendrogram was generated by polymorphic SSR markers using the software 'Power Marker'. In case of BC1F1

1126, five plants viz., 5, 9, 11, 14 and 35 came under the range of high homozygosity i.e. > 60% and also have > 80% genome recovery. In case of BC1F1 287, five plants viz., 6, 12, 14, 20, and 24come under the range of high homozygosity i.e.> 65% and genome recovery i.e. >83%. From the findings, plants which possess high homozygosity and genome recovery were found suitable for growing next generation. Therefore, Large plant population size should be used for growing next generation, More number of markers per chromosome should be used for backcrossing and plants, those have high genome recovery, should be used for growing the BC2F1 generation.

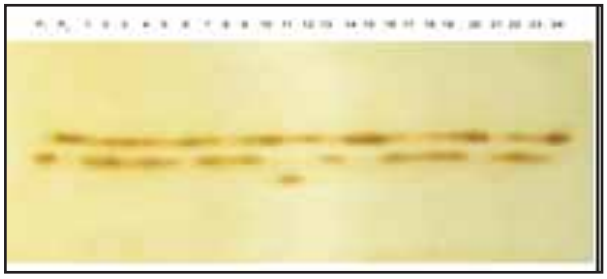
Genetic diversity analysis using RAPD markers in geographically distinct germplasm of Bacopa monnieri: Bacopa monnieri (Brahmi), a traditional 'Ayurvedic' medicinal plant has been used for centuries as a memory enhancing, agent. ies in different geographic locations needs to be assessed. Fifteen accessions were collected from different localities of Madhya Pradesh, India. A set of 22 RAPD primers was used to analyze different accessions of Brahmi (Baccopa monnieri). A total of 197 reproducible bands were detected as amplified products upon PCR amplification, out of which 187 were polymorphic (94.9%). Specific alleles were amplified by different primers. The UPGMA cluster analysis grouped all the Brahmi accessions under study in two major groups. Similarity indices ranged from 0.161 to 0.960 among different plants, based on RAPD data.

Polymorphism analysis in advanced mutant population of Oat: The genomic DNA of 38 Avena sativa mutants and one parent maintained at experimental farm of agronomy Department of JNKVV, Jabalpur, was isolated by CTAB method and subjected to amplification with 21 ISSR primers in thermal cycler. Amplified products were resolved by electrophoresis on 1.5 % agarose gel. Twenty one ISSR primers amplified 132 ISSR marker loci. Out of these 132 loci, 116 loci were found to be polymorphic (87.87 %) The genetic similarity coefficient values among 39 oat genotypes based on ISSR analysis ranged from 0.305 to 0.957. This indicates a low to high genetic diversity. The cluster analysis divided

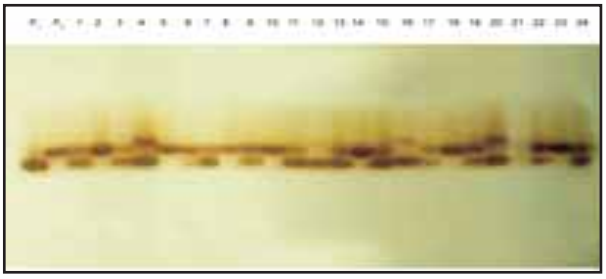


Electrophoretic bending pattern of SSR amplification products by primer umc2334 of resolved on 4% Agarose gel

Electrophoretic bending pattern of SSR amplification products by primer umc1110 resolved on 4% PAGE



Electrophoretic bending pattern of SSR amplification products by primer umc1639 resolved on 4% PAGE



Electrophoretic bending pattern of SSR amplification products by primer umc2130 resolved on 4% PAGE

the oat genotypes into groups. Mutants JMO 81 and JMO 82 were found most divergent hence could be used as parent in breeding programs. The ISSR markers employed to screen A. sativa M6 population were clearly able to differentiate each and every mutant included in the study. The genetic relationship among different mutant genotypes of A. sativa was analyzed using ISSR marker systems, which are effective and reliable tools for this type of analysis. These findings not only highlight the capacity of the ISSR technique but also help in the selection of better A. sativa genotype for further breeding and research work. Twenty one ISSR primers generated a total of 132 bands. Out of these 116 bands were polymorphic (87.87 %). Genotype specific loci (bands) were amplified by several primers such as UBC 811, UBC 842, UBC 855, UBC 889, UBC 890, SSR 1, ISSR 4, ISSR 5, ISSR 6, ISSR 14, ISSR 18, ISSR 20 and ISSR 21. These primers can be used to differentiate the specific mutants from other mutants. Based on ISSR markers, pair wise genetic similarity among M6 population of A. sativa included in the study was ranged from 0.305 to 0.957. The cluster analysis divided the Oat mutant population into 2 groups. Highest genetic similarity (95.74 %) was shown between JMO 75 and JMO 66. JMO 54 was 93.75 % similar with JMO 75 and JMO 66. All these mutants were in the same cluster. JMO66 and JO1 are showing genetic similarity of 81.25% with each other and they are in same cluster. The subgroup 'B' consisted of only two mutants JMO 11 and JMO 49 having 78.16 % similarity. Mutant JMO 81 was found to be most divergent sharing only 43.5 % similarity with parent JO1.

Studies on in vitro regeneration of Oat (Avena sativa): The objective of the research is to identify suitable culture media and conditions for efficient plantlet regeneration from mature embryo, immature embryo and leaf base of oat and to study the culture media x genotype interactions for efficient plant regeneration. For the in vitro regeneration studies in oat from different explants, mature embryo, immature embryo and leaf base were cultured on MS medium supplemented with different concentration and combination of auxins and cytokinins. In vitro regeneration in oat has been studied by culturing explants on MS medium supplemented with higher concentration of 2,4-D (2-50.0 mg/l) and BAP (1-5 mg/l) in combination with NAA (1.0-10 mg.l-1). After 45 days of culture, the calli were transferred into regeneration medium. The pH of the entire medium was adjusted to 5.8 prior to autoclaving. All cultures were incubated at 25+2 0 C under PAR light and a 12/12 hrs light dark photoperiod. Based on results obtained from different explants, mature embryo and immature embryo of oat were preferred over leaf base. Shoot differentiation via callusing takes place when basal medium is without 2,4-D, whereas shoot differentiation occurs on basal medium supplemented with different concentration and combination of BAP with NAA. Two factors, which affected the in vitro regeneration frequency of oat, are genotype interaction X culture media and type of explants.

Biosynthesis of microbial pigments using co-culture of Monascus purpureus and Monascus ruber: The study was carried out with the objectives of optimization of blending carbon source such as rice grits with nitrogen sources such as cottonseed oilcake (CSOC) and mustard oilcake (MOC) in 1: 1 and 2: 1 ratios for maximum production of microbial pigments, optimization of dissimilar variables viz. temperature, pH, incubation period, initial moisture and inoculum size in solid state (SSF) and submerged fermentation (SmF) for better recovery of microbial pigments alongwith isolation and partial purification of the extracted pigments. The findings indicated that:

- Among all the carbon and nitrogen sources, the combination of RG: CSOC resulted in the highest total yield of microbial pigments in both SSF and SmF

methods.

- Using the method of solid state fermentation (SSF), highest yield of microbial pigments was obtained at initial moisture level of 60%, temperature of 30o C, inoculum size of 1.5 x 106 (spores/ml) and incubation period of 12 days with the combination of RG: CSOC as a substrates in 2: 1 ratio.
- In submerged fermentation (SmF) also, highest total yield of pigments was recorded using carbon and nitrogen sources (RG: CSOC) in 2: 1 ratio by maintaining the optimum conditions of fermentation variables such as pH of 6.0 temperature of 30o C inoculum size of 1.5 x 106 (spores/ml) and incubation period of 7 days. The pattern of thin layer chromatography (TLC) indicated that the extracted pigment contained three major components in the extracts obtained from both the methods of fermentation.

Characterization of phytase producing bacteria from soil: Phytate is one of the most abundant sources of organic phosphorus (P) in soils, but must be mineralized by phytase-producing bacteria to release P for plant uptake. Five isolates (BC1, BC2, BC3, BC4 and BC5) had shown zone of clearance around the bacterial colony and maximum zone of clearance found in BC3 isolate (41 ± 0.3 U ml-1). The enzyme activity was measured at 415 nm wave length showed maximum activity in BC3 isolate (Polluted sewage soil bacteria) (0.37 ± 0.04U ml-1). Further for the molecular characterization of these isolates, 16S rRNA gene was amplified by PCR at 50C annealing temperature. 1500bp fragment was obtained through PCR. PCR products were sequenced and found with 1363, 1342, 970, 1441 and 1453 bp sequence length for BC1, BC2, BC3, BC4 and BC5 respectively. In silico analysis was carried out using different software and BC3 isolate showed the maximum diversity 54.7% and 32.7% homology to Bacillus strains. On the basis of molecular characterization through 16S rRNA gene sequencing, isolates were identified as the members of genus 'Bacillus'.

AGRICULTURAL ENGINEERING

Agro meteorological Studies

The rainfall occurred in 2011 due to south-west monsoon was more than normal in all the eleven agro-climatic zones of Madhya Pradesh (M.P.) It was deficient in one district (Katni) only. Overall, agro-climatic zone of Chhattisgarh plains received deficient amount of rainfall in 2011, while rainfall was more than normal in all other agro-climatic zone of M.P.

Rainfall Situation of Madhya Pradesh

Zone	Rainfall (mm)			
	Actual	Normal	Def/Excess	% Depart
Chhattisgarh Plains	1162.3	1292.1	-129.8	-10.0
Northern Hill Zone of Chhattisgarh	1278.4	1139.8	138.6	12.6
Kymore Plateau & Satpura Hills	1153.4	973.1	180.4	19.6
Vindhyan Plateau	1307.1	1028.6	278.6	27.2
Central Narmada Valley	1201.1	1141.5	59.6	5.1
Grid Zone	1060.0	764.3	295.7	36.4
Bundelkhand Zone	1006.1	848.3	157.8	18.3
Satpura Plateau	955.0	866.2	88.8	10.7
Malwa Plateau	1191.2	814.0	377.2	46.4
Nimar Valley	842.8	777.5	65.3	7.7
Jhabua Hills	805.3	753.9	51.4	7.6
Mean	**1087.5**	**945.4**	**142.1**	**16.5**

Analysis of weather parameters during kharif season 2011:

During kharif season 2011, actual rainfall occurred more than normal from 27-38 weeks of 2011. After 38th week, the trend was similar to that of normal. Similar is the trend of number of rainy days, where actual rainy days were more than normal from 27-38 weeks. During kharif 2011 (27- 45 weeks of year 2011), maximum temperature was less than normal during the kharif season 2011, however minimum temperature was more than normal during the entire kharif season. Similarly, relative humidity of morning was more than normal from 27-45 weeks of 2011 while relative humidity of evening was near to normal. Bright sunshine hours at Jabalpur was more than normal from 29-31 weeks and also from 33-36 weeks while it was less than normal from 28-29, 31-33, and 36-40 weeks. After 40th week, sunshine hours occurred was similar to normal. Wind speed (km/hr) was less than normal from 27-37 weeks of kharif season 2011. It increased from 37-40 weeks compare to normal speed.

Analysis of weather parameters during rabi season 2011-12:

Rainfall occurred at beginning of year 2012 and lasted for 8 weeks. It was observed in a range of 15-30 mm. This is a good time as most of the crops are in flowering stage, and irrigation during this time improved gain quality and quantity, and ultimately increase grain production. Similarly, number of rainy days was one during the first two weeks of the year 2012, and two rainy days were observed from 4-7 weeks of 2012. Beside this, maximum temperature of rabi season 2011-12 was less than normal (20-25 ?C) from 1-7 weeks at the beginning of the year 2012. Similarly, minimum temperature was also less than normal (5-10 0C) from 49-52 weeks of year 2011 and 2-13 weeks of 2012. The analysis suggest that the minimum temperature remained less than normal for a prolonged period that favours flowering and gain formation stages of wheat crop. This condition is said to be benign for getting good production of wheat crop. On the other hand, relative humidity (morning) was more than normal during the entire rabi season however relative humidity (evening) was near to normal, except 1-3 and 4-6 weeks of the year 2012. On the contrary, bright sunshine hours was less than normal from 1-13 weeks of 2012, however, wind speed was more than normal from 1-12 weeks of 2012 of rabi season

Crop-weather studies

Early maturing rice experiment for evaluating suitable drought tolerant variety in rice.

Nine early maturing paddy varieties were planted under different irrigation regimes to study of phenological stages and evaluating drought tolerant variety.

Phenological observations: Accumulated growing degree days (GDD) was similar among all the varieties at 50% tillering stage. During panicle initiation, accumulated GDD was more under rainfed condition. Among varieties, NDR 97 and Sahbhagi had maximum GDD while DVD 109 minimum GDD. During 50% flowering, IET 20859, NDR 97, and Sahbhagi varieties planted under irrigated condition had maximum GDD while IET 20863 minimum under different irrigation regimes. During harvest maturity, JR 201 and NDR-97 varieties had maximum GDD under irrigated condition, while BVD 109, IET20863 & Vandana varieties recorded minimum GDD under different irrigated regimes.

Similarly, helio-thermal unit (HTU) and photo-thermal units (PTU) were maximum in JR 201 and minimum in BVD109 varieties during harvest maturity stage . JR 201 variety absorbs more thermal units during all the phenological stages of rice & BVD 109 variety absorbs minimum thermal units. Similarly, rice varieties planted under irrigated conditions takes more time to mature (113 days) than planted under

rainfed conditions (106 days) . The GDD, HTU & PTU were similar under all irrigated regimes during 50% tillering and 50% panicle stages. From flowering to grain maturity stages, heat unit absorption were more in irrigated followed by marginal irrigated and rainfed conditions.

From sowing to physiological maturity, IET 20863 & JR 201 varieties absorbs more heat units than the other varieties under irrigated conditions. Under rainfed condition, JR 201 and Sahbhagi varieties absorbed more heat units from sowing to physiological maturity stages. From sowing to harvest maturity stages, JR 201 and NDR 97 varieties absorb maximum heat units than other varieties during irrigated condition. No difference was observed in marginal irrigated condition, which state that applying irrigation after depleting of monsoon may not affect heat unit absorption in rice. At the same stages, no difference among varieties were observed in GDD under rainfed condition.

Leaf area (cm2) and chlorophyll content (%): A correlation observed between leaf area (cm2) & chlorophyll content (%) with growing degree days. Both irrigated and rainfed conditions showed a positive correlation between chlorophyll content and absorbing heat units. Total leaf area under irrigated conditions increased with an increase of GDD at 50 % tillering and flowering stages. However both 50 % tillering and flowering stages, leaf area decrease with an increase of GDD under rainfed condition

Yield studies: Under irrigated condition, Sahbhagi variety produced maximum grain yield 4048 kg ha-1 while JR 201 variety minimum yield 2144 kg ha-1. Under marginal irrigated condition, Vandana variety produced maximum yield 3378 kg ha-1, if irrigated between flowering to grain development stage. Anjali variety produced minimum yield with no effect of applying additional irrigation. During rainfed condition, Sahbhagi performed equally good.

Grain yield decreased with an increase in absorbing heat units under both irrigated and rainfed conditions in rice which suggest a negative correlation between grain yield and growing degree days.

Drought Susceptibility Index (DSI)

DSI was calculated as:

DSI = (1-Yd/Yp)/D, where

Yd = Grain yield of genotype under moisture stress/ rainfed condition,

Yp = Gain yield of genotype under irrigated condition

D = mean yield of all varieties under moisture stress or rainfed condition/ mean yield of all varieties under irrigated condition

The variety with least DSI suggest more tolerable in drought condition. This suggest that Sahbhagi variety is tolerant to drought condition with least DSI, while JR 201 is more susceptible under drought condition in producing grain yield

Evaluating medium to late maturity rice varieties planted under different irrigation regimes

Penological observations: Among rice varieties, MR-219 absorbed more heat units (GDD, HTU and PTU) than other varieties from sowing to physiological maturity stages. Similarly, GDD was maximum in MR219 variety under all irrigated regimes from sowing to 50% flowering to physiological maturity stages. WGL 32100 variety showed maximum GDD by applying additional irrigation during flowering stage .

Under irrigation regimes, irrigated conditions takes more time to mature, which results in absorbing more heat units (higher GDD, PTU & HTU) than rainfed conditions .

