ANNUAL REPORT

2009-2010

Jawaharlal Nehru Krishi Vishwavidyalaya
Jabalpur 482004 (M.P.)

Citation: Annual Report 2009-2010
Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur 482 004 (M.P.)

CONTENTS

Prof. Gautam Kalloo
Vice Chancellor

Jawaharlal Nehru Krishi Vishwavidyalaya
Adhartal, Krishinagar, Jabalpur 482004 (M.P.)
Phone: 0761-2681706, 2681858
Fax: 0761-2681389
e-mail: gkalloo_jnkvv@yahoo.co.in

FOREWORD

Education holds an important key to human growth and development. In this regard, the State Agricultural Universities (SAU) have significantly contributed and added new dimension in agriculture sector by grooming manpower. The SAUs are also instrumental in generating, assessing and disseminating new agricultural technologies for the economic benefit of agrarian community. The Jawaharlal Nehru Krishi Vishwavidyalaya (JNKVV) in the last four decades has witnessed growth and development that has few parallels in the country and long way in serving the farming community since 1964. The success of JNKVV especially during last three years has received global appreciation in teaching, research and extension forefront. It has shown credibility and visibility in every sphere of agricultural development. Besides, adapting new ICAR course curriculum, the infrastructure facilities with modern information technology tools have also been introduced in agricultural education to bring academic excellence and education relevant to future needs. Each department has been strengthen with 10 points module i.e., information bank, CD bank, slide bank, question bank, departmental library, collection of classical papers, instructional farms, curricula research programmes, publication of books, manuals and quality papers, externally funded projects, etc. This year, Placement Cell at DSW Office vigorously promoted students in getting placement in different public and private sector organisations by strengthening facilities provided under ICAR Development Grant.

With the concerted research efforts, the University has released 14 new crop varieties/hybrids during the year. Also, the SRI techniques in rice production, ridge & furrow planting in soybean, varieties and seed replacement rate, integrated pest management, integrated nutrient management, integrated farming system, farm mechanization, weed control and crop diversification are well received by the farmers through Krishi Vigyan Kendras (KVK).

During last year, scientists were recognized by the National Awards viz. Rafi Ahmad Kidwai Award, ICAR National Best Teacher Award, ICAR Outstanding Team Research Award, etc. We have also signed MoU with IARI, New Delhi and Alcorn State University, USA for pursuing joint education research and extension programmes in emerging areas of agricultural sciences.

This year, University has been recognized as role model in seed production, medicinal plant research, agri-business and transfer of technology fronts. The diffusion model, kisan call centre, technology park, crop cafeteria are some of the modules which are adopted at National level. In a nutshell, in spite of several constraints, we have made tremendous progress for which I place on record my appreciation to each and every member of JNKVV family.

I appreciate the efforts and congratulate the editorial team of Annual Report 2009-2010 and contributors, who have worked with ingenuity and sincerity to bring out this valuable document, which gives a comprehensive record of achievement and progress made by the University during the year 2009-2010.

(Gautam Kalloo)

Dr. O.P. Veda
Dierctor Instruction

Jawaharlal Nehru Krishi Vishwavidyalaya
Adhartal, Krishinagar, Jabalpur 482004 (M.P.)
Phone: 0761-2681608
Fax: 0761-2681608
e-mail: opveda@yahoo.co.in

PREFACE

Jawaharlal Nehru Krishi VishwvVidyalaya, Jabalpur has been a pioneer institution in the field of agricultural research and development in Madhya Pradesh. The institution has maintained its tradition of excellence this year too and has contributed towards the upliftment of the farming community of the State and Country. The three major areas of activities namely education, research and extension had been sincerely addressed to and attended by the staff of the University during the year 2009-10. Excellent performance of JNKVV farms at National level is a remarkable achievement of the Institution that is recognised for its highest production of breeder seed. Other activities of the institution are also presented briefly in this report.

I express my gratitude to Hon'ble Vice Chancellor, Prof. Gautam Kalloo for his valuable guidance and encouragement in the preparation of the report. I also convey my sincere thanks to the editorial committee and to all those who have contributed in the 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 regions. 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 to 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, Ganjbasoda	2007
Faculty of Veterinary Science & Animal Husbandry*	
College of Veterinary Science & Animal Husbandry, Jabalpur*	1948
College of Veterinary Science & Animal Husbandry, MHOW*	1955
College of Veterinary Science & Animal Husbandry, Rewa*	2007
Faculty of Agricultural Engineering	
College of Agricultural Engineering, Jabalpur	1966
Other	
Dry land Horticulture Research &Training Centre, Garhakota	2006
Horticulture Vocational Education Institute Rangua, Garhakota, Sagar	2008

* Now separated from JNKVV and notified as a separate University, the Madhya Pradesh Pashu Chikitsa Vigyan Vishwa Vidyalaya, Jabalpur

PRESENT STATUS

The University had to part with Chhattisgarh comprising three agro-climatic zones of the State with the creation of a sister university Indira Gandhi Krishi Vishwa Vidyalaya at Raipur in 1987. Consequently, four Research Stations and the College of Agriculture, Raipur had gone to IGKVV, but two new Colleges at Khandwa and Mandsaur were established in the same year to cater to the needs of Malwa plateau and Nimar valley zones of the State, respectively.

A new Agriculture University named as Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya was created in August 2008, with its Headquarter at Gwalior, by transferring four Agriculture colleges located at Indore, Sehore, Khandwa and Gwalior, one College of Horticulture located at Mandsaur, one College of Veterinary Science & Animal Husbandry located at MHOW, several research stations and Krishi Vigyan Kendras of JNKVV to the new University.

A new Veterinary University, i.e., Madhya Pradesh Pashu Chikitsa Vigyan Vishwa Vidyalaya, Jabalpur has been established in November 2009 at Jabalpur and the College of Veterinary Science & A.H., Jabalpur, MHOW and Rewa have been transferred to the new University.

At present, the Vishwa Vidyalaya has four colleges of Agriculture, and one college of Agricultural Engineering. There are 12 research stations and 20 KVKs.

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 benefiting the farming community.

The University has a lion's share in the development of human resources. It has so far 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 in to 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 four 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 Vishwa Vidyalaya

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 Nineth 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 created at Jabalpur and College of Veterinary Science & A.H., Jabalpur and Rewa under the jurisdiction of JNKVV have been transferred to new University.

Jawaharlal Nehru Krishi Vishwa Vidyalaya

Mission

To gain recognition as well knit organization for providing agriculture human resources, research and extension education base for enhancing productivity, profitability and sustainability of agriculture based production systems and quality of rural livelihood in the State of Madhya Pradesh.

Mandate

- To serve as a center of teaching and training in the field of agriculture and its allied sciences
- To conduct applied and basic research in Agricultural and allied sciences
- Transfer of technology to farmers, extension personnel and organizations engaged in agricultural development through various extension programmes

Objectives

- Making provision for the education in agriculture and other allied sciences
- Furthering the prosecution of research, particularly in agriculture and other allied sciences
- Undertaking field extension programme and
- Such other purposes related to the aforesaid with the object of improving the level of living of rural people as the State Government may, by notification, direct.