Yield studies: Kranti variety produced maximum seed yield 4207 kg ha-1 under irrigated conditions. Similarly, IR-64 variety produced higher seed yield than other varieties

	GRAIN YIELD (kg ha^{-1})			
Varieties	**Irrigated**	**Marginal irrigated**	**Rainfed**	**DSI**
IR-36	3592	3066	3137	0.220
IR-64	3963	3748	3507	0.194
JGL3844	3570	2011	1138	1.121
Kranti	4207	3322	1363	1.087
Mahamaya	3662	3248	3129	0.221
MR-219	3370	2959	2152	0.590
PS-4	2211	2048	1428	0.553
PS-5	2611	1918	949	1.036
WGL-32100	3252	2915	1911	0.668

planted under both marginal irrigated and rainfed conditions. On the other side, PS-4 and PS-5 varieties produced minimum yield than other varieties under all irrigated regimes.The DSI was least in IR-64 variety while JGL 3844 and PAS-5 varieties with maximum DSI. This suggests that IR-64 is more tolerant under drought conditions than JGL 3844 and PS-5 varieties.

Grain yield and drought susceptibility index of medium to late rice varieties planted under different irrigated regimes

Effect of sowing dates on growth and yield of different chickpea types. :

Phenological stages: The accumulated GDD during emergence were in a range from 122-197. JGG-1 absorb more heat units than other varieties at sowing to 50% flowering. Similar is the result at sowing to physiological maturity and harvest maturity stages. At the same stages, JGK-1 absorbs minimum heat units than the other varieties. Among planting dates, chickpea planted on November 11 absorb more heat units at all the phenological stages than planted on December 10. This suggests that chickpea plants absorb more heat units if planted early than planting late.

Physiological observations: Among all the varieties selected, plant height (cm) was higher at first planting date (Nov. 11) than the other two planting dates (Nov. 26 and Dec. 10, 2011) at 30 DAS . Similarly at 60 DAS, plant height was maximum at 3rd planting date in all the varieties except JGG-1. At 90 DAS, chickpea plants were at pod initiation stage and planting dates may not affect the plant height at this time.

Yield studies: Desi chickpea varieties (JG315, JG11, and JG322) performed better at first planting date (Nov. 11) followed by second planting dates (Nov. 26).Desi type variety JG-74 performed better then Kabuli and Gulabi chickpea types but its performance was inferior to other desi chickpea type varieties in terms of seed yield. Both kabuli type varieties (JGK-1 and JGK-3) performed inferior to Gulabi type variety. Kabuli type performance was better at Nov. 26 planting date than Nov.11 and Dec. 10 planting dates. Gulabi type produced more seeds if planted on Nov. 11 followed by Nov. 26, and Dec. 10 planting dates . The harvest index (%) was maximum at 2nd planting date (Nov. 26) among all chickpea types except JG-322 variety.

Correlation studies

The results showed that both maximum and minimum temperatures were negatively correlated with chickpea seed yield. An increase of both temperatures affect chickpea yield. Similar was the result with GDD association with seed yield. This suggests that increase in the number of days to mature chickpea may absorb more heat units. This decreases seed yield, or chickpea should be planted early to avoid higher temperature during flowering to maturity stages.

Effect of sowing dates on growth and yield of wheat

Phenological observations: The crop reached physiological maturity stage with higher GDD at first planting date followed by second and third planting dates. Among planting dates, varieties planted early (Nov. 11) absorbed maximum heat units followed by planting at Dec. 09, 2011 followed by planting late (Dec. 24).

Yield studies: MP-1142 variety performed better than the other wheat varieties at first planting date, DL 7882 (Vidisha) and MP-4010 varieties performed better at third planting date. MP-1142 variety had maximum (35.5%)harvest index (HI) than other varieties at first date, MP-1203 and GW-173 variety at first planting date, MP-1203 and GW-173 varieties had higher HI than other wheat variety. At third planting dates MP-1203 and MP-4010 varieties performed better with (>35%).

Correlation studies: A positive correlation observed between wheat seed yield and growing degree days from sowing to physiological maturity stages. Similarly, a positive correlation also exists between seed yield with mean and minimum temperatures. However, a negative correlation occurred between seed yield and maximum temperature . This suggests that wheat seed yield is directly related with the temperatures. If the temperature is high then seed yield will be low and vice-versa.

Weather-Insect-Pest Relationship

Crop-weather relationship of Helicoverpa armigera in chickpea (Cicer arietinum L.): Larval counts of Helicoverpa armigera (Gram pod borer) observed in chickpea plots during rabi 2011-12 season. The larval population was fewer in density with a range of 1-2 larva/m2. It was mainly found in between 3-10 weeks of the year 2012. Due to prolonged winter season caused fewer population of H. armigera to be available in this year. The population (larva counts/m^2) increased after 10th week in March 2012 with the increase of both maximum and minimum temperatures.

Ground water studies in Upper Narmada Basin

The study was carried out in the upper Narmada basin consisting of Mandla, Jabalpur, Narsingpur and Hosangabad districts. The findings are :

- The ground water level fluctuation from premonsoon to postmonsoon season varies from 2.66 to 3..58 m, where as it depletes from 2.85 m to 3.85 m from post to pre monsoon season.
- The recharge from rainfall varied from 1048.2 to 1715.4 mm over the decade.
- The pumping recovery tests at 10 locations show that the transmissibility varies from 245 m^2 day 1 to 757 m^2 day 1. The storage coefficient varies from 0.0009 to 0.019. The discharge during the pumping tests varied from 617 m^3 day 1 to 1190 m^3 day 1.

Impact of Conjunctive Use in Canal Command

Conjunctive use of canal water and ground water has become essential in order to make dynamic equilibrium in water resources. The study was carried out in the command area of Bargi LBC.

- In conjunction with canal water in canal command areas, ground water is also being used in tail ends of command. The ratio of surface water to ground water is 0.12 to 8.83 in various reaches of commands of Jamuniya, Jhansi and Khulri minor.
- Use of ground water in tail reach is 34.18 % and 20.78 % more than head reach of the command in Jamuniya and Khulri minors respectively. Tail enders use more ground water due to the reason of non availability of canal water as compared to head reach.
- Water use efficiency of irrigated command

is 1.72 kg m^3 in ground water command which was more than that of 1.46 kg m-3 in surface water command.

- Conjunctive use has a definite impact on cropping pattern of the area, yield, production, water table and other parameters studied.
- Wheat area intensity (WAI) in all the minors increased significantly from 4.87 to 64.8 during 2003-04 to 2009-10. On an average the WAI increased from 28 to 56 per cent during this time period, where as intensity of gram reduced from 45 to 33%. This change can be attributed to a rise in ground water use which reduced surface and ground water ratio from 3.5 to 0.70.
- Highest yield of wheat (38.00 ha^{-1}) was obtained at Jamuniya with higher ratio of SW:GW, of 8.83 whereas it was 36.45 ha^{-1} in Jhansi minor with a SW:GW as 0.71.
- The pressurized irrigation methods are significantly better utilized with lower ratio of SW:GW and enhanced better production and water productivity in canal commands.

Utilization of Haveli storage for Ground Water recharge

Haveli' is a system of collecting water within the periphery of field boundaries in heavy to very heavy soils of central part of Madhya Pradesh. This harvested water remains inundated in the field for entire monsoon and thus recharge the aquifer in addition to restricted weed infestation. A large area of more than 8 lakh hectare had been under Haveli system in central part of Madhya Pradesh. The Haveli stored water is actually released in first fortnight of October, which can be utilized for ground water recharge. The direct injection of Haveli stored water can be possible through recharge shafts. This year the study was conducted on utilizing the stored runoff in haveli fields in Shahpura block of Jabalpur district. The salient findings are :

- The quantity of water available for recharging ground water in addition to haveli recharge in Shahpura block is estimated to be 31,079 ha m^{-1}. This quantity is available at the end of monsoon period.
- Looking to the aquifer capacity in the zone all available water can be converted into recharge.
- A recharge rate of 0.5 to 7.7 ha m day^{-1} can be achieved using 0.15 m to 3 m diameter recharge shafts.
- Number and capacity of recharge shaft can be decided based on recharge rate available and potential area of the haveli storage.
- The size of the recharge shaft may be kept at minimum considering number of days available to clear the haveli fields.
- The number of days available for recharge through shaft may be increased by early start of recharge before the end of monsoon.
- In a survey of 72 existing haveli fields consisting of 288 bunds with total 25685 m length of bunds, it was found that about 40 per cent fields still have bunds in good condition. The average length of the bunds ranged between 40 m to 400 m with a height of 0.5 m to 2.5 m.

Extent of sewage irrigation in Jabalpur city

- Sewage Irrigation causes ground water pollution as well as contamination of direct eatables grown through irrigation. To identify the points of pollution and quality of water at source of pollution, its extent and irrigated fields a survey was conducted in one of the major drain of Jabalpur City named as Motinala.
- Irrigation from Moti Nala is in practice in an area extends about 300-350 m both side along Nala in a length of about 1600 m.
- The water was applied in summer through motor pumps of 2 hp /3hp (I-phase). The pumps were operated by keeping them at Nala-bed itself due to poor discharge in Nala.
- Only eight ground water structures, five tube wells and three open wells are

available in this sewage irrigated area. Presently crops are taken only in upper 800 m reach of the Nala covering an area of about 350 m both side.

- The depth of open well varies from 8.00 m to 13.50 m, while the average depth of tube wells was 50 m. Ground water is applied through sprinklers while Nala water is used through flood irrigation.
- Bacterial test shows that the sewage water contaminates the soil, water and plants and need to be treated or filtered through soil or biological filters before its direct use for vegetables.

Farm Implement and Machinery (FIM)

Feasibility evaluation of T.D. inclined plate planter.

Total area covered (year 2011	= 12.00 ha
Field Capacity, ha hr^{-1}	= 0.3 - 0.4
Field efficiency, %	= 68 - 70
Seed saving, %	= 15 - 20

- Different types of plates are used for different kinds of seeds. The overall performance of the planter for sowing vegetable pea, moong and lady finger was found satisfactory.
- This machine is very good for intercropping as it has separate seed boxes.

Front Line Demonstration (FLD)

Demonstration of raised bed planter.

Total area covered (year 2011)	= 5.00 ha
Average field capacity (ha h^{-1})	= 0.40 - 0.45
efficiency (%)	= 67 - 70
Bed width, cm	= 30
Bed height, cm	= 15

- It can be recommended for light and medium type soils. In heavy soils it requires very good field preparation to collect soils for making beds. The raised bed planter does proper placement of seed and fertilizer on beds.
- Soybean yield increased 15%

Demonstration of tractor operated laser guided land leveler.

Total area covered (year 2011)	= 15.00 ha
Average field capacity (ha h^{-1})	= 0.20 - 0.24
Average field efficiency (%)	= 60 - 65
Saving in irrigation, %	= 20 - 25
Cost of leveling, Rs. ha^{-1}	= 2425/-

- The laser guided land leveler suitable for operation at zero slopes could be used by dividing plots into smaller subplots and then leveling each subplot separately.
- The laser guided land leveler giving precision leveling with standard deviation of reduced levels varying from 0.40 - 0.50cm
- The yield of soybean was found to increase by 17 - 22%

Demonstration of tractor operated roto-till drill.

Total area covered (year 2011)	= 12.00 ha
Average field capacity (ha h^{-1})	= 0.31 - 0.35
Average field efficiency (%)	= 64 - 77
Fuel saving, %	= 50 - 60
Time saving, %	= 60 - 70

- Very useful machine for early sowing of wheat in fields where weed infestation was low. A higher Hp (50HP) tractor is required in black soils.

Demonstration of self -propelled 8-row rice transplanter.

Total area covered (year 2011)	= 3.00 ha
Average field capacity (ha h^{-1})	= 0.15 - 0.18
Average field efficiency (%)	= 65 -70
Cost of operation, Rs. ha^{-1}	= 1200/-
Labour saving, %	= 50 - 60

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

Demonstration of tractor operated aero blast sprayer.

Total area covered (year 2011)	= 8.00 ha
Average field capacity (ha h^{-1})	= 1.5 - 2.2
Average field efficiency (%)	= 70 - 72
Operating speed (kg h^{-1})	= 1.5
Effective width of coverage, m	= 12 - 13
Time saving, %	= 40 - 50
Cost saving, %	= 45 - 50
Cost of operation, Rs. ha^{-1}	= 580/-

- Machine is found to be very useful for application of pesticide on tall crops and fruit trees.
- The farmers are satisfied with the performance of the machine.
- The main breakdown were observed in cross, pulley and belt.
- The cost of machine high.
- Weight of machine is higher.
- The sprayer can spray volume ranging from 100- 400 l ha^{-1} effectively.
- The performance of the sprayer is largely affected during high wind speed.
- Machine is recommended for large scale adoption. Efforts are being made to popularize the machine by the State Govt. by providing subsidy on this machine (Rs. 30,000/-).

Post Harvest Technology

Operational Research Project in Agro Processing complex with techno-economic Feasibility

Demonstration of de oiling soybeans by mechanical oil expeller: De oiling of soy grits was demonstrated to a small oil miller Shri Sanat Sondhiya of Pariyat Village.

- An oil recovery of 82.95% was obtained.
- Oil recovery of more than 80% can be obtained from soybean expeller in oil ordinarily purchased by small oil millers.

Development of agro processing complex (APC): The following technologies were extended for demonstration and training through different APCs of the PHTS.

- Mini rice mill.
- Potato chips making machines
- Mini Dal mill- (Akola Designs)
- Coarse millet peeler
- An standard oil expeller for deoiling oil seeds crops
- Mini wheat flour mill
- Pea shelling machine

Design, Development of Testing of Groundnut Testa Remover

- Best Shelling efficiency was 88.78% over canvas sheet .
- The capacity of the machine is 40 kg hr^{-1}.
- The processing cost of machine was calculated 0.80 Rs. kg^{-1}.

Design, development Bengal Gram Pod Stripping Machine.

- The Stripping efficiency was 93.66 % and 89.44 % respectively.
- The capacity of the machine is 24 kg hr^{-1}

Field evaluation and testing of equipments developed at centers.

" After preconditioning treatment, The efficiency was found to be about 84%. The feed rate of pigeon pea in Akola dal mill should be 60 kg hr^{-1}.

- For CFTRI Dal Mill the feed rate of pigeon pea in Akola dal mill should be 60 kg hr^{-1}, i.e. the hand wheel should be opened up to 1.5 threads. Efficiency was 78%.
- CIAE Grain Pearler is a batch type pearler working for a batch of 20 kg. per batch, having a retention time of 2 to 3 minutes. Its efficiency was 80-82%. It worked satisfactorily for pearling of sorghum and Kodo.

Post harvest Management of Medicinal crops.

- Maximum peeling capacity 101.6 g hr^{-1} was obtained when peeling is done by knife and

Feasibility evaluation of T.D. Inclined Plate Planter

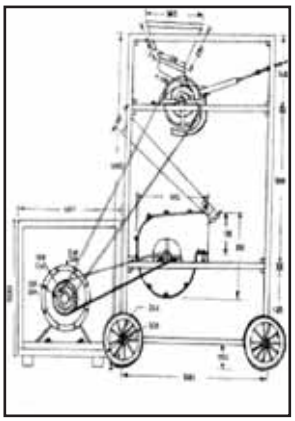
Raised Bed Planter

Tractor operated Laser Guided Land leveller

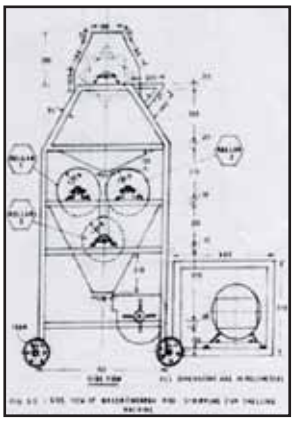
Tractor operated Roto-Till Drill

Self Propelled 8-row Rice Transplanter

Tractor operated Aero Blast Sprayer



Groundnut Testa Remover



Gram Pod Stripping Machine

the least 41.6 g hr^{-1} when the sample is pre blanched and peeled by knife.