Members of the Statutory Bodies

Members, Board of Management

- Prof. Gautam Kalloo
  Vice Chancellor
  JNKVV, Jabalpur
  Chairman
- Shri I.N.S. Dani
  Principal Secretary
  Farmers Welfare and Agril.
  Development Department
  M.P. Government
  Mantralaya, Bhopal (M.P.)
- Shri G.P. Singhai
  Secretary
  Department of Finance
  M.P. Government
  Mantralaya, Bhopal (M.P.)
- 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-85
- 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. S.N. Shukla
  A.D.G. (FC)
  Krishi Bhawan, New Delhi-1
- Dr. Preetam Chandra
  Asst. Director General
  ICAR, New Delhi
- Dr. G.P. Mishra
  1655, Vivekanand Ward
  Garha Road, Jabalpur
- 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
- Shri Sunil Jaiswal
  M.L.A.
  Shristi 40, Civil Lines
  Dist. Narsinghpur (M.P.)
  Jabapur (M.P.)
- Shri B.B. Mishra
  Registrar & Secretary
  JNKVV, Jabalpur

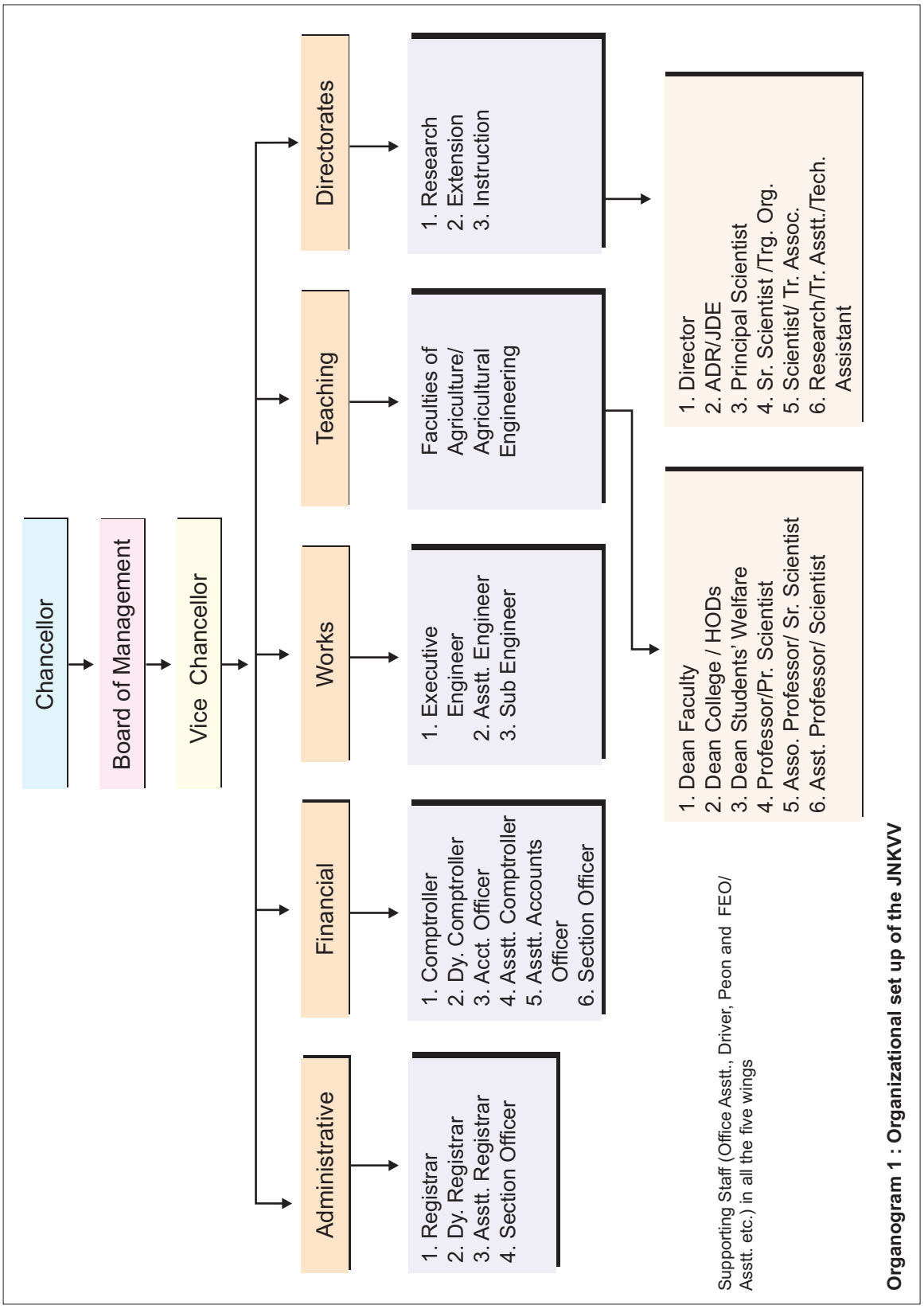
Members, Academic Council

- Prof. Gautam Kalloo
  Vice Chancellor
  JNKVV, Jabalpur
  Chairman
- Dr. S.S. Tomar
  Dean, Faculty of Agriculture &
  Director Research Services
  JNKVV, Jabalpur
- Dr. K.K. Saxena
  Director Extension Services &
  Dean, College of Agriculture
  JNKVV, Jabalpur

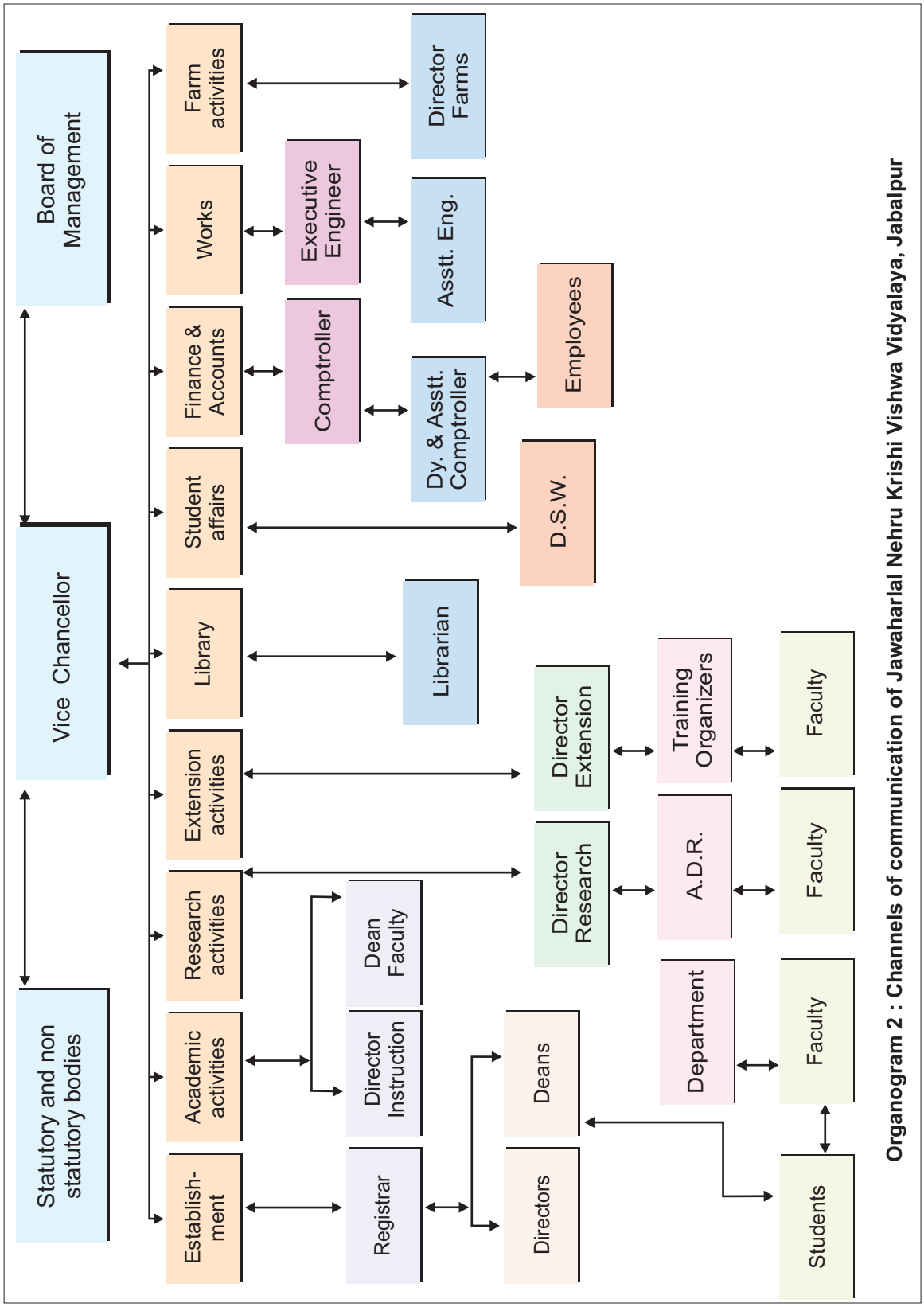
- Dr. G.S. Rajput
  Dean, College of Agril. Engg.
  Jabalpur
- Dr. P.K. Mishra
  Dean, College of Agriculture
  Tikamgarh
- Dr. V.M. Bhan
  Former Director
  National Research Centre
  for Weed Science
  Jabalpur
- Dr. J.M. Nigam
  Ex-Dean, Veterinary Sci. & A.H.
  Palampur
- Dr. B.M. Khandelwal
  Associate Professor
  College of Agricultural Engg.
  JNKVV, Jabalpur
- Shri B.B. Mishra
  Registrar
  JNKVV, Jabalpur
  Secretary