- Drying of Safed Musli takes more time when dried in shade than any other method but the lightness and saponin content was found to be maximum under this condition of drying.
- Maximum loss of saponin content was observed when dried in cabinet dryer in which the temperature lies in the range of 57-92°C with the air velocity of 1.62 m/s and 1.88 m/s respectively.

Compilation of status and potential of agro processing industries in Madhya Pradesh

- In all 12 Process Industries from different part of MP were visited.
- The operational efficiency as reported by plant operators was 60 to 80 %.
- Most of these industries directly sell out their by-products.
- Wastage was reported to be 5- 15%.
- Most of these industry owners observed market driven standard and were aware of legal standards.

Impact assessment of technologies developed on PHT

Manual Water Chest Nut Decorticator:

- Whole Kernel Recovery enhanced by 23 %. (increased from 76% to 99%)
- Employment generation
- Direct = 1800 mandays
- Indirect= 9,000 mandays
- Savings over traditional method = Rs. 1150 q^{-1}.

Power operated Pea Shelling Machine:

- Capacity of Peeling increased from 2 to 3 kg per person to more than 30 kg per person.
- Time saving increased by 900%
- Employment generation
- Direct = 360 man days per year
- Indirect= 1800 man days per year.
- Savings over traditional method = Rs.2772 day^{-1}.

Green Bengal Gram Pod Stripping Machine

- Capacity of pod stripping (per person per hour) increased from 2 to 3 kg to more than 50 kg.
- Time saving increased by 1567 %
- Employment generation

Direct = 180 man days per year per machine.

- Indirect= 540 man days per year per machine.
- Savings over traditional method = Rs. 308 q^{-1}

Multi-Fruit Grader

- Capacity of Grading increased from 25 kg hr^{-1} to 1200 kg. hr^{-1} per person
- Time saving increased by 4700 %
- Employment generation

Direct = 600 mandays per year per Machine

- Indirect = 1200 mandays per year per Machine.
- Savings over traditional method = Rs. 15 q^{-1}.

Renewable Energy Sources for Agriculture and Agro based Industries-

Thermo-chemical conversion technology

ORP on 6-10 m^3 capacity cattle dung based solid state biogas plant under vertisol conditions.

- One biogas plant of 10 m^3 capacity has been recently constructed & commissioned
- Monitoring and data collection is on going for performance evaluation of the plant

Planned subsequent use:

- Lighting 4 gas lamps each of 100 candles soon after their availability.
- Power generation by running 5hp diesel engine on dual fuel mode
- The total cost of the construction of 10 m^3 Modified Janta type biogas plant was found

to be Rs. 1.10 lacs

- The bio gas generation started after 7 days of first initial charging of the plant. The feed slurry had water dung ratio 1:1
- The gas generation from plant appeared satisfactory qualitatively.

Evaluation and ORP trials of SPRERI IDBG wood stove

Design dimension of IDBG cook stove

- Height of cook stove = 49.5 cm,
- Inner diameter =17 cm,
- Outer diameter = 22 cm,
- Gas wick diameter = 8.5cm,
- Gas wick thickness = 4cm,
- Grate diameter = 14cm,
- Grate thickness = 1cm,
- Primary air holes = 4 no.
- Primary air hole dia. = 3.3 cm
- Secondary holes = 24no
- Secondary hole dia. = 1.5cm
- Length between secondary hole and grate = 25.5cm
- Volume of fill of cook stove = 0.005785 m^3

Laboratory evaluation of IDBG cook-stoves

Stove operation	:	consistent with negligible smoke emission and satisfactory flame controllability
Thermal efficiency	:	29.10 to 31.20%
Fuel wood consumption Rate	:	1+0.25 kg h^{-1}
Fuel Specification	:	Sized wood blocks Max dimension 30-50mm Min dimension 20-40mm Moisture content 10+0.8 % LHV - 4000 kcal kg^{-1}

Results of evaluation of IDBG cook-stove with other biomass fuels viz Coconut shell, Groundnut shell, Jatropha shell, spent Maize cobs, Pigeon pea stalks, Lantana stalks.

Stove operation: Satisfactory

Thermal efficiency	:	28.2 to 30.3%
Fuel processing requirement	:	Drying and sizing

Field evaluation based on user's feedback

Test location	-	College-canteen, Roadside hotels
Stove operation	-	Highly satisfactory
Fuel used	-	Sawn off cuts of timber
LPG replacement	-	About 5kg of biomass fuel replaced 1kg of LPG

The stove is portable and offers trouble free operation with sized dry biomass fuels and has potential for offering considerable fuel saving in rural area for domestic use and reducing health hazards as it ensures complete combustion with visibly no smoke emission.

***Ad-hoc* project sanctioned : (1.4.2011 to 31.3.2012)**

- Preservation of water chestnut (Trapa bispinosa roxburg.) by gamma. Principal Investigator Dr. S. S. Shukla, Sr. Scientist (PB) College of Agriculture, JNKVV, Jabalpur. Funding agency BARC, Trombay Bombay. Sanctioned for Rs. 17.55 lakhs duration 3 years.
- Development of transgenic oat (Avena sativum) over expressing fungal phytase gene" Principal Investigator Dr. Sharad Tiwari Principal Scientist (PB), Jabalpur Funding agency MPCST, Govt. of MP sanctioned for Rs. 7.98 lakh duration 5 years.
- Molecular breeding selection strategies to combine and validate QTL for improving WUE and Heat tolerance in wheat" P. I. Dr. P. C. Mishra, Pr. Scientist (PB) Powarkheda (Hoshangabad), funding agency CIMMYT University of Sydney for Rs. US$ 67505 duration 5 years.
- Revalorizing small millets in rainfed regions of South Asia" Principal Investigator Dr. A. K. Jain, Senior Scientist College of Agriculture, Rewa funding agency Dhan Foundation Madurai (TN) sanctioned for Rs. 6.41 lakhs duration 4 year.

- Collaborative Hybrid maize evaluation trial" P. I. Dr. D. K. Mishra, Head, Dept. of Plant Breeding & Genetics, Funding agency CIMMYT, Univesity of Sydney for Rs. 2.50 lakhs.
- Selection and utilization of water logging tolerant cultivars in pigeon pea. P. I. Dr. S. K. Rao, Dean Faculty of Agriculture, JNKVV Jabalpur , funding agency Govt. of India and ICRISAT under NFSM sanctioned for Rs. 68.53 duration 5 years.
- Stress Tolerance Rice for Africa and South Asia (STRASA) Principal Investigator Dr. P. Perraju, Sr. Scientist (PB) College of Agriculture, Rewa funding agency IRRI, Philippines sanctioned for Rs. 4000 US$ duration 3 years.
- "National Initiatives on Climate Resilient Agriculture (NICRA) Real time pest surveillance in Pigeon pea P. I. Dr. S. B. Das, Principal Scientist (Entomology), College of Agriculture, Jabalpur. Funding Agency ICAR, New Delhi, sanctioned for Rs. 5.00 lakhs (2011-12) (NICRA)
- Climate change and Lac crop performance at Jabalpur P. I. Dr. Moni Thomas Sr. Scientist (Entomology) Directorate of Research Services Jabalpur, funding agency ICAR, New Delhi. Sanctioned for Rs. 15.00 lakhs duration 3 years. (NICRA)
- Maximization of Soybean production in Madhya Pradesh. P. I. Director Research Services, JNKVV. Jabalpur, funding agency Japan International Cooperation Agency (JICA), Japan sanctioned for Rs. 15.00 lakhs (2011-12)
- Tribal Seed Project (TSP) Principal Investigator Dr. S. K. Rao, Dean Faculty of Agriculture, JNKVV Jabalpur. Funding agency Govt. of India. Sanctioned for 4.00 lakhs.
- Establishment of mother plant nurseries for high pedigree planting material of fruit crops" Principal Investigator Dr. S. K. Pandey, Principal Scientist (Horti), College of Agriculture, Jabalpur. Funding agency Govt. of India sectioned for Rs. 42.62 lakhs duration 3 years.
- 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 lakh duration two years.
- 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 lakh duration 4 months
- 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 lakh duration two years.
- Surveillance study of soybean cultivation in East MP (East surveillance) Dr. S. B. Nahatkar, Principal Scientist (Agril. Econ.) Directorate of Research Services, JNKVV Jabalpur, Sanctioned by Japan International Cooperation Agency, Japan for Rs. 8.50 lakh duration one year.

List of ongoing All India Coordinated Research Projects/All India Network Projects Operating under JNKVV during 2011-12

S. No.	Name of Project	Budget For 2011-12 (Rs. in lakhs)	Name of Project Incharge	Associated Scientists
CROP IMPROVEMENT				
1	Maize Improvement, Chhindwara	49.17	Dr. R.K. Reddy	Dr. V.K. Paradkar
2	Rice Improvement, Rewa	78.94	Dr. S.K. Tripathi	Dr. C.M. Mishra Dr. P. Perraju Dr. I.M. Khan
3	Niger, Chhindwara	35.82	Dr. S.K. Thakur	Shri G.K. Rai
4	Linseed, Sagar	43.76	Dr. M.P. Dubey	Dr.(Smt) P. Das
5	Linseed, Powarkheda	2.00	Dr. V.S.N. Rao	-
6	Sesame, Tikamgarh	74.69	Dr. S.K. Chourasia	Dr. G.K. Satpute Dr. M.P. Gupta
7	Sesame, Powarkheda	31.55	Dr. V.S.N. Rao	Dr. G.L. Thakur
8	Soybean, Jabalpur	62.72	Dr. A.N. Shrivastava	Dr. R.K. Verma
9	Chickpea, Jabalpur	67.24	Dr. (Mrs) Om Gupta	Dr.(Smt) Anita Babbar Dr. Suneeta Pandey
10	Millets Improvement, Dindori	59.70	Dr. O.P. Dubey	Dr. S.K. Choubey Dr. Abhinav Sao
11	Millets Improvement, Rewa,	60.34	Dr. A.K. Singh	-
12	Wheat Improvement, Powarkheda	51.29	Dr. P.C. Mishra	Dr. D.N. Shrivas
13	Wheat Improvement, Sagar	58.19	Dr. U.K. Tiwari	Dr. A.R. Washnikar
14	Sugarcane, Powarkheda	73.63	Dr. A. Chatterjee	Dr. A.K. Choudhary
15	Nematode Pests & their control, Jabalpur	65.34	Dr. S.P. Tiwari	Dr. Jayant Bhatt Dr.(Smt) Usha Bhale
16	Barley Improvement, Rewa	22.62	Dr. A.K. Singh	-
17	NSP - Breeder Seed Production, Jabalpur	56.72	Dr. G.K. Koutu	Dr. S.K. Singh
18	NSP - Seed Technology Research, Jabalpur	117.86	Dr. D. Khare	Dr. M.S. Bhale
20	Forage Crops	60.75	Dr. A.K. Mehta	Dr. Amit Kumar Jha
21	MULLaRP, Sagar	17.79	Dr. (Smt) P. Das	-

S. No.	Name of Project	Budget For 2011-12 (Rs. in lakhs)	Name of Project Incharge	Associated Scientists
CROP IMPROVEMENT				
22	Biological Control of Crop, Pests and Weeds, Jabalpur	1.86	Dr. S.B. Das	-
NATURAL RESOURCE MANAGEMENT				
23	Integrated Farming System Research, Jabalpur	182.34	Dr. K.K. Agrawal	Dr. B.S. Dwivedi
	(i) MAE , Rewa		Dr. B.M. Mourya	-
	Powarkheda		Dr. R.S. Lidder	-
	(ii) ECF, Dindori		Dr. R. K. Meshram	-
	Katni		Sh. R.K. Sharma	-
24	NWP – Organic Farming	7.57	Dr. K.K. Agrawal	-
25	Micro & Secondary nutrients and Pollutant Elements in Soils, Jablpur	61.34	Dr. P.S. Kulhare	-
26	Soil Test Crop Response, Jabalpur	8.00	Dr. B. Sachidanand	Shri S.S. Baghel Dr. Amit Upadhyay
27	Long Term Fertilizer Exp., Jabalpur	58.40	Dr. N.K. Khamparia	Dr. S.K. Sawarkar Dr. R.K. Pathak (RA)
28	AINP on Biofertilizer (BNF), Jabalpur	20.00	Dr. A.K. Rawat	-
29	Agro-Forestry, Jabalpur	73.96	Dr. L.D. Koshta	-
30	Dryland Agriculture, Rewa	165.48	Dr. D.P. Dubey	Dr. S.K. Pyasi Shri A.S. Patel
31	Optimization of Ground Water Resources through Wells & Pumps	23.33	Dr. R.K. Nema	Dr. M.K. Awasthi Shri Y.K. Tiwari
32	Agro-meteorology	68.00	Dr. Manish Bhan	-
33	Water Management	75.00	Dr. R.V. Singh	Dr. P.B. Sharma Dr. M.L. Sahu Dr. P.N. Tiwari Dr. S.K. Padihar
HORTICULTURE				
34	Vegetable Improvement	63.22	Dr. S.K. Sen Gupta	Dr. S.K. Sengupta Dr. S.K. Mittra Dr. R.K. Shrivastava
35	Potato Improvement	30.50	Dr. A.K. Naidu	-

S. No.	Name of Project	Budget For 2011-12 (Rs. in lakhs)	Name of Project Incharge	Associated Scientists
36	Sub Tropical Fruits	36.51	Dr. Jagdish Singh	Dr. T.K. Singh
37	Medicinal, Aromatic Plants and Betelvine	40.92	Dr. U.K. Khare	Dr. Sanjeev Kumar Dr. Swati Barche
38	Spices	0.95	Dr. Sengupta	-
39	Arid Zone Fruits	20.13	Dr. C.S. Pandey	-
40	AINRP on Onion & Garlic	10.96	Dr. Akhlesh Tiwari	-
AGRICULTURAL ENGINEERING				
41	Farm Implements & Machinery	51.00	Dr. K.B. Tiwari	-
42	Harvest & Post Harvest Technology	78.68	Dr. Mohan Singh	Dr. Ravi Agrawal Dr. (Smt) Sheela Pandey
43	Renewable Energy Sources	42.44	Dr. B.M. Khandelwal	-
	Grand Total	**2210.71**		
Government of India Projects				(Rs. In lakhs)
44	Agro Economics Research Centre, Jabalpur	86.05	Dr. A. Shrivastava	Dr. N. P. Sharma Dr. H. O. Sharma Dr. U. S. Thakur
45	Cost of Cultivation Scheme, Jabalpur	280.00	Dr. R.M. Sahu	
46	Agro Advisory Services, Jabalpur	4.10	Dr. Manish Bhan	
	Powarkheda	4.95	Dr. Anita Thakur	
	Tikamgarh	4.24	Dr. A.K. Shrivastava	
	Chhindwara	4.32	Dr. V.K. Paradkar	
	Grand Total	**383.66**		

LIST OF ON GOING AD-HOC PROJECTS

S. No	Title	Amount (in lacs)	Duration	Name of PI
GOVERNMENT OF INDIA				
1.	Establishment of Facilitation centre on medicinal and aromatic plants.	30.00	1.4.2008 31.3.2013	Dr. S. D. Upadhayay Professor, Jabalpur
2.	'Rapid conversion of normal maize inbreeds to quality protein maize and further enhancement of limiting amino acids in elite inbreeds through market assisted selection"	52.61	1.11.09 30.10.14	Dr. Sharad Tiwari Biotechnology Cetrre JNKVV, Jabalpur
3.	Identification of potential vegetation for bio drainage and fitting in evaluation of bio drainage in Tawa Command of Madhya Pradesh	55.52	1.4.2010 31.3.2015	Dr. N.N. Pathak, Head, Agroforestry, Jabalpur
4.	"Marker assisted breeding of abiotic stress tolerant rice varieties with major QTLs for drought, submergence and salt tolerance at Rewa".	48.60	1.11.2010 31.10.2015	Dr. P. Perajju Senior Scientist (PB) Rewa
5.	"Integrated Agri-biotechnologies of socio-economic upliftment of Baiga and Gond tribes of Madhya Pradesh"	108.48	1.1.2011 31.12.2014	Dr.Sharad Tiwari Principal Sci. (PB) JNKVV. Jabalpur
6.	Preservation of water chestnut *(Trapa bispinosa roxburg.)* by gamma radiation.	17.55	1.4.2011 31.3.2014	Dr. S. S. Shukla Sr. Scientist (PB) JNKVV,Jabalpur
7.	Seed Production in Agricultural Crops (Mega Seed project)	23.00	2011-12 Continued	Dr. S. K. Rao, Director Farms
8.	Evaluation and production of Cytoplasmic Genetic Male Sterility (CGMS) Based hybrids for enhancement of productivity and stability of yield in pigeonpea	189.96	16.8.2011 15.8.2013	Dr. Dhirendra Khare Professor (PB) Jabalpur
9.	Establishment of mother plant nurseries for high pedigree planting material of fruit crops"	42.62	5.11.11 4.11.14	Dr. S. K. Pandey Principal Scientist (H) Jabalpur
10.	1. Rehabilitation of 3 plant tissue culture Laboratories. 2. Estt. of 2 leaf/Plant tissue culture Laboratories (Jabalpur Horticulture Biotech.)	116.00	23.01.2008 continued	HOD Horti Dr. Sharad Tiwari
11.	"Development of molecular markers in chickpea breeding for developing superior cultivars with enhanced disease resistance"	56.39	1.11.2009 31.10.2014	Dr.Anita Babbar, Principal Scientist (PB), Jabalpur
12.	Improving heat tolerance in chickpea for enhancing its productivity in warm growing conditions and mitigating impact of climate change	29.94	1.4.2010- 31.3.2014 31.7.2012	Dr. Anita Babbar, Principal Sceitnsit (PB), Jabalpur