Members, Administrative Council

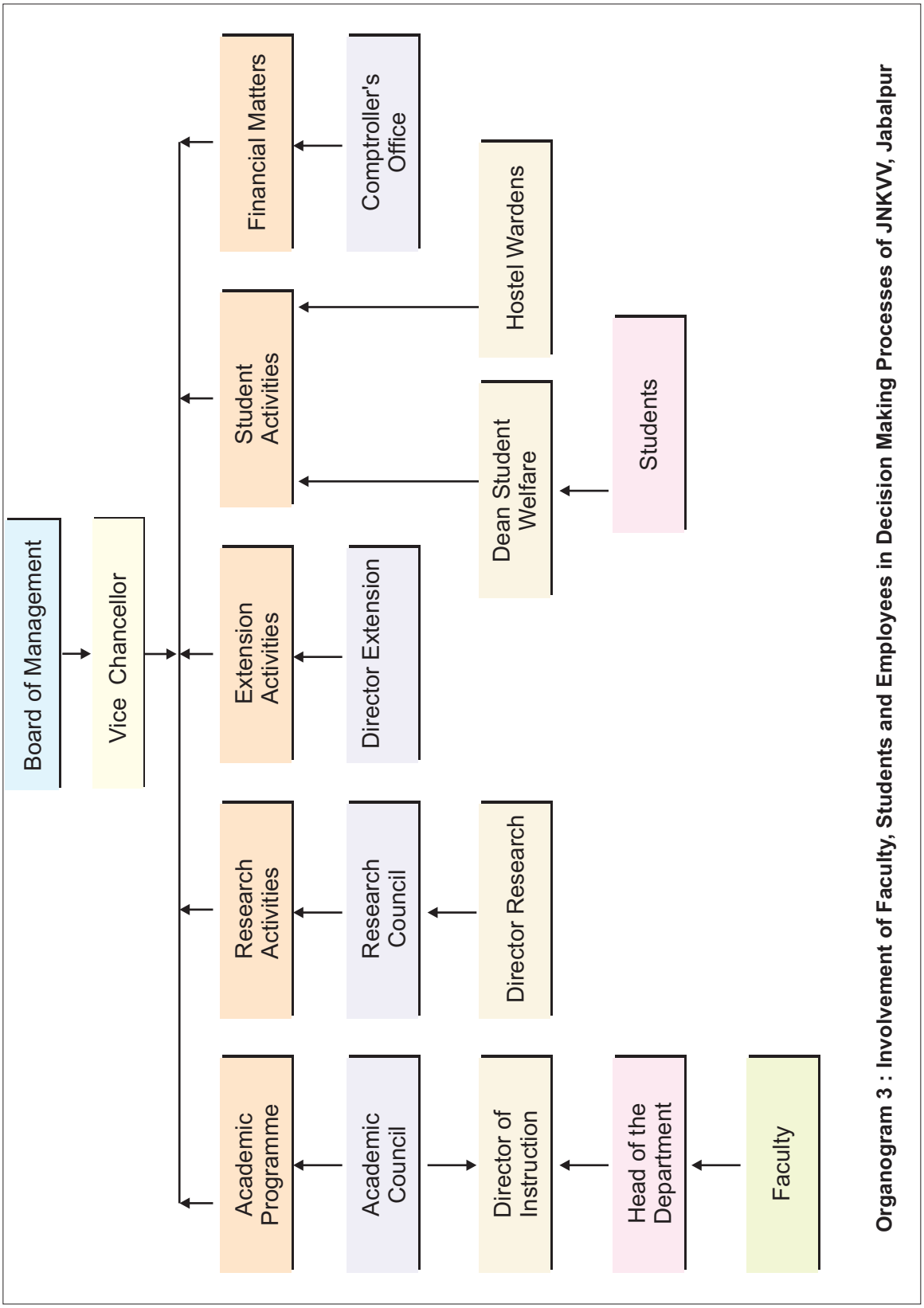
- Prof. Gautam Kalloo
  Vice Chancellor
  JNKVV, Jabalpur
  Chairman
- Shri G.S. Kurveti
  Comptroller
  JNKVV, Jabalpur
- Dr. S.S. Tomar
  Dean, Faculty of Agriculture &
  Director Research Services
  JNKVV, Jabalpur
- Dr. O.P. Veda
  Director Instruction
  JNKVV, Jabalpur
- Dr. G.S. Rajput
  Dean, College of Agril. Engg.
  Jabalpur
- Dr. R.P.S. Baghel
  Dean, College of Veterinary
  Science & A.H.
  Jabalpur
- Shri B.B. Mishra
  Registrar
  JNKVV, Jabalpur
  Secretary
- Dr. K.K. Saxena
  Director Extension Services &
  Dean, College of Agriculture
  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. N.K. Seth
  Dy. Director Research (Engg.)
  Directorate of Research Services
  JNKVV, Jabalpur
- Dr. M.L. Parmar
  Professor & Head (Anatomy)
  College of Veterinary Sci. & A.H.
  JNKVV, Jabalpur
- Dr. (Mrs.) Ameeta Kushwah
  Professor & Head (Vety. Biochemistry)
  JNKVV, Jabalpur
- Dr. R.S. Sharma
  Professor & Head (Agronomy)
  JNKVV, Jabalpur
- Dr. P.K. Jain
  Professor & Head (Horticulture)
  JNKVV, Jabalpur
- Dr. A.G. Nema
  Professor & Head (Plant Pathology)
  JNKVV, Jabalpur



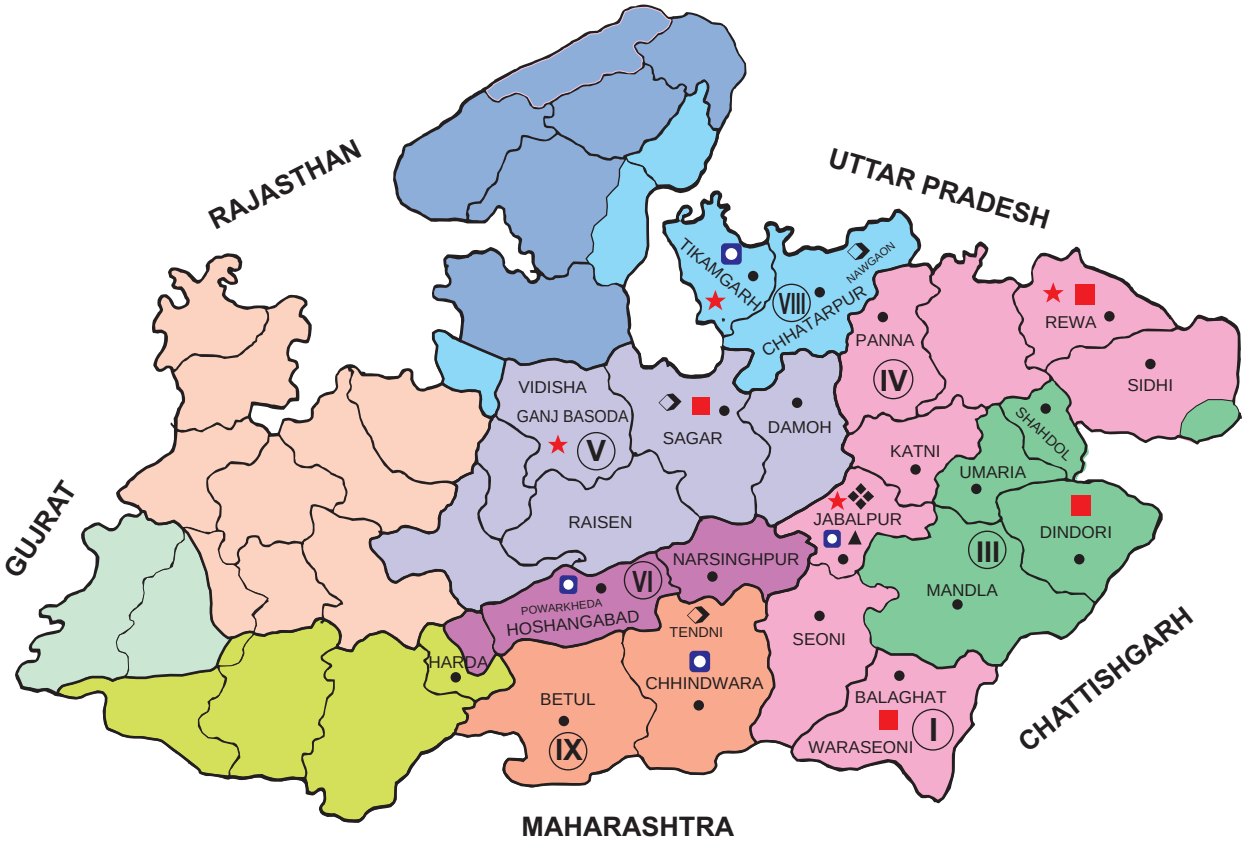
Organogram 1 : Organizational set up of the JNKVV



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

The University has three Faculties viz. Agriculture (four constituent colleges at Jabalpur, Rewa, Tikamgarh and Ganj Basoda), Veterinary Science & Animal Husbandry (Jabalpur and Rewa) and Agricultural Engineering (Jabalpur) with 13, 16 and 6 departments, respectively. The Faculty of Veterinary Science & Animal Husbandry has separated from JNKVV with the creation of Madhya Pradesh Pashu Chikitsa Vigyan Vishwa Vidyalaya, Jabalpur in November 2009.

Academic programmes

The University offers four Bachelor's Degree programmes viz. B.Sc. (Ag.), B.Sc. (Forestry), B.V.Sc. & A.H. and B.Tech. The Master's Degree programmes are available in thirteen departments under Agriculture faculty, in sixteen departments under the Faculty of Veterinary Science & A.H. and in three departments in the Faculty of Agricultural Engineering. The programme on Agri-Business Management is also available under Agriculture Faculty. Doctoral degree programmes are available in nine departments of Agriculture Faculty, fourteen departments of Veterinary Faculty and in three departments of Agricultural Engineering Faculty. In addition

Departments in different Faculties

Agriculture	Veterinary Science & A.H.	Agricultural Engineering
Agronomy	Animal Biotechnology	Farm Machinery & Power
Agricultural Biotechnology	Animal Breeding & Genetics	Post Harvest Process & Food Engineering
Agricultural Eco. & FM	Animal Nutrition	Soil & Water Engineering
Mathematics & Statistics	Animal Reproduction,	Applied Physics & Agril. Meteorology
Crop Physiology (Medicinal	Gynaecology & Obstetrics	Agricultural Structures &
& Aromatic Plants)	Veterinary Medicine	Environmental Engineering
Entomology	Livestock Production & Management	
Extension Education	Poultry Science	
Food Science & Technology	Veterinary Anatomy & Histology	
Horticulture	Veterinary Biochemistry	
Plant Breeding & Genetics	Veterinary Microbiology	
Plant Pathology	Veterinary Parasitology	
Soil Science &	Veterinary Pathology	
Agricultural Chemistry	Veterinary Pharmacology & Toxicology	
Forestry	Veterinary Physiology	
	Veterinary Surgery & Radiology	
	Wildlife Health Management	

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 are granted by the Dean, Faculty of Agriculture/ Agricultural Engineering/ Veterinary Science & Animal Husbandry, through pre-entrance test conducted by Professional Examination Board, Bhopal. The availability of seats under different UG / PG / Ph.D. programmes as given in the table below:

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 of 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 of Instruction also recommends the appointment of external examiner, for evaluating the thesis of every postgraduate student. The Registrar issues the notification regarding the declaration of results and the award of the Degree.

The Advisory Committee is constituted for each student, drawn from different Faculties depending on the research topic. Intra-institutional movement is also allowed to the students for the conduct of their research for utilizing the expertise and infrastructure facilities available. Inter disciplinary approach in the post graduate programme is adopted and the students register courses of other disciplines also. ICAR's new PG course curriculum has been implemented at JNKVV..

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

Availability of seats in different programmes at JNKVV under the Faculty of Agriculture, Veterinary Sci. & A.H. and Agricultural Engineering

Programmes	Availability of seats (2009-10)				
	Free	ICAR	Payment	NRI	Total
B.Sc. (Ag.)	200	30	40	10	280
B.Sc. (Forestry)	20	3	4	1	28
M.Sc. (Ag. / Forestry)	131	33	115	-	279
M.B.A. (Agri Business)	15	-	15	-	30
Ph.D. (Agriculture Faculty)	30	7	22	-	59
B.V.Sc. & A.H.	120	18	24	12	174
M.V.Sc. & A.H.	59	9	27	10	105
Ph.D. (Veterinary Science & AH)	14	2	-	3	19
B. Tech.	60	9	12	3	84
M. Tech.	18	3	18	2	41
Ph.D. (Agricultural Engineering)	12	2	12	1	27
Total	679	116	289	42	1126

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 to conduct collaborative research in various fields of agriculture, agricultural engineering and veterinary science.

Revision of course curriculum

Heads of the departments develop and propose for revision of course curricula after thorough discussion with the teachers of the departments. They prepare detailed course out line for all the courses to be revised along with names of prescribed text and reference books. The revised course curriculum is first discussed in the faculty meetings and after approval; the proposal is submitted for consideration and approval in the Academic Council. The revised course curriculum after due approval of Academic Council, is printed and circulated amongst the staff and students for implementation.

U.G. programme

The new UG course curriculum as proposed by the fourth Deans Committee has been implemented at the university w.e.f. from the academic session 2007-08. The new course curriculum at Master's and Doctoral level Programmes, as proposed by ICAR, has been implemented in all the constituent colleges of the Vishwa Vidyalaya.