S. No	Title	Amount (in lacs)	Duration	Name of PI
GOVERNMENT OF INDIA				
13.	Molecular breeding selection strategies to combine and validate QTLs for improving WUE and Heat tolerance in wheat	33.75	15.5.2011 14.5.2016	Dr. P.C. Mishra ADR Powarkheda
14.	Metabolic and molecular profiling of aromatic rice germplasm of India for gaining insights about aroma	10.20	1.8.2012 30.9.2014	Dr. G. K. Koutu, Principal Scientist JNKVV Jabalpur
15.	CSS on Developing guidelines for conduct of DUS test in small millets	12.74	2012-13 1.9.2012 30.8.2013	Dr. Abhinav Sao Scientst (PB) RARS, Dindori
16.	Baseline survey of flora and fauna around atomic power plant at Chutka (BARC)	24.55	1.10.2012 30.9.2014	Dr. S. D. Upadhayaya Prof. (Crop Physio.) Jabalpur
Agril. Engineering Division				
17.	"Scaling of water productivity in agriculture for livelihood through teaching cum demonstration training of trainers and farmers at Powarkheda"	125.00	2007-2012	Dr. R. V. Singh Principal Scientist (Agro) Powarkheda
INDIAN COUNCIL OF AGRICULTURAL RESEARCH (ICAR)				
18.	Technology Mission Citrus	284.06	18-1-2011 Continued	Dr. S. R. Dharpure Principal Scientist Chhindwara
19.	Network project on harvest, processing and value addition of Natural resin and gums	61.15	1.10.2008 31.3.2013	Dr. Moni Thomas Sr. Scientist (Ento.) Jabalpur
20.	Biotic Stress (Rusts) of wheat, Powarkheda	5.05	1.12.2009 30.6.2012 continued	Dr. P.C. Mishra, ADR, Powarkheda
21.	Business Planning and Development (BPD) Project	327.61	1.12.2009 30.6.2013	Dr. S. K. Rao, Dean Rewa
22.	Increasing chickpea and pigeonpea production through intensive application of integrated Pest Management	60.80	1.7.2010 31.3.13	Dr. A. K. Bhowmick Principal Scientist (Entomology) JNKVV Jabalpur
23.	"Development of new plant type varieties with higher yield and in built resistance to major pest and disease"	14.65	1.7.2010 30.6.2013	Dr. G. K. Koutu, Senior Scientist, (PB) Jabalpur
24.	"Network project on hybrid rice research"	9.00	1.7.2010 30.6.2013	Dr. G. K. Koutu, Senior Scientist, (PB) Jabalpur

S. No	Title	Amount (in lacs)	Duration	Name of PI
25.	Network centre on National initiative on climate change resilient agriculture—AICRPDA-NICRA (ICAR)	30.25	2010-11 2011-12	Officer in charge Dry land Agriculture, Rewa
26.	Weather based agro advisories and assessment of vulnerable areas of major food crops production zone. AICRPAM-NICRA (ICAR)	13.05	2010-11 2011-12	Dr. Manish Bhan Scientist JNKVV. Jabalpur
27.	"National Initiatives on Climate Resilient Agriculture (NICRA) Real time pest surveillance in Pigeon pea	5.00	2010-11 2011-12	Entomology (Dr. S. B. Das)
28.	Climate change and *Lak* crop performance at Jabalpur (NICRA)	4.00	9.11.11 8.11.14	Dr. Moni Thomas Senior Scientist (Ento.) Jabalpur
INTERNATIONAL AID FUNDED				
29.	Maximization of Soybean production in Madhya Pradesh.	15.00	2011-12	Director Research Services, JNKVV. Jabalpur
30.	Surveillance study of soybean cultivation in East MP (East surveillance)	8.50	2012	Dr. S. B. Nahatkar Principal Scientist (Agril. Econ.)
31.	Development of a new drainage, tillage and sowing method combination for stabilizing soybean yield (cultivation and machinery)	8.93	2012	Dr. A. K. Jha, PI Asstt. Prof (Agro) CoA Jabalpur
32.	Re-evaluation of soil fertility and fertilizer effects in MP soybean fields (Fertilizer reduction)	8.43	2012	Dr. B. S. Dwivedi Asstt. Prof (Soil Sci.) CoA Jabalpur
33.	Evaluation of soybean cultivars against moisture stress and dense plant population in East MP	8.43	2012	Dr. S. K. Pandey, (Plant Breeding)
34.	IPM adopting seed dressing technology with systemic and selective pesticides for using natural enemy (Natural enemy	3.93	2012	Dr. S. K. Srivastava Professor /ADR DRS Office Jabalpur
35.	Development of observation sheet and book on soybean pests and diseases of MP farmers (Observation materials)	2.20	2012	Dr. A. K. Bhowmik Professor (Ento.) Jabalpur
36.	Molecular identification of insect biotypes and virus species for selection of optimum chemicals in East MP	3.93	2012	Dr. (Mrs.) Keerti Tantuwai Asstt. Professor (Biotechnology)
37.	Selection of new *Trichoderma* strains against soil borne diseases in East MP	5.93	2012	Dr. R. K. Verma Professor (Pl.Patho) Principal Investigator

S. No	Title	Amount (in lacs)	Duration	Name of PI
38.	Molecular marker evaluation of soybean cultivars for gene based cultivar selection (Molecular marker)	3.93	2012	Dr. Sharad Tiwari Professor (Pl. Br.) Biotech Centre JNKVV Jabalpur
39.	Soybean cultivation manual and demonstration trials in East MP	7.36	2012	Dr. S. B. Nahatkar Dr. S. K. Shrivastava
40.	Development of locally adoptable cooking recipes using soybean	5.93	2012	Dr. C. J. Singh Dr. K. C. Singh
41.	Project planning and management as facilitator organization	8.00	2012	Dr. S. S. Tomar, DRS (Project Manager-JICA)
42.	Collaborative Hybrid maize evaluation trial	2.50	15.7.2011 2011-12	Dr. D. K. Mishra HOD Plant Breeding JNKVV
43.	Stress Tolerance Rice for Africa and South Asia (STRASA)	20.00	2011-12	Dr. P. Perraju, Sr. Scientist (PB) Rewa
STATE GOVERN MENT				
44.	Establishment of five Model Nursery of medicinal Plants under JNKVV (Jabalpur/Powarkheda/ Sagar/Mandla/Dindori)	100.00	(2009-10 2010-11) continued	Dr. A. B. Tiwari, Principal Sci. Cop Physiology) JNKVV Jabalpur
45.	Exploration, collection and conservation of wild species and land races from eastern Madhya Pradesh”	9.77	1.4.2010 31.3.2013	Dr. P. Perajju, Sr.Scientist (PB), Rewa
46.	Conservation and evaluation of germplasm of mango in Rewa district of Madhya Pradesh”	8.47	1.4.2010 31.3.2013	Dr. Rajesh Singh. SMS, (Horti.) Rewa
47.	“Data generation and evaluation of production technology of medicinal and aromatic plants using IT tools”	3.33	1.5.2010 30.4.2013 continued	Dr. A. K. Rai, Assistant Processor Instrumentation Centre
48.	Ensuring livelihood security through management of genetic resources and seed supply system in tribal areas of M.P.	751.47	2008 2013 (5 years)	Dr. S. K. Rao Director Farms JNKVV. Jabalpur
49.	Development of transgenic Oat *(Avena sativum)* over expression fungal	7.98	1.5.2011 30.6.2016	Dr Sharad Tiwari Professor (PB) JNKVV. Jabalpur
50.	Drying and dehydration characteristics and potential for value addition in under utilized as well as commercially important fruits and vegetables of Madhya Pradesh”	4.36	11.1.2012 31.12.14 .	Dr. Aparna Sharma, Assistant Professor (Food Sci.) Ganj Basoda (Vidisha).
51.	Biocontrol potential of local isolates of *Trichoderma* in Madhya Pradesh”	6.39	1.4.2012 31.3.2014	Dr. Ashish Kumar Asstt. Professor (Plan Pathology) Rewa

S. No	Title	Amount (in lacs)	Duration	Name of PI
52.	Collection, evaluation and utilization of elite lines of wheat from different parts of MP	7.82	3.7.12 2.7.15	Dr. R. S. Shukla Principal Scientist (PB) Jabalpur
Agril. Engineering division				
53.	Madhya Pradesh Water Sector Restructuring Project (MPWSRP)	1301.00	2006 to 2014	Dr. G. S. Rajput Dr. M. K .Nema Principal Scientist (SWE), Jabalpr
OTHER AGENCIES				
54.	Revalorizing small millets in rainfed regions of South Asia	6.40	2011-2014	Dr. A. K. Jain Senior Scientist Rewa
55.	Effective utilization and popularization of GYPSUM as source of nutrient in different crops of Vidisha district of MP	2.27	1.9.2012 28.02.13	Dr. R. S. Raghuvansi Associte Professor (Ag. Economics) Ganj Basoda

List of Mandi funded projects functioning during 2011-12

(Rs. in lakh)

	Name of project	Total Budget Out lay	Remarks
1.	Estt.of Dryland Horti. Res. St. -cum-Training Centre, *Rangua, Garhakota*	*347.73*	*Completion: till March 2012*
2.	Estt of Horticulture Vocational Edu. Inst, *Ranguan, Garhakota*	*897.00*	*Completion: till March 2012*
3.	Use of Microbes for plant protection and nutrient management in increasing crop productivity. *Dept. of Soil Science & Agril. Chemistry, College of Agriculture, Jabalpur*	767.44	*Completion: till March 2014*
	Grand total Rs.	2012.17	

Detail of Product Testing 2011-2012

SNo	Name of company	Fee (Rs.)	Name of Product	Crop	Location
1.	BASF INDIA LTD. MUMBAI	1,10,300	Verismo 22% SC	Soybean	Jabalpur
		1,10,300	Persuit (+) 70% Wg	Soybean	Powerkheda
		1,10,300	Succeeding	wheat	Powerkheda
		1,10,300	Basagran Bentazone 48%	Soybean	Jabalpur
		1,10,300	Succeeding crop	wheat	Jabalpur
		1,10,300	Acronis- 50% FS: against Seedling diseases	Soybean	Jabalpur
		1,10,300	Opera -18.3% SE: against Foliar diseases in	Soybean	Jabalpur
		1,10,300	Intepid -10%SC against DBM in	Cabbage	Jabalpur
2.	EXCELL INDUSTRIES LTD MUMBAI	1,10,300	Emidachloprid 0.3%	Ground Nut	Chhindwara
3.		1,10,300	Tabuconazole 25%	Rice	Rewa
4.		1,10,300	Amm.Salt Glyphosate : Herbicide	Cotton	Chhindwara
5.		1,10,300	Amm.Salt Glyphosate : Herbicide	Tomato	Jabalpur
6.		1,10,300	Profenophos 40% + Fenpyroximate 5%	Chilli	Jabalpur
7.		1,10,300	Azoxystronin 2.5%+ Tabuconazole 25%	Rice	Jabalpur
8.		1,10,300	Azoxystronin 23.5%	Chilli	Jabalpur
9.		1,10,300	Tabuconazole 25% + sulphur	Chilli	Jabalpur
10.		1,10,300	Tabuconazole 25% + sulphur	Soybean	Jabalpur
11.		1,10,300	Azoxystronin 2.5%+ Tabuconazole 25%	Chili	Jabalpur
12.	Parijat Agro Chem NewDelhi	1,10,300	Pyroprofen insecticide	Tomato	Jabalpur
		1,10,300	Pyroprofen	chili	Jabalpur
		1,10,300	Pyroprofen	Okra	Jabalpur
		1,10,300	Pyroprofen	Brinjal	Jabalpur
		1,10,300	Fipronil 4% + Acetamiprid in	cotton	Chhindwara
13.	Mahyco seeds	1,10,300	Bhindi varieties	Bhindi	Jabalpur
14.	Crystal Phos	1,10,300	Chloromurion Herbicide / Succeeding crop	Soybean Trs. Paddy Wheat	Jabalpur
15.	Sharda World wd export Pvt.	1,10,300	Quizalofop-P-ethyl 5%EC II nd se	soybean	Jabalpur

SNo	Name of company	Fee (Rs.)	Name of Product	Crop	Location
16.		1,10,300	Imazathapyr 10% SL	soybean	Jabalpur
17.	Dupont	1,10,300	Picoxystrobilurin 25 SC	soybean	Jabalpur
18.		1,10,300	Cyazypyr (HWG 10% OD)	soybean	Jabalpur
19.	MONSONTO MUMBAI	1,10,300	Maize Hybrids	Maize	Chhindwara
20.	Syngenta, Pune	1,10,300	Paddy varieties	Paddy	Jabalpur
21.		1,10,300	Maize varieties	Maize	Chhindwara
22.		1,10,300	Vertako insecticide	Cotton	Chhindwara
23.	Biocare, Nagp[ur	1,10,300	Organic soil conditioner :	Paddy// Wheat	Jabalpur
24.		1,10,300		Kodo Kutki Niger, Ragi	Dindori
25.	Manisha seeds	1,10,300	Rice hybrids		Waraseoni
		1,10,300	Maize hybrids		Chhindwara
26.	Pesticide India	1,10,300	Profenophos 50%EC	Soybean	Jabalpur
27.	Devgen seeds	1,10,300	Rice hybrids	Paddy	Jabalpur
28.	Insecticide India	1,10,300	Imazathyper 10SL Succeeding Wheat crop	Soybean Wheat	Jabalpur
29.	Nuziveedu seeds	1,10,300	Paddy varieties/ hybrids	Paddy	Jabalpur
30.		1,10,300	Maize Seed varieties/ hybrids	Maize	Jabalpur
31.	Fortune hybrids	1,10,300	Paddy Seed varieties/ hybrids	Paddy	Jabalpur
32.		1,10,300	Maize Seed varieties/ hybrids	Maize	Jabalpur
33.	Prabhat Agri, Bio Tech Hyderabad	1,10,300	Paddy Seed varieties/ / hybrids	Paddy	Jabalpur
34.		1,10,300	Maize Seed varieties/ hybrids	Maize	Jabalpur
35.	Pravardhan Seeds Pvt Ltd Hyderabad	1,10,300	Paddy Seed varieties/ / hybrids	Paddy	Jabalpur
36.		1,10,300	Maize Seed varieties/ hybrids	Maize	Jabalpur
37.	Yaganti Seeds Pvt Ltd	1,10,300	Paddy Seed varieties/ /hybrids	Paddy	Jabalpur
38.	Intd Panaacea Ltd	1,10,300	Insecticide/ Kalichakra : stem borer Paddy		Rewa
39.	Ananya Multi tech pvt ltd.	1,10,300	Organic manure –	Soybean /Paddy/ Tomato	Jabalpur
40.	Nirmal seeds	1,10,300	Paddy hybrids/ hybrids	Paddy	Rewa
41.	Bio Seed res Hyderabad	1,10,300	Yellow/ white maize hybrids	maize	Chhindwara

SNo	Name of company	Fee (Rs.)	Name of Product	Crop	Location
42.	Ralis India	1,10,300	RIL -060/F-1	Soybean	Jabalpur
43.	Akash seeds	1,10,300	Rice hybrids	Paddy	Jabalpur
44.	Kohinoor seeds N. Delhi	1,10,300	Cotton hybrids	Cotton	Chhindwara
45.	Seed Works Hyderabad	1,10,300	Paddy varieties	Paddy	Rewa

EXTENSION SERVICES

Directorate of Extension Services as a constituent unit of Jawaharlal Nehru Krishi vishwa Vidyalaya, Jabalpur is entrusted with the responsibility for promotion of agricultural development in the state through quick transfer of technology by providing training, farm advisory services, KMS and information to extension personnel of the line departments and farmers. The Directorate of Extension Services is committed to serve farmers through well organized network covering seven agro climatic zones of the state. The channels for the transfer of agricultural and allied technologies are the direct approach to the farmers and indirectly by training of the master trainers of the extension agencies who own the responsibilities of transfer of agricultural technologies to the farmers, covering 25 districts of the state The motto of the university is reach the unreached through extension system, focused mainly on

- Testing and verification of new technologies developed at research stations in farmers fields, through on farm trials, on farm research and adaptive trials.
- Organizing demonstrations, kisan melas, exhibitions, farmers-scientists interactions meetings.
- Processing and publication of technical information and dissemination through publication, mass media such as press, radio TV channels for benefit of farmers and extension personnel.