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 seven campii.

Centre of Advanced Faculty Training

ICAR, New Delhi, has recognized the Department of Soil Science and Agril. Chemistry, College of Agriculture, Jabalpur as Centre of Advanced Studies in Soil Science and Agril. Chemistry w.e.f. 1995. The centre is engaged in organizing various training programmes, in which scientists/ teachers and other research workers from different states participate and update their knowledge and skill. In all these training programmes besides JNKVV trainers, eminent scientists, resource persons from other universities and subject matter specialists from various fields of specialization are invited to deliver lectures.

Human Resource Development

Human Resource Development is one of the most important functions of the university. Since its establishment, the University has produced 16,031 Graduates and 6,634 Post Graduates (till 2008-09 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 Extention Officers by the Government of Madhya Pradesh under a programme funded by the Danish International Development Agency (DANIDA) aimed at providing knowledge and skills of improved agricultural technology to the farm women. The quality education is the top most priority with main thrust on improving the infrastructure and teaching capabilities of the faculty.

All the constituent colleges are equipped with adequate facilities to carry out teaching and research activities. However there is need to upgrade the teaching and research facilities at Agriculture college Tikamgarh and Agriculture college Ganj Basoda.

Central Library

The Central Library of JNKVV is located at Jabalpur. It was established with a view to collect, organize and analyze agricultural information and making it available for users. The library is catering to the need of all constituent colleges of JNKVV (Agriculture, Forestry, Veterinary and Agricultural Engineering) KVK's and research stations. Presently, the LIBMAN software has been installed in the library and its automation is in progress. 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 student consultation. Internet facility is provided through LAN/Ethernet. There are 100+ CD database on different disciplines of Agriculture, Veterinary 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 AG. ECONOMICS, SOILCD, Biological Abstracts, Annual Review 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 18 Foreign Journals and 40+ Indian Journals. The Central Library is linked with 30 International and 60 National Institutes/Universities under exchange programme. There are currently 85,000 entries representing 60,000 general books, textbooks, teacher reference books and 16,308 back and current volumes of foreign and Indian journals, about 6000 (PG/Ph.D.) theses and 8632 pamphlets, bulletins and reports etc. Every year, approximately 4000 new entries of literature are added.

Students of the Vishwa Vidyalaya are getting facility of borrowing books through Book Bank which has 20,000 books. Every year, 3000 to 4000 new books are added to Book Bank. The outlying campii (Agriculture, Forestry and Veterinary) colleges have separate libraries They are funded for procuring books, journals and book-bank books separately every year.

IX Convocation of JNKVV

Dr. Mangala Rai, Secretary, DARE and Director General, ICAR delivering the Convocation Address (left) and invited dignitaries (right) during the Convocation

The IX Convocation of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur was organized on Oct. 20, 2009. In the beginning, the Academic Procession lead by Shri B.B. Mishra, Registrar, JNKVV, Jabalpur, entered the auditorium following which the convocation was declared open by Hon'ble Vice Chancellor on behalf of His Excellency, Shri Rameshwar Thakur, Governor of Madhya Pradesh and Chancellor of the University. Shri Ishwardas Rohani, Hon'ble Speaker, Madhya Pradesh Vidhan Sabha, Bhopal inaugurated the convocation. The Presidential Address of His Excellency, the Governor of Madhya Pradesh & Chancellor was delivered by Prof. Gautam Kalloo, Hon'ble Vice Chancellor, JNKVV, Jabalpur. Dr. Mangala Rai, Secretary, DARE & Director General, Indian Council of Agricultural Research, New Delhi delivered the Convocation Address while Prof. Gautam Kalloo, Vice-Chancellor, JNKVV, Jabalpur delivered the Welcome Address and presented the brief report of University activities. Dr. S.M. Paul Khurana, Vice Chancellor, Rani Durgavati Vishwa Vidyalaya, Jabalpur, Shri Prabhat Parashar, Commissioner, Jabalpur Division, Hon'ble Members of Board of Management, Academic Council, Directors and Deans, Head of the Departments, Faculty Members, other staff, esteemed guests and alumni of the JNKVV were present on the occasion.

During the Convocation, agricultural scientists of international repute, Dr. Gurdev Singh Khush and Dr. Surinder Kumar Vasal were conferred the Honorary Doctorate degrees *(Honoris Causa)* by the University *in absentia*. In addition, 15 students were conferred the degree of Doctor of Philosophy, 34 were awarded the gold medals and nine with cash awards in various disciplines under different faculties. A total of 1,512 students (605 students passing during the academic year 2005-06 and 907 students passing during 2006-07) of undergraduate and post-graduate courses were conferred the degrees during this Convocation.

Award of Degree to an outgoing student by Prof. Gautam Kalloo, Vice Chancellor, JNKVV

Galaxy of invitees, staff and degree awardees during the Convocation

Awards and Honours

- Dr. S.K. Rao has been awarded the Rafi Ahmed Kidwai Award for the 2008 by ICAR, New Delhi. Dr. Rao played a pivotal role in reorganizing crop improvement research and was responsible for the development of several crop varieties, infrastructure for maintenance breeding, and diversified nucleus and breeder seed producing systems. Dr Rao established brand image of quality seeds and planting material through trade mark of Jawahar Seeds and logo. The Vishwa Vidyalaya emerged as top ranking institution in breeder seed production in the National Agricultural Research System in India. He provided the policy framework and guidelines for the establishment of old seed cooperatives in Madhya Pradesh. This resulted in high seed replacement rates owing to better seed production and supply systems through model seed system and seed village system.
- Wheat Scientists of JNKVV Honored by ICAR: Wheat scientists the University have been honored during preliminary session of Wheat Workshop held at IARI, New Delhi by ADG (FC), Director, IARI and Director Wheat for Development and release of wheat variety MP 1203 during 2008.
- Best Paper Award on 'ICT Based Kisan Mobile Sandesh- An Innovative Approach' was awarded to A.K. Wankhade, Nalin Khare & S.K. Panase during the National Seminar on ICT for Agriculture and Rural Development organized by Central Agricultural University, College of Horticulture & Forestry, Pasighat, Arunachal Pradesh Pradesh during Sept. 9-11, 2009.
- Dr. B.S. Dwivedi, Programme Assistant, KVK, Rewa and Dr A.K. Rawat, Principal Scientist, Department of Soil Science & Agril. Chemistry, College of Agriculture, JNKVV, Jabalpur were awarded the Aryabhatt award for best paper presentation entitled “Input integration effects on kutki (*Panicum sumatrense*)” on the occasion of IInd National Conference on Innovation in Indian Science, Engineering and Technology held at National Physical Laboratory, Pusa, New Delhi from July 17-19 , 2009.
- Prof. V.K. Gour (Geneticist & Plant Breeder), JNKVV was under the auspices of Delhi Technological University, Delhi. The panel discussed the "Impact of Biofuels on Climate Change". Prof. Gour was honored by Dr. P.B. Sharma, Vice Chancellor amongst the august gathering. Prof. Gour also presented two invited papers during the conference *viz.* "Genetic Improvement of Jatropha curcas" and "Jatropha as Feedstock for Biodiesel - Challenges and Potential *vis-a-vis* other non-food Crops: Global Scenario and Indian Perspective" respectively. He was also invited to present a paper entitled "Jatropha Plantation and Management to Maximize Feedstock Production" during the the Biofuel Conference organized by Winrock Inter-national, India during February 11 - 13, 2010.
- During the 74th Annual Convention of the Indian Society of Soil Science held at New

Awards to JNKVV scientists and students

Delhi on Dec. 22, 2009, Dr. S.S. Tomar, Dean, Faculty of Agriculture and Director Research Services, JNKVV, Jabalpur was conferred with the Fellowship of the Indian Society of Soil Science. Dr. Tomar, an eminent Soil Physicist was honoured in recognition of his outstanding work on evolving "Technology for land and water management (raised sunken bed and ridge furrow) in deep vertisols of high rainfall area and improving tillage practices for rice-wheat cropping systems in vertisols".