Communication Centre

- Publication of literature, bulletins, manuals, books and folders.
- Recording of radio programmes for broadcasting through All India Radio, Jabalpur

Agricultural Technological Information Centre (ATIC)

Agricultural Technological Information Centre (ATIC) has been established at Jabalpur to cater the needs of farming community in terms of technological information products offered for sale and services rendered by the university through "Single Window System". A separate infrastructure under ATIC is being created with the following objectives:

- Strengthening the sale of Jawahar products like seeds, culture, planting material, vegetable seeds, medicinal and aromatic plants, farm implements, fingerling, poultry & dairy products.
- Plant and animal clinic services.
- Soil and water testing facilities.
- Testing of new pesticide products.

- Weather forecast based agro-advisory services.
- Dissemination of technology through electronic and print media.
- Agriculture Help Line on phone.

Krishi Vigyan Kendra (KVK)

A plan scheme designed and nurtured by ICAR for past four decades, will play a vital role as it has the following unique features:

- Creation of valuable resources in terms of technical manpower and assets.
- Confirmation of technologies to suit local specificity.
- Showcasing the frontier technologies.
- Capacity building among stakehold.ers.
- Front runner in technological application, information and inputs.
- Participatory approaches in planning, implementing, executing and evaluation.

KVKs all working towards reducing the time lag between generation of technology at the research institution and its application to the location specific farmers filed for increasing production, productivity and net farm income on sustained basis with the following mandates:

Application of technology / products through assessment, refinement and demonstration for adoption.

To achieve the mandate effectively, the fooling activities are envisaged

- On-farm testing to identify location specificity of agricultural technologies under various farming system.
- Front line demonstration to establish its production potentials on the farmers' fields.
- Training of farmers and extension personnel to update their knowledge and skills in modern agricultural technologies.
- Work as resource and knowledge centre of agricultural technologies for supporting initiative of public, private and voluntary sector for improving the agricultural economy of district..
- Produce and make available technological products like seeds, planting material, bio agents, young ones of livestock etc to the farmers.
- Organize extension activities to create awareness bout improved agricultural technologies to facilitate fast diffusion and adoption of technologies in agriculture and allied sector.

Location of KVKs

The KVKs are established as follows: 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), Chhattarpur (2005), Katni (2005), Mandla (2006) and Umaria (2006).

Method of assessing the need

All the extension based programmes are being designed based on need assessment of the farmers, field extension personnel and rural youths. The need of different members of the community are being assessed through Participatory Rural Appraisal (PRA) and based on the problems and availability of resources in the locality, Different programmes and activities are being designed and implemented based on need assessment. Training needs of the extension personnel are also assessed before start of training programmes and accordingly training curriculum are being designed.

2. Funding sources

- The Indian Council of Agricultural Research funded for KVKs programmes and activities.

- Beside this, the University also provides the funds for implementing different programmes especially for production of quality seeds at Instructional Farm.
- The funds are also made available by the Central Government for producing quality seeds of different major crops on the farmers' fields through participatory mode.
- The State government also provides the funds for multiplication of quality planting materials of horticultural crops under National Horticultural Mission.
- The Directorate of Extension Services and Communication Centre are being funded by the State government under State plan.
- The ATIC is being operated on revolving fund basis
- The extension activities organized at Zonal Research Stations, Regional Research Stations and College Campii are being funded by the ICAR and State Government.

Faculty and Scientists involvement

Units	Scientists (Nos.)	Supporting staff (Nos.)
Directorate of Extension Services	9	10
Communication Centre	1	2
ATIC	3	3
KVKs	130	62
Total	**143**	**77**

Salient Achievements

National Conference

The JNKVV has organized National Conference on Krishi Vigyan Kendra-2011 from December 3-5, 2011. Exhibition organized during the National Conference of KVKs, the achievements of the University were highlighted in the exhibition.

The conference was inaugurated by Sh. Sharad Pawar, Hon'ble Union Minister of Agriculture and Food Processing Industries, Govt. of India, New Delhi. More than 1200 delegates from 600 KVKs across the country participated in the conference based on the theme "Enabling Farmers for Secondary Agriculture". The National Conference was jointly organized by the ICAR, New Delhi and JNKVV, Jabalpur. The objective of the conference was to bring KVKs on a platform so that they could be benefitted from experience of each other and interact with eminent agriculture scientists. An exhibition was organized with the focus on Secondary Agriculture with some farm innovators and other stakeholders. Hon'ble Minister of Agriculture, Govt. of India and other dignitaries visited the exhibition stall of the KVKs and appreciated to work actively in their respective areas.

Monitoring system

Efforts were made to improve the monitoring system for which different programme were launched for timely submission of information. The e-linkage facility has been created in five KVKs. The need based infrastructural facilities were provided in all the KVKs for smooth functioning of KVKs. The reporting system of information was strengthened for timely submission of information to concerned organizations. Pre zonal and Zonal workshops of KVKs were organized successfully and review the progress of different KVKS. The scientific advisory meetings of all the KVKs were organized and action plan were developed for implementation in the operational areas.

Human resource development

A comprehensive training scheduled was prepared on various aspects of transferable technology with the aim to upgrade the knowledge and skill of extension functionaries of the state departments of agriculture, veterinary, horticulture, agricultural

engineering and allied developmental agencies. These trainings were organized in different campaii and emphasizing on natural resources management, diversification and intensification of cropping, organic farming, rainfed horticulture, integrated pest/disease and weed management. Training units were physically and financially strengthened for further improving the quality of trainings. Besides, regular training programmes at different units of the university, special trainings sponsored by Department of Farmers Welfare & Agriculture Development covering various aspects of production technology of crops viz. soybean, rice, rabi pulses, coarse cereals, biofertilizers and integrated pest management were organized for extension officers. The University also had the privilege to organize a State level training programmes sponsored by Department of Farmers Welfare and Agriculture Development on production technologies for productivity improvement in which senior officers participated. Another training programme of National Level was organized by this Directorate on technologies for productivity improvement in Rabi pulses in which extension personnel from State Department of Agriculture, Government of Madhya Pradesh, Chhattisgarh and Maharashtra states participated. The feedback from the participants helped to process the planning and development activities in future.

Back stopping

The Human Resource Development (HRD) could play a key role in the progress of agriculture. The University has given high priority to its HRD programmes. To update the knowledge and skill of KVK scientists, Directorate of Extension arranged 12 courses to benefit KVK Scientist during 2011-12.

Communication Centre

The Communication Centre publishes magazines, periodicals, bulletins and leaflets

Year	Programme	Participants
2007-08	07	226
2008-09	03	144
2009-10	05	183
2010-11	06	123
2011-12	12	239
TOTAL	33	915

for dissemination of information to the extension works and the farmers. "Krishi Vishwa", a quarterly publication has been very popular among farmers and extension workers. Special issues on major cereals, pulses and oilseeds, and horticultural crops are being published. Important state newspapers are publishing regular special columns on different agriculture features through popular articles prepared by scientists of the Vishwa Vidyalaya.

Every KVK published need based technical bulletins covering the technologies suitable for agro climatic zones. All India Radio Rewa, Chhattarpur, Bhopal and Jabalpur broadcasted 260 programmes on production technologies. Television media has also been utilized for mass dissemination of technologies. ETV and City Cable of Jabalpur featured more than 85 programmes on different aspects. Similarly, 347 TV talks were broadcasted through Doordarshan Kendra, Bhopal.

Krishi Vigyan Kendra

The Krishi Vigyan Kendra are assessing the technological needs of the district and revalidating the technology for adoption. Systematic work through field demonstrations, on and off campus training to extension workers and vocational trainings for farm youths and farm women have been regular activities of the KVKs, thus minimizing the technological gap between production achieved of various crops by the farming community and production potential of the technologies. Field days and Kisan Melas were also organized in all the seasons.

The State has the highest population of

tribal (23.68%) among the different Sates of the country (8.01%). The tribal farmers responded well to technical inputs of JNKVV in terms of natural resource management, use of improved varieties of maize, cotton and rice, soybean, castor and vegetables in their cropping systems. The Krishi Vigyan Kendra Dindori, Mandla, Betul, Chhindwara, Shahdol and Umaria have done commendable efforts for socio-economic upliftment of tribes. Similarly, Gonds and Baigas of Eastern tribal regions of the State have been benefited by extension efforts of Krishi Vigyan Kendras of Sidhi, Shahdol, Umaria, Katni and Seoni. Use of improved strains of minor millets and their substitutions by early varieties of urid, niger and paddy made definite impact on the productivity and socio-economic status of the farmers.

On-farm testing

During 2011-12, 306 OFTs on different aspects of crop production and protection were conducted by KVKs. These were conducted in participatory mode on 6635 farmers' fields. The process gave opportunities to the scientists to work and interact with farming community and collect useful feed back for production purposes.

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

On farm testing on different aspects

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

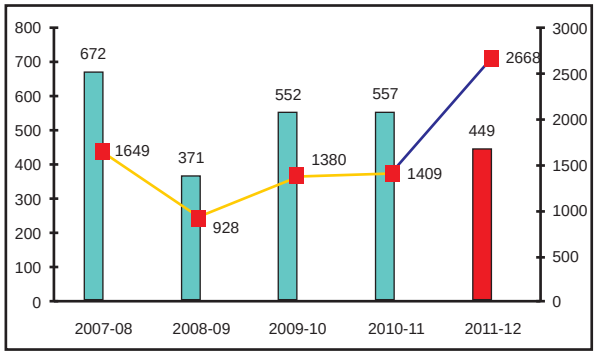
Assessment of wheat variety MP1202

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.

Frontline demonstration on soybean

A comprehensive FLD programme on oilseed (soybean, niger, sesame, groundnut, linseed mustard) and pulses (arhar, moong,

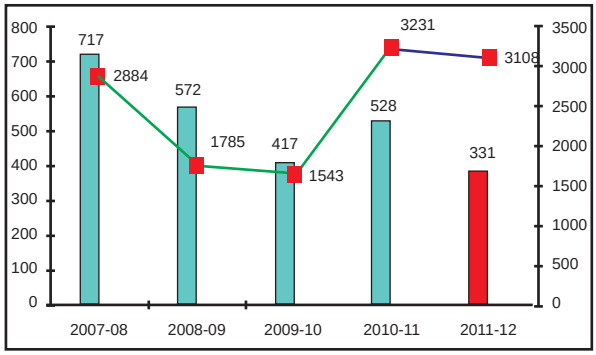


Frontline demonstration on oilseeds and pulses

urid, 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 499 hectares area and 2668 farm families during 2011-12.

FLD programme on other then oilseeds and pulses were organized in 391 hectares, covering 3108 farm families. Nearly one third of the beneficiaries under these programmes belong to weaker section of the farming communities. Major emphasis was given on introduction of improved varieties, IPM, INM and IPDM. Superiority of improved technology over farmers' practices was demonstrated successfully.

Frontline demonstration on wheat



FLD on other then oilseeds and pulses

Frontline demonstration on chili

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

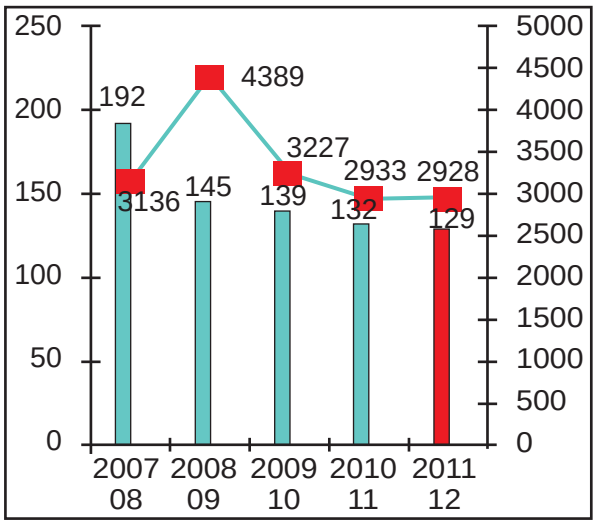
To update the knowledge and skill of extension functionaries, KVKs arranged courses to benefit extension officials. These courses were formulated looking to the needs of field extension functionaries.

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.

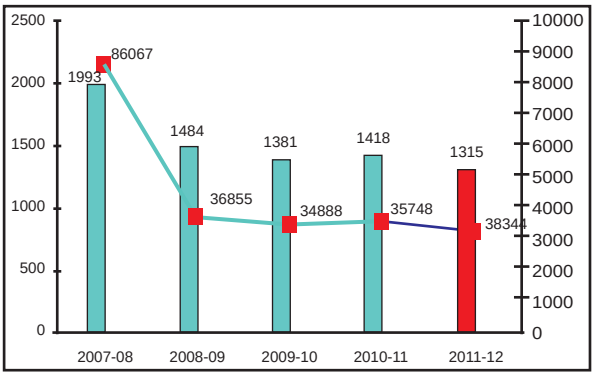
During 2011-12, 129 in-service training programmes were conducted and benefitted 2928 field extension personnel.

Training for farmers and farmwomen

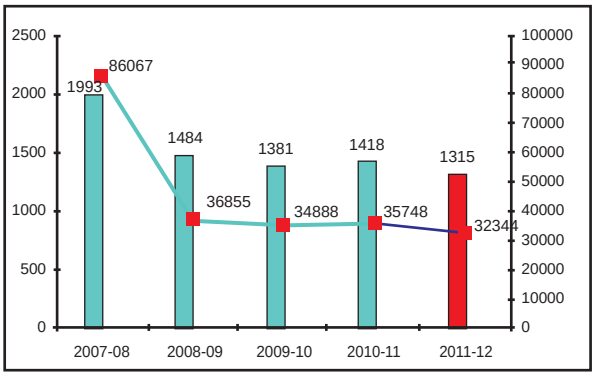
One of the mandates of KVKs is to organize trainings for farmers and farm women. In training programmes, emphasis was given for skill Improvement on various aspects of management of field crops, vegetables, fruit crops, medicinal and



Courses offered and participation of extension personnel



Training programme and participation of farmers and farm women



Vocational training programme and participation of rural youths

aromatic plants like plant protection, identification of symptoms of diseases, pest damage, nutrient deficiency and their management practices. During 2011-12, 1315 training programmes were organized to benefit 32344 participants. These need based training programmes 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 vermicompost, nursery management, vegetative propagation of fruits and ornamental crops.

During 2011-12, 123 vocational training courses on various aspects were organized to benefit 2949 participants in order to facilitate them to be self dependent.

Training for empowerment of farm women

Under empowerment of farm women programmes, trainings to farm women in different fields such as kitchen gardening, tailoring, preservation, health and hygiene were imparted. The other activities included training of screen painting, tie and dye printing and safe storage of grains to rural youths including farm women and 64 training programmes for 510 days were organized for the empowerment of women.

Sponsored training programme

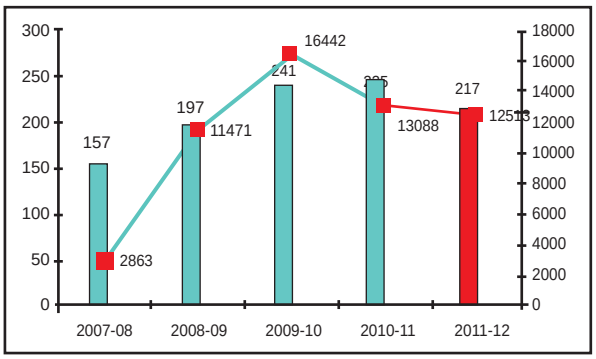
Beside this, 217 sponsored trainings were conducted during 2011-12, benefitted 12513 farmers.

Kisan mela and kisan sangosthi

Kisan Mela, Kisan Sangosthi and Crop Days are the regular features of the extension

Production technology of mushroom for rural youth

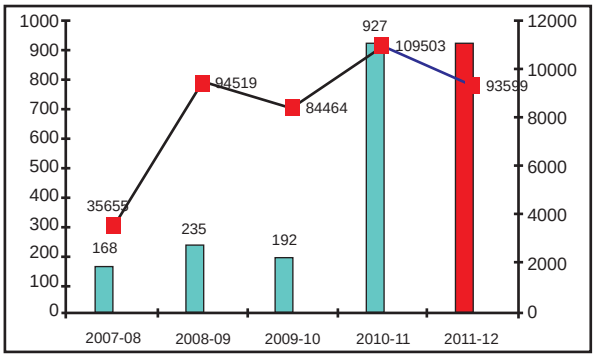
Training programme for women empowerment



Sponsored training programme and participation

Sponsored training programme

Field day on gram



Extension activities and participation

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 asses their problems.

Thirty three kisan melas and field days from block level to state level were organized. The special feature of these kisan melas was farmers' scientists interface through Kisan Sangosthi, which had the direct impact on farming community for promoting horticultural crops in the state. During 2011-12, 825 such events were organized in which 93589 farmers have participated.

News letter

All Krishi Vigyan Kendras publish KVK News letter on quarterly basis. These news letters cover the events scheduled for next three months and achievements made by them in the previous quarter. The need based technologies are being made available through these news letters for further dissemination to farmers and field extension workers. These news letters are being sent to larger numbers of panchayats, farmers, field extension personnel and district authorities.

Kisan mobile advisory

This programme was launched by the university in 2008-09 through which need based technologies in form of messages were sent to farmers on mobile once a week. The date for sending the messages is fixed. This programme has gain the popularity within a

year and farmers receive the advice of scientists in the form of SMS messages on various aspects without any charge and without loosing the time. SMS messages were sent to farmers and other users.

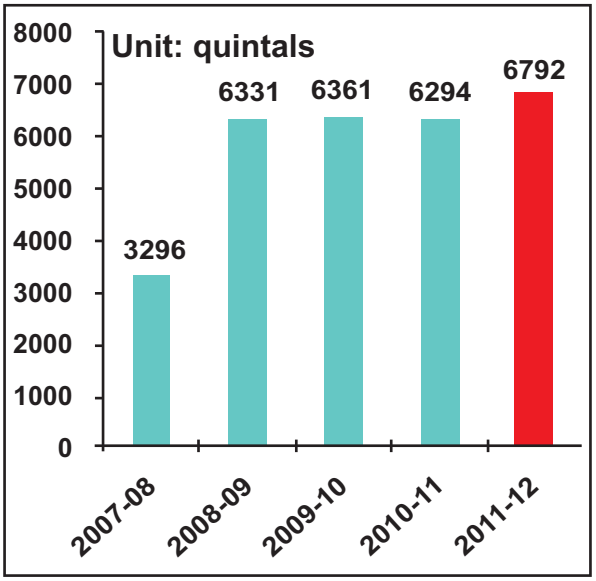
Seed production programmes

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.

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 materials.

Seed production programme

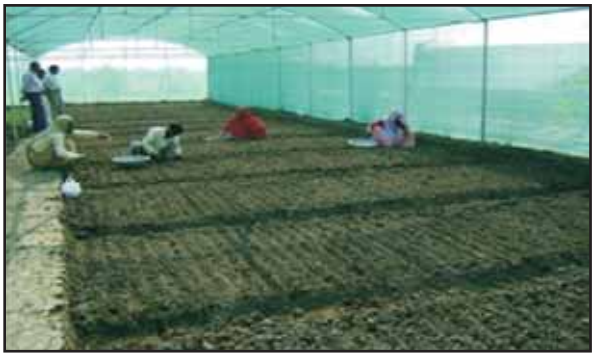


Seed produced at instructional farm of KVK

Crop cafeteria

This new programme was implemented by all the KVKs and seeds of 115 new crops varieties/ hybrids of Kharif and rabi crops were made available to farmers with the object to assess and demonstrate the suitability of new crops cultivars. About 15,151 farmers visited he demonstrated plots. This programme also facilitated the scientists to develop seed bank

View of progeny orchard at instructional farm



Production of saplings at instructional farm

Production of saplings at instructional farm

Crop cafeteria at instructional farm

System of rice intensification

of different varieties. The most appropriate varieties were identified for conducting OFTs and FLDs on farmers' fields.

System of rice intensification

The new technology for improving the rice productivity in the State was identified and adopted by all the KVKs. SRI is the technology with lesser input (seed, water) with higher return. KVK Shahdol, Katni, Seoni, Rewa, Jabalpur, Umaria, Balaghat, Dindori, Betul and Mandla started this programme on large scale. The numbers of interventions were implemented by these KVKs to disseminate the technology to larger farming communities.

View of rice nursery

View of filed preparation

Productivity improvement in rainfed rice fallow system

For improving the productivity and cropping intensity in rainfed rice fallow cropping system, the National Food Security Mission funded Programme was implemented through 4 KVKs viz. Jabalpur, Satna, Rewa and Damoh. This programme is implemented with collaboration with ICRISAT, Hyderabad. Quality seeds of improved varieties of rice and chickpea along with its production technologies were made available to the farmers. These farmers were invited in the farmers-scientist interface and other extension activities for promoting farmers to famer's dissemination of technology.

Seed village programme

This innovative programme was implemented through all 20 KVKs in both seasons. Quality seeds were made available to farmers. This helped in improving the seed replacement rate in the state.

Livelihood security

The NAIP funded project is implemented in four districts through different non government agencies and KVKs. This programme is started in Chhattarpur, Tikamgarh, Betul and Mandla districts with the object to promote integrated farming system modules to ensure the livelihood security of small and marginal

farmers. Need based technologies were made available to farmers on participatory mode with active participation and involvement of farmers and NGOs.

National Initiative on Climate 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

New Programmes

Tribal Sub Plan (Agro Forestry) in Dindori, Mandla, Seoni Shahdol, Jabalpur & Umaria has been implemented.

Tribal Sub Plan - Pulses: Three KVKs viz. Dindori, Mandla and Shahdol have implemented Tribal Sub Plan - Pulses scheme "Enhancing Pulses Production for Food, Nutritional Security and Rural livelihoods of Tribal Community through Demonstration and Training" in tribal dominating area as desired by council.

ISOPOM in Dindori and Shahdol

Livelihood security programme in Mandla & Dindori under DBT

Reorganization of KVKs and Farmers

Outstanding performing KVKs

Name of KVKs	Award	Theme
Jabalpur	ICAR- Best KVK award Zone VII (2010)	Outstanding contribution in Extension Education

Outstanding performing Farmers

Name of Farmer	Award	Theme
Shri Madhusudan Tonpe (Chhindwara)	State level (CIAE)	Drip irrigation in Papaya
	Zonal Level (ICAR)	Horticulture – Fruit production technology
Shri Roshanlal Vishwakarma (Narsinghpur)	Zonal Level (ICAR)	Agricultural equipment - Sugarcane bud chopper
Shri Vilas Tijare (Seoni)	Zonal Level (ICAR)	Integrated farming system- Paddy – Water chestnut cultivation and processing

Jagjivan Ram Abhinav Kisan Puraskar

In order to recognize the outstanding contribution of innovative farmers for initiative in development of water-chestnut based integrated farming system the Jagjivan Ram Abhinav Kisan Puraskar (Zonal, Zone VII) for the year 2011 has been awarded to Mr. Vilas Tijare Village Bori-Khurd, Block-Barghat, District-Seoni dated 16 July 2012 by Hon'ble Union Minister of Agriculture & food processing, Government of India in the presence of Hon'ble D.G. ICAR Dr. S. Ayyappan, Secretary & Director General, ICAR, New Delhi. Shri Vilas Tijare Integrated different enterprises, viz. fish culture, Mango plantation, Dairy farming, water chestnut cultivation etc. and posed as a role model for the visiting farmers/extension functionaries under the technical guidance of KVK Seoni. The byproduct or residue of water chestnut was used for other purposes, e.g. compost which reduced dependence on external inputs and reduced the cost of production which makes more viable ecosystem for sustainable agriculture.

AGRICULTURE 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 (farmers) 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 J.N.K.V.V. 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, 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.

Technical Progress

I. Technological inputs

Technical inputs with coordination with the production unit of JNKVV are producing Jawahar seeds of improved varieties, planting materials of ornamental plants, fruit trees and other plant material, mushroom spawn, medicinal and aromatic plants and seeds and bio-fertilizers which are being produced and sold in respective production units except technical literature, seed and honey which is sold by ATIC

II. Technological products/processed products sold

In coordination with the production and processing units of JNKVV, technology products like milk, horticultural products, animals and animal products, mushroom, implements etc are sold from respective units.

III. Priced publication sold

Communication Centre in the directorate of extension services has well equipped infrastructure and all the publication including package of practices, special issues and other technical literatures are published by this centers as priced publications and sold from ATIC

IV. Un-priced publication

The Directorate of Extension / College / ZARS / KVKs regularly organizes Kisan Mela, Kisan Sangosthi, monthly meeting and scientist farmers interfaces. During these occasions a large number of farmers participate. In these programmes, technical literature comprising of pamphlets, leaflets, technical brochures and folders are provided free of cost.

V. Diagnostic Services

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

VI. Farm advisory services provided to farmers

To update knowledge and skill among the farmers and farm workers. Farm Advisory services like personal visits, through letters, telephone help line. Farmers field visits, kisan sangosthi, farmers scientists interface. Use of print and electronic media are being used effectively. A special biweekly programme entitled "Sawal kisano ke Jababe Vigyaniko dawara" was initiated in collaboration with AIR. Jabalpur. Bhopal. Indore and other AIR stations of the State for replying the farmer's queries. ATIC also serves farming community through annual structured T.V. programme under "Gram Mangal".

VII. Visits of farmers and other stakeholders to ATIC

Farmers and field extension officers of state department of agriculture, Horticulture, Veterinary of M.P. and other states visited ATIC.

VIII. Feedback from farmers

The farmers and field extension functionaries are regularly approaching the centre for seeking advisement particularly on 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, varmi compost production & Piggery. As per the feed back the centre organize training programme on various aspect.

1. Details of calls received

(Under Kisan Call Centre Level- II)

Total Calls - 439

Sale Through ATIC

Technology Displayed

About 35 laminated photographs depicting a various technologies related to Agriculture, Veterinary and Agriculture Engineering. The photograph are enough to tell the farmers regarding the technologies of the university generated for various sections of the farmers.

Sale of various products

Sale of various products such as crop seed and seed of medicinal and aromatic plants, planting material, plants of fruit trees, all are being sold from the respective units of the University and the income generated goes to the respective units. From Jan. 2005 ATIC has started the sale of literature, seed and honey bee.

Enquiry / Letters

About 23 letters received and replied during 2011-12, these letters were regarding training programme on mushroom and on other aspects of medicinal and aromatic plants, cultivation technology of various crops, seed availability, plant protection, horticulture, animal sciences, agricultural engineering and literature. All letters were replied on next day or within a week

Farmers Visited

2257 Farmers, Farm women, Trainees visited the centre to learn / know the various technologies of the University. They purchased literatures and other material.

Farmers team of M.P. and other States visited ATIC

Date	District	No. of Farmers
07-04-2011	Raisen (MP)	30
20-05-2011	Narsinghpur (MP)	10
27-06-2011	Chitrakoot (MP)	35
13-07-2011	Banda (UP)	50
08-08-2011	Betul (MP)	60
08-08-2011	Seoni (MP)	55
10-08-2011	Lakhnadon (Seoni)	15
20-09-2011	Seoni (MP)	50
23-09-2011	Seoni, Mandla, Sagar (MP)	40
24-09-2011	Sagar (MP)	35
29-09-2011	Mahoba (UP)	30
01-10-2011	Sohagpur (Hoshangabad) (MP)	19
10-10-2011	Lamehti (Jabalpur)	10
23-11-2011	Seetapur (C.G.)	10
24-11-2011	Umaria (MP)	30
25-11-2011	Mahoba (U.P)	35
26-11-2011	Maihar (MP)	20
27-12-2011	Sagar (MP)	32
28-12-2011	Seoni (MP)	50
29-12-2011	Moonger (Bihar)	10
06-01-2012	Satna (MP)	35
07-01-2012	Hoshangabad (MP)	25
10-01-2012	Chhindwara (MP)	25
17-01-2012	Satna (MP)	35
04-02-2012	Jabera (Damoh) (MP)	21
06-02-2012	Shahodal (MP)	28

08-02-2012	Hameerpur (UP)	35
08-02-2012	Varanasi (UP)	8
13-02-2012	Sagar (MP)	50
14-02-2012	Namakkan (Tamilnadu)	17
16-02-2012	Raisen (MP)	45
16-02-2012	Sagar (MP)	45
17-02-2012	Jodhpur (Raj.)	50
17-02-2012	Nadedh (MH)	45
17-02-2012	Kundam (Jabalpur) (MP)	46
23-02-2012	Damoh (MP)	30
24-02-2012	Mandla (MP)	44
03-03-2012	Sagar (MP)	36
07-03-2012	Chhindwara (MP)	45
12-03-2012	Sagar (MP)	18
14-03-2012	Raisen (MP)	21
20-03-2012	Sohagpur (MP)	18
20-03-2012	Seoni (MP)	8
21-03-2012	Betul (MP)	45
22-03-2012	Gwalior (MP)	56
31-03-2012	Amaravati (MH)	18
Total	**1465**	

Trainings organized by ATIC

Date	Topic	Number of Participants
20-30 April 2011	Hi-Tech Horticulture	31
02-04 May 2011	Hi-Tech Horticulture	65
24-26 Aug., 2011	Hi-Tech Horticulture	50
1-3 Sept. 2011	Hi-Tech Horticulture	50
07-09 Sept. 2011	Hi-Tech Horticulture	87
10-12 Oct. 2011	Hi-Tech Horticulture	50
27 Feb.-02 March 2012	Hi-Tech Horticulture	36
12-16 March 2012	Hi-Tech Horticulture	54
	Total	**423**

Revolving fund Position:

Opening Balance	18,80,735/-
Receipt	12,55,993/-
Expenditure	20,04,874/-
Balance	11,31,854/-

FARMS

The significance of sustainable agriculture is hidden in the use of quality seed. It is the most crucial and vital input for enhancing productivity. The importance of seed has been recognized since time, human practices crop husbandry. Procuring quality seed for sowing has been a major concern for farmer ever since crop husbandry was initiated. The crop varieties are being grown under diverse environmental conditions. In an organized seed production programme, it is essential to maintain genetic purity of seed stock in large-scale multiplications and to ensure conformity to the original stock. The maintenance of population in an organized and systematic way has been a big task, as it has to retain the relationship of nucleus seed with that originally developed by a plant breeder and the certified seed, marketed. Genotype x environment interaction also affects the expression of the variety. Natural selection and management practices may affect the genetic purity of the variety grown in the environment for which it has not been developed and recommended. Changing growing environment also has major effect on population behaviour and have important consequences on quality including varietal maintenance. Realizing the significance and impact of quality seeds, the JNKVV, launched a scheme for production of Breeder seed alongwith maintenance of varieties in early 1980s at Jabalpur even before launch of the National Seed Project by ICAR. Seed is one of the basic and vital input of any plant production activity. The importance of seed as the carrier of critical characteristics of crop production has been recognised from the early days of agriculture. Hence, it is always necessary to launch a special drive to orient and strengthen the on going seed developmenl programmes to enhance the availability of quality seed of improved varieties.