- Dr. S.K. Rao, Director Farms and Dean, College of Agriculture, Rewa has been conferred the prestigious “Dr. Kailash Nath Katju Award” for the year 2008 for his outstanding contribution in the field of varietal improvement and breeder seed production by the Deptt. of Science & Technology, Government of Madhya Pradesh, Bhopal.
- Dr. S.K. Gupta, Technical Officer, Faculty of Agriculture, JNKVV, Jabalpur and Principal Scientist (Agricultural Economics) was elected as Executive Member of the Indian Society of Agricultural Economics for two years i.e., for 2008 and 2009 during General Body Meeting of the Society held at Bankers Institute of Rural Development (BIRD), Lucknow (U.P.).
- Dr. M.L. Kewat, Associate Professor (Agronomy) was awarded Indian Society of Weed Science (ISWS) Fellowship 2009-10 for his excellence contribution in the field of Weed Science by Shri Chandra Shekhar Sahu, Hon'ble Minister of Agriculture, Govt. of Chattisgarh during Biennial Conference of ISWS held at Indira Gandhi Krishi V.V. Raipur on Feb. 25, 2010.
- Dr. S.B. Nahatkar, Senior Scientist, Directorate of Research Services, JNKVV, Jabalpur has been elected as a Member of Executive Body of the Indian Society of Agricultural Economics, Mumbai for the years 2010 and 2011. He has also been elected as Member of Executive Body of Agricultural Economics Research Association (India), New Delhi for the period 2010-12.
- Mr. A.B. Tiwari, Sr. Scientist, Deptt. of Plant Physiology has been nominated by the Collector, Jabalpur as a Member of District Medicinal Plants Mission Committee to promote medicinal plants in Jabalpur district.
- Dr. S.K. Tripathi, Senior Scientist, College of Agriculture, Rewa was awarded "KPV Menon Award 2009" from Indian Phyto-pathological Society, IARI, New Delhi during the 5th International Conference on "Plant Pathology in Globlized Era" held at New Delhi during Nov. 10-13, 2009.

Visits

- Smt. Vidyavati, Deputy Director, Agriculture Department, Satna and a group of farmers from Satna district visited Facilitation Centre for Medicinal Plants on Nov. 17, 2009 to study the production, processing & value addition of medicinal plants for commercial cultivation in the Satna district.
- Dr. Ranjana Chaudhary, Addl. Chief Secretary and Agriculture Production Commissioner, M.P. visited College of Agriculture, Rewa on Oct. 2, 2009. She visited Millet & Rice Project and appreciated the seed production programme of Kodo Kutki and hybrid rice.
- Shri Kedar Nath Shukla, MLA and Board Member, JNKVV, Jabalpur visited College of Agriculture, Kuthulia Farm, Rewa on Nov. 2, 2009 and KVK, Sidhi on Nov. 3, 2009 with Dr. S.K. Rao and Dr. R.P. Singh and appreciated the activities.
- Prof. Gautam Kalloo, Vice Chancellor, JNKVV, Jabalpur and Dr. Arvind Kumar from IRRI, Philippines visited Rewa on Oct. 25, 2009. Special lecture on "Drought Stress and Aerobic Rice" was delivered by Dr. Arvind Kumar.
- Dr. K. Kasturirangan, Hon'ble Member, Planning Commission, Govt. of India, New Delhi visited JNKVV, Jabalpur on Jan. 22, 2010 for an interface meeting to

discuss and review pulse production programme/ strategies for increasing productivity and production in M.P. Vice Chancellors, Director Research of State Agricultural Universities, Director of Pulse Development, Senior officers of Department of Agriculture and senior pulse scientists, representatives of ICAR, DAC and Planning Commission participated in the meet. Short and long term strategies for pulse improvement in future were discussed at length and finalized for further implementation.

- Dr. N.P. Singh, Project Co-ordinator (Chickpea), IIPR, Kanpur visited JNKVV, Jabalpur on Feb. 23, 2010 to review the on-going research programme in different disciplines under AICRP on chickpea.
- Drs. P.M. Gaur, Principal Scientist (Chickpea Breeding) and Suresh Pande (Legume Pathologist) ICRISAT, Hyderabad visited JNKVV, Jabalpur during March 11-12, 2010 to review the experiments being conducted on chickpea under ICAR- ICRISAT Collaborative programme and DBT projects.
- Dr. Suresh Pande, Scientist, ICRISAT, Hyderabad visited and monitored Rice fallow-chickpea programme in Rewa and Satna districts from March 5-12, 2010.
- Dr. R.J. Rabindra, Director, National Bureau of Agriculturally Important Insects, Bangalore on January 5, 2010 advocated the farming community that due consideration should be given to biological control in managing the insect pests population. He was addressing a group of scientists, students in JNKVV and warned about number of problems arising due to non- judicious use of pesticides.
- Dr. K. Kasturirangan, Hon'ble Member, Planning Commission, Govt. of India, New Delhi visited the Entomology stall arranged in the Farmers Fair (Kisan Mela) organised by the Directorate of Weed Science Research, Maharajpur, Jabalpur on January 23, 2010. Dr. O.P. Veda, Director Instruction and Professor & Head (Entomology) explained him about the role of Light Trap in managing the insect pest population. About 1500 farmers visited the Entomology stall.
- Japanese team JICA lead by Dr. Teruo Miura visited JNKVV, Jabalpur from August 31 to September 1, 2009 to study the production, protection and processing technologies of soybean. The team also visited the research & production programme of soybean.
- Members of Board of Management visited research as well as seed production programmes at Jabalpur Centre on Sept. 14, 2009.
- Dr. D.N. Sharma, Director Agriculture, Department of Farmers Welfare and Agriculture Development, Bhopal visited seed production plots, as well as rice, soybean and pigeonpea at Jabalpur campus on Sept. 5, 2009.
- Shri Virendra Singh Rana, Hon'ble Member, Board of Management, JNKVV, Jabalpur visited the College of Agriculture, Ganjbasoda on July 15, 2009. He was impressed with the overall progress of the college. He said that the seed production programme of the college is for the benefit of the farmers. During the visit, Dean, Dr. R.V. Singh accompanied the Hon'ble Board Member.

Visits Abroad

- Dr. S.K. Rao attended an International Training Programme on “Food and Agribusiness Management” organized by Cornell-Sathguru Consultant in India at Ithaca, USA. This programme covers food security management and agribusiness management strategies, advances in agriculture research, IPR management and commercialization of technologies.
- Prof. V.K. Gour (Geneticist & Plant Breeder), was invited by Global Forum for Agricultural Research (GFAR) and Agropolis International, France as delegate to participate in Global Conference on Agriculture Research for Development (GCARD 2010) held at Montpellier, France during March 27 -

April 1, 2010. He actively participated in concurrent sessions on Bio-diversity and Visioning Future Agriculture. Prof. Gour emphasied the need of global collection and conservation of Jetropha curcas germplasm for genetic enhancement and its development to ensure livelihood security as long term option to the rural poor across the tropical and sub-tropical regions of the world besides food security being the focus of the conference.

- Dr. P.C. Mishra, Principal Scientist (Plant Breeding & Genetics), Zonal Agricultural Research Station, Powarkheda visited CIMMYT, Mexico to participate as Visiting Scientist in the course on "Phenotyping for Physiological trait based breeding" from November 23 to December 4, 2009.