Mission

To produce adequate quantity of quality seed for enhancing productivity and profitability of crops in a sustainable eco-friendly manner for the livelihood security.

Mandate

- To maintain the genetic purity of crop varieties;
- To make available the sufficient quantity of breeder seed
- To produce, market and distribute Jawahar seed and planting material.

Genesis

Dr. Laxman Singh is the founder of quality seed production in JNKVV, Jabalpur and established Breeder Seed Production Unit at JNKVV during 1975 in the Department of Plant Breeding & Genetics to fulfil the seed requirement of improved varieties of pulses in the State of Madhya Pradesh. The

maintenance breeding work was also initiated for the improved varieties of other crops. Considering the necessity and importance of large quantities of quality seed, JNKVV established Directorate of Farms in the year 1987 at Jabalpur. Director utilizes the on-farm resources to produce quality planting material of improved varieties developed at JNKVV as well as of the recommended National varieties suitable for Madhya Pradesh. Directorate shoulder the responsibility of farm planning, production, marketing and quality assurance of seeds/ saplings through effective coordination of State/National Seed Developmental Agencies and by developing organizational-operational frame work with dedicated team of plant breeders, seed technologists, seed production experts, seed agronomists, Administrative Officer (Farms) and other associated staff. The programmes are well organised to meet the expectations of seed industry in the country through a well knit action oriented network and infrastructure.

Growth

Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV) is the premier institution for seed production and distribution in the country. It caters around one third of breeder seed requirement of the nation. The clientle include National and State Seed Corporations, State Farms Corporation of India, State Departments of Agriculture, Horticulture & Farm Forestry and Animal Husbandry, State Agriculture Cooperatives, KRIBHCO, Ministry of Agriculture, Govt. of India, National Dairy Development Board, Bharat Krishak Samaj, National and multinational seed companies, progressive farmers, Oil Federations and several other organizations directly/indirectly involved in seed production activities. The University has developed an expertise in production, processing and management of seeds of cereals, pulses, oil seed crops, fodder crops, vegetables, 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 l 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, spices, sugarcane, medicinal & 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 Agriculture, State Seed Corporations, State Seed Certification Agencies, National and Multi-national Seed Companies to up date knowledge on seed technology, seed certification standards and covering all important and relevant aspects of seed production, processing and storage. The University has also shared its experience by organizing ICAR sponsored winter school of 21 day on Recent trends in seed production management at Jabalpur. Capacity building programmes were organized for seed growers to strengthen the seed production programmes through Seed Village programmes, Megaseed Project, Rice fallow Chickpea etc. The seed production programmes of pulses was strengthenend through national food security mission.

Functioning of 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 five satellite centres viz., Sehore, Rewa, Indore, Tikamgarh and Powarkheda located at Zonal Agricultural Research Stations.

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 system that utilizes the internal scientific/technical resources of the University to produce quality breeder seed. The system is strongly supported by maintenance breeding programme : Field crops-ICAR · Mega Seed Project ICAR; Soybean & Groundnut ICAR-GOI · Seed Legume Project ICAR-GOI; Vegetables ICAR · Seed Village Project- GOI; Spices- Govt. of MP & GOI · Water Management Project (World Bank) and Medicinal & Aromatics-GOI, Seed Village programmes, National Food Security Mission etc.

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. The entire production programme is being developed with the consent of officer-in-charge of farms and controlling officer at zonal level every year. The change in programme is permissible subject to the approval of Director Farms.

Review of production programme

The University issue NSP-I and BSP-I proforma for the entire seed programme implemented separately for field crops, vegetables, spices fruit plants and saplings. After issue of programme to the concerned, the follow up action being submitted to Director Farms. The implemented programme is being reviewed through zonal wise meeting during the Kharif season. The annual review meetings are being organized in the month of April/May.

Seed production system

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. Several crop varieties have been developed and released in wheat, linseed, etc through crop improvement programme etc.

Maintenance breeding centres: 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.

Status of breeder seed production

JNKVV produces more than 24% part 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.

Monitoring systems

The financial and physical targets are fixed on annual basis and reviewed in the JNKVV planning meeting in the month of April every

year. The corrective measures are planned for the improvement in the implemented programmes. The mid-term corrective measures are also being taken up in the farm seed production activities as per the advice of local farm advisory committee. The monitoring of seed production programme is being done at five levels

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 programmes 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 etc. and with 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. An IPR Management cell of the University has taken care of transferable technologies for commercialization of rice hybrid JRH 5

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 from 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 the persons lifted the same seed lots so that corrective measures may be taken up timely to maintain the seed quality.

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 alongwith 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 cut off date, quantity of seed available is being also made available at Agricultural Technological Information Center, JNKVV, Jabalpur (ATIC) as well as Directorate Farms. The upto date seed availability is being upgraded in the JNKVV web site from time to time to benefit the seed producing agencies.

Innovative seed Systems: Several seed systems i.e., seed village programme, model seed sytems at Vidisha and Sagar, Rice fallow chickpea quality seed production in livelihood seed system paid dividends to the farmers and brought self reliance in quality seed availability

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. 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 enterprises has also generated employment at the village level. The major beneficiaries are small holder farming families who may gain access quality seed of improved varieties.

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.

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 horticulture crops in the state. Fruits plant nurseries were established at all centres of V.V.

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 emerging 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, pigeonpea. Identification of seed production areas as well as seed production practices were standerdised for rice, maize and pigeonpea

BREEDER SEED PRODUCTION DURING KHARIF 2011

Breeder Seed Production of 66 varieties of kharif field crops was proposed to be taken in 26 different farms of JNKVV, Jabalpur in 621.24 ha area during kharif 2011. The total targeted production of breeder seed during kharif 2011 was 17757.20 q against the GoI seed indent of 6057.50 q. (Table-1). However, the targeted production of breeder seed for Soybean (JS 335, JS 93-05, JS 95-60 and JS 97-52) was 7028.80 q. Similarly for Arhar (ICPH 2671, ICPH 2671 parents, ICPL 87, ICPL 87-119, ICPL 88039, TT 401 and TJT 501) was 400.00 q , for rice (BVD 109, Danteshwari, HMT, IR 36, IR 64, JR 201, JR 503, JRH 17, JRH 17-R line, JRH 19, JRH 5, JRH 5- A, B and R line, JRH 5 Parents, JRH 8 A and R lines, Kranti, Mahamaya, MR 219, MTU 1010, MTU 1081, P 1460, PS 3, 4 and 5, Sahabhagi, WGL 32100) was 9744.50 q, Niger (JNC 1, JNC 6, and JNC 9) 25.00 q, Kodo (JK 13, 41, 48, 106, 155 and JK1439) 42.00 q, Kutki (JK 8 and JK 36) 32.00 q, Maize (JM 216 and African Tall) 50.00 q, Sesame JTS 8, TKG 21, 22, 306 and TKG 55) 71.40 q, Mung (SL668, HUM 16, TMB 37, TJM 3) 80.0 q and Urd (JU 3, PU 35 and TU 9) was 283.50 q.

Table 1. Breeder Seed Production of field crops during Kharif 2011 in JNKVV Farms

S.No.	Crop	Varieties	Area (ha)	Indent (q)	Targeted Production (q)
1.	Soybean	04	351.44	5700.00	7028.80
2.	Arhar	07	20.00	46.25	400.00
3.	Paddy	28	198.45	217.00	9744.50
4.	Niger	03	5.00	14.90	25.00
5.	Kodo	06	4.20	3.00	42.00
6.	Kutki	03	1.00	-	32.00
7.	Maize	01	1.00	-	40.00
8.	Maize (F)	01	0.25	-	10.00
9.	Sesame	06	11.90	14.65	71.40
10.	Moong	04	7.00	43.50	80.00
11.	Urid	03	21.00	18.20	283.50
	TOTAL	**66**	**621.24**	**6057.50**	**17757.20**

Nucleus Seed Production During Kharif 2011

Nucleus seed production of 52 varieties of field crops namely Soybean, Arhar, Groundnut, Paddy, Kodo, Kutki, Til and Niger was proposed to be taken at BSP (FC), BSP(Soy), BSP(GN), Chhindwara, Kuthulia, Powarkheda, Sagar, Waraseoni, Dindori, Rewa and Tikamgarh farms in 56.02 ha. The total targeted production of SPS and Nucleus Seed Production was fixed up at 179.70 and 914.00 q respectively. (Table - 2). However, the SPS and Nucleus Seed Production for Soybean (JS 335, JS97-52, JS 93-05 and JS 95-60), Arhar (ICPL 87- 119, TT 401, ICPL 88039, TJT 501 and ICPL 87), Groundnut (TG 37A and TKG 24), Rice (MTU1010, Kranti, IR 36, Mahamaya, JR 201, PS 4, PS 5, P 1460, MTU 1081, JR 503, PS 3, WGL 32100, MR 219, IR 36, Danteshwari, Birsa Dhan 109, Subhagni and parental lines of JRH 12, 15, 5, 8,), Kodo (DPS 9-1, JK 41, JK 48, KDPS 439, JK 106,JK 155 and JK 13), Kutki (JK8 and JK 36), Sesame (JT 7, TKG 21, 22, 8, 55, 306,PKDS 11 and 12) and Niger (JNC 1, JNC 9 and JNC 6) was 56.00 and 910.00 q ; 20.00 and 0.00; 6.00 and 0.00 q ; 92.50 and 0.00 q ; 3.00 and 0.00 q; 1.00 and 0.00 ;0.80 and 4.00; 0.40 and 0.00 q respectively.

Table 2. Nucleus Seed Production Programme during Kharif 2011 NSP-I [Field Crops]

S.No.	Crop	Area [ha]	Targeted Production [q]	
			SPS	Nucleus
1.	Soybean	45.50	56.00	910.00
2.	Arhar	1.60	20.00	0.00
3.	Groundnut	0.40	6.00	0.00
4.	Paddy	6.67	92.50	0.00
5.	Kodo	0.35	3.00	0.00
6.	Kutki	0.10	1.00	0.00
7.	Til	0.80	0.80	4.00
8.	Niger	0.60	0.40	0.00
	Total	**56.02**	**179.70**	**914.00**

Breeder Seed Produced During Kharif 2011

Breeder Seed production of 46 varieties of kharif field crops namely Soybean, Arhar, Paddy, Niger, Kodo, Kutki, Maize, Sesame, Moong and Urd was actually taken up at different JNKVV Farms and 6814.52 q Breeder Seed was produced against GoI seed indent of 6057.05 q (Table 3). The crop wise breeder seed produced at different farms was 2098.38 q in case of Soybean (JS 335, JS 97-52, JS 93-05 and JS 95-60), Arhar (ICPL 87-119, ICPL 88039, TT 401 and TJT 501) 73.00 q, Paddy (BVD 109, Danteshwari, IR 36, IR 64, JR 201, JR 503, Kranti, Mahamaya, MTU 1010, MTU1081, P 1460, PS 3, 4 and 5, Sahabhagi, WGL 32100) 4459.50 q, Niger (JNC 1, JNC 6 and JNC 9) 16.20 q, Kodo (JK 13, JK 155 and JK 439) 8.12 q, Kutki (JK 8 and JK 36) 10.04 q, Maize(JM 216) 51.00 q, Sesame (TKG 21, TKG 22, TKG 306, JTS 8 and TKG 55) 27.88 q, Moong (HUM 12, SL 668, HUM 16, TMB 37, TJM 3) 77.50 q and Urd (JU 3 and PU 35) 26.00 q.

Disposal of Seeds During Kharif 2011

In JNKVV, 5251.50 q Breeder Seed of different Kharif crops namely Paddy, Soybean, Arhar, Til, Kodo, Kutki, Urd and Niger etc was supplied from different farms to various seed agencies involved in seed multiplication programme from breeder seed to foundation and foundation to certified seed(Table 4). The disposal of breeder seed during Kharif 2011 to various seed agencies (NSC, SFCI, SAI, Maharashtra, Chhattisgarh,

Table 3: Breeder Seed produced during Kharif 2011 [Field Crops]

S.No.	Crop	Varieties	Indent (q)	Production (q)
1.	Soybean	4	5700.00	2098.38
2.	Arhar	4	46.25	73.00
3.	Paddy	16	217.00	4459.50
4.	Niger	3	14.90	16.20
5.	Kodo	3	03.00	08.12
6.	Kutki	5	-	10.04
7.	Maize	1	-	51.00
8.	Sesame	3	14.65	15.88
9.	Mung	5	43.50	77.50
10.	Urd	2	18.20	04.90
	TOTAL	**46**	**6057.05**	**6814.52**

Rajasthan, Uttar Pradesh, Karnataka and Madhya Pradesh Seed Corporation, Beej Sangh and Seed Co-operative societies) was maximum in case of Paddy (2561.91 q) followed by Soybean (2506.57 q), Arhar(94.95 q), Til (36.57 q), Kodo (13.84 q), Kutki (7.76 q), Mung (8.68 q), Urd (15.20 q) and Niger (6.02 q).

Table 4: Disposal of Breeder Seed during Kharif 2011 (Produce of Kharif 2010)

S.No.	Crop	Quantity (q)
1.	Paddy	2561.91
2.	Soybean	2506.57
3.	Arhar	94.95
4.	Til	36.57
5.	Kodo	13.84
6.	Kutki	07.76
7.	Mung	08.68
8.	Urd	15.20
9.	Niger	06.02
	TOTAL	**5251.50**

Breeder Seed Production Programme During Rabi 2011-12 [BSP-I]

Breeder seed production of 58 varieties of Rabi field crops namely wheat, Barley, Chickpea, Mustard, Niger, Linseed, Lentil, Berseem , Oat, Pea and Maize etc. was proposed to taken in 583.14 ha area in 27 different farms of JNKVV, Jabalpur. The target production of breeder seed during Rabi 2011-12 was fixed up at 18785.00 q against the GoI seed indent of 6023.30 q during Rabi 2011-12. The targeted production of breeder seed was more in case of Wheat (13255.00 q), followed by Chickpea (4584.00 q). Whereas, it was 236, 190,144, 115, 90, 68, 46, 39 and 18 q in case of Pea , Lentil, Oat, Barley, Mustard, Maize, Berseem, Linseed and Niger respectively.

Table 5. Breeder Seed Production Programme during Rabi 2011-12 [BSP-I]

S.No.	Crop	Varieties	Indent (q)	Target (q)	Area (ha)
1.	Wheat	21	3916.00	13255.00	297.56
2.	Barley	2	22.00	115.00	2.30
3.	Chickpea	12	2077.00	4584.00	229.18
4.	Mustard	2	-	90.00	04.50
5.	Niger	2	-	18.00	03.50
6.	Linseed	4	8.50	39.00	07.60
7.	Lentil	1	-	190.00	09.50
8.	Berseem	2	-	46.00	08.40
9.	Oat	2	-	144.00	04.80
10.	Pea	4	-	236.00	11.80
11.	Maize	6	-	68.00	04.00
	Total	**58**	**6023.50**	**18785.00**	**583.14**

Nucleus Seed Production Programme During Rabi 2011-12 [NSP-I]

Nucleus seed production of 74 varieties of Rabi crops was proposed to be taken at different JNKVV farms and targeted production of SPS and Nucleus seed was fixed at 178.45 and 833.08 q respectively. However, actual production of SPS and Nucleus seed of Rabi crops was 97.71 and 1422.58 q, respectively, during Rabi season 2011-12 (Table 6).

Table 6. Nucleus Seed Production programme during Rabi 2011-12 [NSP-I]

S.No.	Crop	Target Production(q)		Actual Production (q)	
		SPS	Nucleus	SPS	Nucleus
1.	Wheat	81.75	440.00	81.55	1012.56
2.	Gram	45.00	305.00	4.01	362.77
3.	Peas	33.00	68.00	9.98	13.41
4.	Linseed	8.90	-	-	1.41
5.	Lentil	2.15	6.00	1.20	-
6.	Mustard	5.00	-	0.97	1.19
7.	Toria	0.05	-	-	0.00
8.	Oat	1.20	12.28	-	31.24
9.	Berseem	0.20	1.80	-	-
10.	Barley	1.20	-	-	-
	Total	**178.45**	**833.08**	**97.71**	**1422.58**

Breeder Seed Produced Rabi 2011-12

Breeder seed production of 72 varieties of Rabi field crops namely Wheat, Barley, Chickpea, Mustard, Niger, Linseed, Lentil, Berseem , Oat, Pea, maize, Sugarcane, Mung, Sesame etc. was taken at different JNKVV Farms during Rabi 2011-12 and 11077.40 q of breeder seed was produced against GoI seed indent of 6023. 50 q (Table 7). Crop wise breeder seed production was maximum in case of Wheat (8385.25) q followed by Chickpea (18.85 q), Sugarcane (280.00 q), Pea (131.46 q) and Barley 98.00 q). However, the breeder seed production of Mustard, Niger, Linseed, Lentil, Berseem, Oat, Maize, Mung, and Sesame was to the tune of 28.50, 3.80, 37.85, 43.0, 12.00, 53.00, 68.00, 47.00 and 3.30 q respectively.

Table 7. Breeder Seed Produced during Rabi 2011-12

S.No.	Crop	Varieties	Indent (q)	Production (q)
1.	Wheat	21	3916.00	8385.25
2.	Barley	2	22.00	98.00
3.	Chickpea	12	2077.00	1885.85
4.	Mustard	2	-	28.50
5.	Niger	2	-	3.80
6.	Linseed	4	8.50	37.85
7.	Lentil	1	-	43.00
8.	Berseem	1	-	12.30
9.	Oat	2	-	53.00
10.	Pea	4	-	131.46
11.	Maize	6	-	68.00
12.	Sugarcane	3	-	280.00
13.	Mung	9	-	47.09
14.	Sesame	3	-	3.30
	Total	**72**	**6023.50**	**11077.40**

Disposal of Seeds During Rabi 2011-12

In, JNKVV, 8227.57 q of Breeder Seed was supplied to different seed agencies namely NSC, SFCI, SAI, Maharashtra, Chhattisgarh, Rajasthan, U.P., Karnataka and Madhya Pradesh Seed Corporation, Beej Sangh and Seed Co-operative societies etc. involved in the production and multiplication of foundation and certified seed from Breeder seed (Table 8). The quantity of Breeder seed supplied to different seed agencies was maximum in case of Wheat (6178.44 q) followed by Gram (1717.547 q), Pea (212.03q), Oat (48.70 q), Mustard (28.72 q), Berseem (15.92 q), Lentil (14.24 q) and Linseed (11.95 q).

Table8. Disposal of Breeder Seed during Rabi 2011-12 (Produce of Rabi 2010-11)

S.No.	Crop	Quantity (q)
1.	Wheat	6178.44
2.	Gram	1717.57
3.	Lentil	14.24
4.	Linseed	11.95
5.	Mustard	28.72
6.	Pea	212.03
7.	Oat	48.70
8.	Berseem	15.92
	Total	**8227.57**

Financial Status of JNKVV Farms during 2011-12

During Financial year 2011-12, Rs. 310.47 lakh were released to different Budgetary Farms for breeder seed production programme. As a consequence, Rs. 387.02 lakh were remitted by different farms to Comptroller, JNKVV, Jabalpur at the end of 31st March 2012 through the sale of Breeder Seed. Similarly, Revolving Fund Units (BSP- Field Crops, BSP- Soybean, BSP- Groundnut, and BSP- Vegetable) also fetched the gross profit of RS. 330.80 lakh at the end of Financial year 2011-12 against the expenditure of Rs. 286.77 lakh and there was net profit of Rs. 76.55 lakh and 44.03 lakh to JNKVV from Budgetary and Revolving Fund Units during the year 2011-12 respectively.

Field Photo of VLSS Trail

Field Photo of PVS Trail at Saliya Village

Field View of IPPPT Demonstrations at Gidorha and Saliya

STUDENTS' WELFARE

Youth Festival - organized Inter Collegiate Cultural Competitions during 5-6 December, 2011 at College of Agriculture Jabalpur. The function was inaugurated by Hon'ble Vice-Chancellor as Chief Guest. About 122 students from 5 Colleges of Vishwa Vidyalaya have participated with great zeal and enthusiasm in 18 various events of literary, fine arts, theater, music and folk dance competitions.

Inter Collegiate Sports Meet - (Volley ball, Kabaddi, Kho-Kho) Organization collegiate Sports meet during 11-12 January. 2012, at College of Agriculture Jabalpur total 228 students were participated from all Colleges of JNKVV.

Inter Collegiate Athletic Meet - (Badminton, T.T., and Athletics) Organized Inter Collegiate Athletic meet during February 12, 2012, at College of Agriculture Engineering, Jabalpur total 74 students were participated from all College of JNKVV.

13th AGRIUNISPORTS 2012 All India Inter Agricultural University Sports and Games Competitions sponsored by ICAR, New Delhi was organized at Panjabrao Deshmukh Agricultural Vidhyapeeth, Akola from 16-19 February 2012, JNKVV participated in this tournament in athletics, Volley ball, Table Tennis and Badminton. Total 40 students participated in the national events.

Employment generation through Placement Cell

Organizations/NGO's/Companies/ - 08

Banks visited V.V. Campus.

No. of V.V. students got - 77
employment (April, 2011 to March, 2012).

NATIONAL CADET CORPS (NCC)

NCC activities are carried out at JNKVV Jabalpur, consisting of two infantry troops of Army wing under 1MP, Battalion College of Agriculture, Jabalpur and 3 M.P. Battalion College of Agriculture, Rewa. In addition to above mentioned Units 2MP Girls Battalion was also introduced in College of Agriculture, Jabalpur during 2007.

Cadet Ranjeet Dhakad of Agriculture College Jabalpur got first prize in firing competition held during the National Integration camp Khamariya from 7-17 July ,2011. Senior Under Officer, Anurag Jain received Gold Medal for Army Camp at New Delhi. 104 cadets of both the wings attended various camps. Total 41 cadets secured "B" Certificate and 50 cadets secured "C" certificate from both wings.

NCC cadets of JNKVV presented the "Guard of Honour" to Hon'ble Vice Chancellor, JNKVV, Jabalpur on 26th Jan 2011.

Under the banner of NCC the Cadets are being provided the elementary military training with emphasis on subjects viz. foot drill, weapon training with Rifle, LMG, CMG, SLR etc., self defense, first aid besides participation in adventure activities viz., gliding, parasailing, para jumping and other social activities viz. tree plantation, blood donation, traffic control, election duty, rallies on social awareness, help the people during natural calamities.

NATIONAL SERVICE SCHEME (NSS)

Activities under NSS encompass regular activities and 10 days special camps in each campus arranged in nearby villages. Girls students also participated in education village women related with child health and active participation of women in transfer of technology in the adopted villages. During their stay in the villages. Students get themselves involved in villages activities by organizing rallies for awareness towards AIDS, literacy, anti-dowry and other related activities.

Regular activities

- Active participation of NSS students in NSS day, Yova Divas, Sandhavana Divas, Vysason Mukti Vivas and Teachers Day.
- Organised rallies on Shakcharta Divas.
- At Jabalpur Campus Blood donation camp was arranged at college and Krishi Nagar in which 115 students donated the blood.
- 500 Plantation of medicinal plants and tree species were done in the month of July and August in the campus and adopted Villages.
- 250 students participated in Red Ribban Rally during 1-2 Feb., 2011 at Jabalpur for AIDS awareness programme.
- Farmers of adopted villages were motivated by the students to participate in Kisan Melas by the colleges and university.
- A major programme at village level has been taken up through the 7 days "Mass Contact Programme" where NSS programme officers initiated link between students and villagers of Raipura during 23-2-2011 to 29-2-2011.

FELLOWSHIPS / SCHOLARSHIPS

The scholarships awarded to V.V. students during academic session 2011-12.

National Talent Scholarship	48
Junior Research Fellowship	02
Merit-cum-means	01
Merit Scholarship	97
	Total: 148

PLACEMENT CELL

The university has a full fledged Placement cell under the Dean Students Welfare to arrange for campus interviews for placement of graduate and post graduate students. The placement cell has been successfully organizing campus interviews and more than 77 students have been absorbed in various reputed companies during March 2011 to March 2012. The cell also counsels students on the availability of scholarships and avenues for higher studies. A step forward is the development of software which would keep track of the student profiles in a database and help to manage and sort out more than 1010 students registered at the Placement Cell, thus simplifying the access to the student profiles.

Tutorial Cell: As per guidelines of ICAR, a tutorial cell has been developed in office of the Dean Student Welfare, Initially more than 32 questions banks and data books were made available for students for preparation of competitive examination.

List of selected candidates in various organizations (2011-12)

1	DSCL	May 2011	01	MBA
2	Mahindra & Mahindra	May 2011	10	M.Sc.(Ag.)/B.Sc.(Ag.)/B.Tech.
3	Bank of India	May 2011	17	B.Sc.(Ag.)
4	Punjab National Bank	July 2011	10	M.Sc.(Ag.)/B.Sc.(Ag.)/B.Tech.
5	Watershed Project	July 2011	27	M.Sc.(Ag.)
6	Pradan (NGO)	Jan.2012	06	M.Sc.(Ag.)/B.Sc.(Ag.)/B.Tech.
7	Central Bank of India	March 2012	05	M.Sc.(Ag.)/MBA
	Total		**76**	

CD bank

- Weed control in cropping system - ICAR
- Digital Photo Library - ICAR
- Vermi-composting using plantation material waste
- VISION 2020
- Statistical Outline of India (2008-09)- TATA Services Limited
- Indian Farming - ICAR

Inter College cultural programme of JNKVV

A two days 13th Youth Festival was organized at College of Agriculture, JNKVV, Jabalpur during January 5-6, 2012. Approx.100 students of College of Agriculture, Jabalpur, Rewa, Tikamgarh, Ganj Basoda and College of Agricultural Engineering, Jabalpur took part in the 18 competitions followed with grand cultural programme. The title of overall championship of Youth Festival of 2011-12 went to College of Agriculture, Jabalpur. The second position was won by College of Agriculture, Rewa.

Inter College Sports

A three days inter-Collegiate Sports programme of JNKVV for the year 2011-12 was organized from January 11-13, 2012 at Jawahar Stadium, College of Agriculture, Jabalpur. Around 250 players from College of Agriculture, Jabalpur, Rewa, Tikamgarh, Ganj Basoda and College of Agricultural Engineering, Jabalpur were participated. In the tournament events includeing 100 meter, 200 meter, 400 meter, 800 meter and 1500 meter race, relay race, discuss throw, javelin throw and shot put throw were organized. Besides this kabaddi, kho-kho, volleyball, carrom, chess etc. were organized.

Students participating in the Inter College Sports (Kabaddi) at JNKVV, Jabalpur

View of cultural events during XIII youth festival

New Construction / Infrastructure Development

(a) Civil Works

1. Works	Amount allotted (Rs. In lakh)						Physical Status of the works
	Items works	1st Inst.	2nd Inst.	3rd Inst.	4th Inst.	Total	
1.1 (A)	Construction of Girls Hostel at College of Agriculture Tikamgarh	Nil	Nil	Nil	Nil	Nil	Completed
1.1 (B)	Construction of Boys Hostel at J.N.K..V.V., Jabalpur (Rewa)	35.00	35.00	-	-	70.00	Work order issue
1.2	Construction of Girls Hostel at J.N.K.V.V., Jabalpur	Nil	Nil	Nil	Nil	Nil	F.F. Roof level
1.3	Construction of International Hostel at J.N.K.V.V., Jabalpur	18.00	-	-	-	18.00	F.F. Roof level
1.4	Educational Museum	30.00	-	-	-	30.00	Finishing stage
1.5 (a)	Examination Hall	22.03	-	-	-	22.03	Finishing stage
(b)	Civil work repair renovation etc.(Const. of Swimming Pool)	-	-	-	-	75.00	Work in progress
1.6	Establishment of New Zonal sports complex at H.Q.	50.00	50.00	-	-	100.00	Finishing stage
1.7	Repair, refurbishing / renovation, modernization of educational structure / infrastructure and other work related to teaching & learning including model class rooms & PG Lab.	20.00	95.00*	-	21.00	136.00	List of work executed enclosed

Works Executed under Sub Head-1.7 (Development Grant)

S. No.	Particular of Item	Amount Rs. in Lakh
1.	Electrification Work of Auditorium Hall at College of Agriculture, J.N.K.V.V., Jabalpur.	1.72
2.	Putty and Emulsion painting work in the corridor of College of Agriculture, Jabalpur (Entomology & Horticulture)	2.00
3.	Putty and Emulsion painting work in the corridor of DES & DI Building JNKVV, Jabalpur.	1.99
4.	Const. of Septic Tank at New Teacher home at Suhagi J.N.K.V.V., Jabalpur.	2.00
5.	Water Proofing Treatment for U-Co Bank, Guest House No.1, Kitchen of Guest House No.2 & Gymnasium Building at JNKVV, Jabalpur.	2.00
6.	Putty and Emulsion painting work in DRS & Forestry Building at JNKVV Jabalpur.	1.05

S. No.	Particular of Item	Amount Rs. in Lakh
7.	Emulsion and painting work of Doors & windows in Guest House No.3 JNKVV, Jabalpur.	1.99
8.	Putty and Emulsion painting work in the corridor of College of Agriculture, Jabalpur First floor only	11.70
9.	External Putty and emulsion painting work of ATIC Building J.N.K.V.V., Jabalpur.	2.37
10.	External Putty and emulsion painting work of KVK Building at J.N.K.V.V., Jabalpur.	1.54
11.	Renovation of Toilet V.V. Meeting Hall at J.N.K.V.V., Jabalpur.	0.75
12.	Renovation of Meeting Hall at Director Research Building, J.N.K.V.V., Jabalpur.	1.17
13.	Replacement of A.C. Sheet of Work shop building of College of Agricultural Engineering Jabalpur.	2.77
14.	Renovation & Emulsion painting with putty in the Ground floor at College of Agriculture Engineering, Jabalpur.	3.29
15.	Emulsion painting with putty in the First floor at College of Agriculture Engineering, Jabalpur.	1.79
16.	Supply and filling crusher dust and fixing of old flag stone at court yard of U.G. Girls Hostel at College of Agriculture, Jabalpur.	3.45
17.	Renovation of Director Farm office at J.N.K.V.V., Jabalpur.	1.00
18.	Elect. work supplying & laying armored cable for A.C. point VIP Guest house at JNKVV Jabalpur	1.25
19.	Renovation of Store Rooms of Guest House No.2 at J.N.K.V.V., Jabalpur.	2.00
20.	Inside emulsion painting work at Koushal Bhawan JNKVV JBP	0.51
21.	Emulsion putty & painting work of corridor of V.C. office i/c PVC flooring.	0.25
22.	Replacement of A.C. Sheet in old school building JNKVV	2.25
23.	Emulsion putty painting work in Gym. build. JNKVV	1.00
24.	Floor Renovation and refixing of badminton synthetic floor at Gym. & Koushal Bhawan JNKVV	1.00
25.	Purchase of painting material for maintenance work of different building JNKVV	0.50
26.	External colour washing of Krishi Nagar Girls Hostel etc.	11.23
27.	External repair and putty and emulsion painting work at College of Agriculture Engineering Jabalpur. (External work only)	9.23
28.	Inside room putty & emulsion painting work in the first floor of College of Agriculture Engineering at JNKVV, Jabalpur.	5.62
29.	Inside room putty & emulsion painting work in the Ground floor of College of Agriculture Engineering at JNKVV, Jabalpur	5.72
30.	Inside putty & emulsion painting work at Department of Forestry at JNKVV, Jabalpur.	3.10

S. No.	Particular of Item	Amount Rs. in Lakh
31.	Putty and Emulsion painting work in the corridoor of College of Agriculture, Jabalpur Ground floor only.	5.00
32.	External and putty and emulsion painting work at College of Agriculture Engineering Jabalpur. (Extended work)	4.40
33.	Development of External Electrification work at Tikamgarh	16.50
34.	Renovation of toilet of hostel No. 2 & other minor work at College of Agriculture, Rewa.	7.10
35.	Emulsion panting with putty work outer wall Guest House Agriculture Engineering Building & colour washing of Hostel.	2.43
36.	Emulsion panting with putty of outer wall of Main College Building	7.55

Newly Constructed & Renovated Infrastructure


Newly constructed Examination Hall (front view and inside view)

Educational Museum Building (front view and inside view)


Girls Hostel, College of Agriculture, Tikamgarh (front view and rear view)