Students' World

- Shri Uday Anil Pawar, student of M.Sc. (Ag.) Entomology Previous year has been awarded with ASPE Agricultural Research & Development Foundation Fellowship for the year 2008-10.
- Students of B.Sc. (Ag.) 4th year, College of Agriculture, Jabalpur, Rewa & Tikamgarh were deputed in 70 villages for field practical under Rural Agricultural Work Experience (RAWE) programme.
- Twelve students of College of Vety. Sci. & A.H., Jabalpur were awarded Junior Research Fellowship of ICAR.
- In various campus interviews, 3 students were selected as Field Officer in Nationalized Banks, 18 students as Vety. Officer in J.K. Trust Gram Vikas Yojana, 12 students in BAIF, Pune, 3 students as Sales Officer in Vety. Pharmaceutical companies and 4 students in Indian Broilers group of Industries, Rajnadgaon, Chattishgarh.
- The Intas-Pharmaceuticals awarded cash prize of Rs. 3500/- to meritorious students of the college.
- The Oath Taking Ceremony of outgoing Veterinary Graduates was organized on August 24, 2009 in which Shri Rakesh Singh, Member of Parliament was the Chief Guest and Prof. Gautam Kalloo Hon'ble Vice Chancellor was the Chairman.
- Two students, Shri Gopal Nigwal and Shri Satendra Singh Bagri have been selected in the Union Bank of India as Rural Development Officer (RDO).

Placements

- Office of the Dean Student Welfare, JNKVV, Jabalpur organized campus interviews for placement of Agriculture Graduates, Post Graduates, MBA, B.Tech., M.Tech., B.V.Sc. and M.V.Sc. pass outs. Union Bank of India, Bank of India, Hindustan Petroleum and Dhanuka Agritech conducted interviews at the VV headquarter. Fifty two students were selected for different positions.

Collaboration of JNKVV with IARI, New Delhi

- The Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur and Indian Agricultural Research Institute, New Delhi signed collaborative agreement on August 10, 2009 for facilitating and enhancing the activities in teaching and research, human resource development in marker assisted selection; development and promotion of hybrid technologies of wheat and pigeonpea, multi-location testing of elite materials of pigeon pea and wheat.

Guest Lectures

- Mr. K.T. Chacko, IAS, Director, Indian Institute for Foreign Trade, New Delhi visited JNKVV, Jabalpur on Oct. 10, 2009 addressed the scientists of JNKVV and explored the possibility of opening a Centre for WTO Studies at JNKVV, Jabalpur.
- Dr. Bangali Baboo, Director, Indian Institute for Natural Resins and Gums, Ranchi, visited JNKVV, Jabalpur on Oct. 13, 2009. He visited Lac growing areas in Anooppur district, Dr. Baboo delivered a

lecture on "Importance of Resins and Gums in Indian Economy".

- Shri Rajan Sunderasan, General Manager, Agro-Chemicals Policy Group, New Delhi visited JNKVV, Jabalpur on Nov. 10, 2009 and delivered a talk on "Pesticide Perception".
- Dr. K.C. Upadhyay, Former Vice Chancellor, M.S. University Baroda and Professor, School of Life Sciences, Jawaharlal Nehru University, New Delhi visited JNKVV, Jabalpur on Dec. 22, 2009 and delivered a lecture on "Gene and Genomics".

Rural Agricultural Work Experience (RAWE)

The RAWE programme has been implemented during the year 2009-10 in all the colleges viz. Jabalpur, Rewa & Tikamgarh and Forest Work Experience (FWE) in the Department of Forestry, Jabalpur. In all, 223 students have been benefitted in various components of RAWE programme.

Placement of Students

Name of the College	Number
College of Agriculture, Jabalpur	102
College of Agriculture, Rewa	62
College of Agriculture, Tikamgarh	40
Department of Forestry, Jabalpur	19
Total	223

Objectives

- To provide an opportunity to students for practical skill learning in agriculture through work experience.
- To offer opportunity to students for understanding rural life and problems prevalent in villages with special reference to agriculture to through techno economic survey.
- To make students understand from technologies an adopted by farmers and also to help farmers to prepare sound from plans marching available resources.
- To facilitate development of communication skills in students through use of extension teaching methods for transferable of technology.
- To develop confidence and competence in students for solving technical problems related to agriculture and allied enterprises.

The students have been placed in the various selected villages of KVKs to work with host farmers for intensive training and field experience with the farm families. They get an opportunity to study the different farm situations, farm practices and interact with the farmers to identify the problems and suggest the suitable measures to solve them for improvements in the existing practices. Students also developed confidence and skills with experience and knowledge of the host farmers.

Rural agriculture work experience helped the students in understanding rural life and problems prevalent in villages with reference to agriculture through techno-economic survey and in learning practical skill through agriculture work experience.

Achievements

Activities done by the students in Crop Production Technology

- Land preparation for potato cultivation
- Sowing of potato
- Making irrigation drainage, channels in potato
- Earthling of groundnut and potato
- Harvesting of groundnut
- Sowing of ginger
- Cultivation of medicinal plants to farmers
- Harvesting of maize
- Harvesting of Sesame

Under fruit and vegetable production: Students learnt seed treatment, sowing,

FWE Students observing nursery

RAWE students collecting carrot

RAWE students preparing Thala in Guava

irrigation, weeding / roughing, transplanting, guarding, plantation of mango, spraying of insecticide in guava plantation, drip irrigation, pruning in guava and DAP application.

Under Production and Management of livestock : Grooming of animals, visit to veterinary hospital, vaccination, visit to poultry farm etc. were the main activities performed by the students in adopted villages of Krishi Vigyan Kendra.

Under plant clinic: Students learnt spraying of insecticide in crops, trees, IPM, identification of insecticide & use of different methods for their control, collection of specimen of diseases, mushroom cultivation , identified different types of erosion, collection of soil sample, soil profile etc.

In social science: students collected various data / information of socio economic condition of villages, uses of resources, conducted farm survey and market & celebrated various festivals, organized kisan sangosthi, field days & also participated in various cultural activities & visited development departments for knowing various programmes and its methodology. All the course teachers monitored and evaluated the performance of the activities done by the students of the villages. Necessary instruction and guidance were also given to them for solving the problems of the farming community.

The students were brought in close contact with the farmers of the representative areas. Apart from that the RAWE students were involved in front line demonstrations, on farm trials activities and training programmes like nursery management of vegetables crops & its production technology

Achievements of Forest Work Experience

The students of FWE carried out following activities

- Socio-economic and Institutional aspect of rural life
- Nursing operation and Management
- Farming system (tree, grasses, crops and agroforestry)
- Plantation on degraded land such as wasteland mined areas, and marshy lands.

RAWE student doing vermi compost application in mango

RAWE student preparing Thala for Papaya

Seed production of Wheat

- Fire and Grazing Management
- Forestry Extension and Communication including people participation
- Working of Forestry sector by state forest department
- Socio-economic and Institutional aspect of rural life.

Forestry students were placed in the village Simaria. Studies reveled following information.

Nursing operation and Management

During the course of study students visited Van Anushandham vistar Varat Bamandevi nursery. Students learned the techniques related to raising forest nursery of eucalypts, tectona grandis, madhuca indica, dandrocalamus, strictus and emblica officanlis total area of nursery was 4 ha and was well fenced.

- Students learned about various management practices for raising various seedling and details packages of practices required related to soil, making mixture, watering etc.
- Students learned about selection of trees for seed collection, maturity indices of seed/fruits and collection methods and storage of seeds etc.
- Farming system (tree, grasses, crops and agroforestry)

Following information's on farming system of village Simariya was collected by the students.

- Majority of the farmers of village Simariya grow paddy during kharif, wheat in rule and mung as summer crop
- Common inter cropping system recorded by the students were:
  Guava - Paddy
  Mango - Wheat
  Citrus - Wheat
- Major tree species recorded were - Babul, Saja, Teak and Mahua

Following agro-forestry systems were suggested by the students to the villagers:

Tree species	Kharif crop	Rabi crop
Guava	Paddy	Wheat
Anola	Til	Gum
Bamboo	Arhar	Masur
Mango	Maize	Mustard
Shisham	Soybean	Tilseed

- Plantation on degraded land such as wasteland mined areas, and marshy lands.

Students were taken to various sites of surrounding Seoni (Gopalganj) and were given practical exposure related to the condition that leads to formation of degraded land. Students learned about various types of wasteland and type of trees species that should be planted on them. They learned technically plantation techniques especially on salim khan's site.

Fire and Grazing Management

Students learned about various types of fires, their advantages and disadvantages. They also gathered information on general weather condition required before demonstration on fire techniques, purpose of fire etc. Regarding grazing management Forestry students studied about basic concept of grazing and how to keep animal population optimum in respect to carrying capacity on pasture land so that to maintain sustained yield and how to reduce over grazing.

Forestry Extension and Communication including people participation

Students of FWE organized various demonstration viz.; method demonstration at village simariya with objectives like importance and use of clear drinking water, visits of farmers to medical garden KVK, Seoni, gathered information on socio-personal and economic information, on going tribal and forest development programme, plus point programme, India awas yojna etc.

RESEARCH

Introduction

Looking to the agricultural scenario of the State and available potentials for increasing production and economic upliftments, the multi disciplinary research of applied nature is conducted on Natural Resources Management, Crop Improvement, Crop Production, Crop Protection, Horticultural crops, allied enterprises, Post Harvest Technology, Farm Machinery, Energy utilization and Socio-Economic aspects at four Zonal Agricultural Research Stations, Regional Research Stations and Agricultural Research Stations each respectively. Well-equipped and mechanized farms, workshops, laboratories, agromet center, glass & net houses, library, ARIS cell with latest information and communication technology strengthen the research activities of the University. As on date, All India Coordinated Research Projects, ICAR Network projects, NAIP, Ad-hoc research projects, State Plan and Non-Plan Projects, Madhya Pradesh Mandi Funded Projects, Madhya Pradesh Council of Science & Technology Projects, other externally funded projects (BARC, MSSRS, etc.), Govt of India Projects (Agro-Economic Research Center, CCS, RKVY, FSM, NHM etc.), along with internationally funded project from IRRI, IFPRI, ICRISAT are in operation to carry out the research work in agriculture and allied fields. Besides this product testing facility for corporate sector are also extended on demand basis.

The main thrust of research in the Vishwa Vidyalaya continues to be on the evolution of improved crop varieties having resistance/ tolerance to biotic and abiotic stresses and development of need based location specific improved technologies. 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 also concentrating on frontier areas of research such as bio-technology and molecular biology, agro-forestry, bio-energetics, organic farming including biological control of pests and diseases, bio-fertilizers, natural resource management, crop improvement, cropping system, food processing and post harvest technology, hi-tech horticulture, medicinal and aromatic plants, wasteland management, agricultural machinery and allied aspects and Integrated Farming System approach besides organic farming and conservation agriculture. The socio-economic studies are also carried out by the Agro-economic Center and data on cost of cultivation of major crops of the State are generated for the Commission on Agricultural Cost and Prices.

CROP VARIETIES DEVELOPED

Wheat MP 1215

Wheat MP 1201

- MP 1215 : A durum wheat variety developed by joint collaboration with ZARS, Powarkheda and wheat improvement project at Jabalpur has been identified during the wheat workshop held at IARI, New Delhi in August, 2009. It matures in 118 days, plant is green in colour, bold and shining grain with high protein. It is suitable for irrigated timely sown condition of Central Zone. It is resistant to rusts and other diseases of wheat. The yield potential is 55-57 q/ha.
- Wheat JW 1201: It matures in 118 days, bold grain, good appearance and high protein content. It has resistance to rust and suitable for irrigated condition of M.P. Yield potential is 53 q/ha.
- Wheat JW 3269: It matures in 117-120 days, semi dwarf & is non shattering. Ears are long, shining grain and bold in size. It is resistant to rust and suitable for partially irrigated condition of M.P. In one irrigation it gave 35 q/ha and 43 q/ha in two irrigations.
- Gram JG 12: It matures in 105-115 days. It is semi spreading, profuse tillering and with brown medium seed. Resistant to vascular wilt and moderately resistant to dry root rot. It has yield potential of 20 q/ha and has been found suitable for both rainfed/ irrigated conditions of M.P.
- Linseed PKDL 21: It matures in 97-112 days, extra early, leaves are dark green and place alternately, seed bold and lustrous with brown colour. It is resistant to wilt and powdery mildew and escapes from other diseases of linseed. The yield potential is 5-9 q/ha in rainfed and 8-12 q/ha in limited irrigated condition.
- Linseed PKDL 41: It matures in 115-120 days. It has profuse secondary branching flowers and seed at top, chocolate seed colour and bold. Suitable for irrigated

Wheat MP 3269

Linseed JLS 66

Oat JO 2

timely sown and late sown areas of M.P. Resistant to diseases and tolerant to bud fly. Yield potential is 15-17 q/ha.

- Linseed JLS 66: It matures in 107-114 days, short in height, with white flower and seed are light brown in colour. Moderately resistant to powdery mildew, Alternaria blight, rust and major insect pests. Oil content 40.5% and yield potential is 22 q/ha.
- Oat JO 2: It matures in 145-155 days. It has broad leaves with profuse tillering at the base owned spikelets. Tolerant to lodging and shattering. Recommended for both green and dry fodder, first cut is taken at 60-65 days. The yield potential of green fodder is 635 q/ha and dry yield is 110 q/ha.
- Kodo JK 98: It matures in 104 days. Plants are 60 cm in height, erect, semi compact, dense ears, grain brown. Moderately resistant to head smut and resistant to shoot fly. Suitable for sole and intercropping. Yield potential is 25 q/ha

Wheat variety MP-3288

Kodo JK 98

under rainfed condition of M.P.

- An improved linseed variety JLS-67 has been identified by AICRP workshop during the Rabi 2009-10.
- Wheat variety MP-3288 developed at JNKVV, Jabalpur was found promising in AICRP's trials on wheat and this year, it is in AVT II under rainfed/ restricted irrigated condition in Central Zone. MP-3288 is semi dwarf, sarbati, bold and has shining grains with resistance to rust and other diseases, tolerant to heat and drought. It is high yielding, matures in 118-122 days and is suitable for chapatti with good quality attributes.
- JS 20-09, a soybean culture, has been developed at JNKVV, Jabalpur. It is high yielding, has wide adaptability and ranked first in Central Zone. It is being tested in AVT II. It is tolerant to abiotic stresses and shattering. It is of medium maturity duration (102-105 days) with bold and attractive seeds.

Soybean variety JS 20-09

Crop Improvement

Soybean

- Total 279 (222 general+57 mutant) germplasm lines were evaluated for different purposes.
- In Root Rot Screening Nursery, 125 soybean entries screened against root rot. Out of which, 112 entries showed resistance.
- In YMV Screening Nursery, 48 soybean entries were screened against YMV. Out of which, 42 entries showed resistance
- In Station Varietal Trial, JS 20-30 ranked first by providing yield of 2767 kg ha^{-1} followed by JS 20-29 (2333 kg ha^{-1}), JS 20-34 (2211 kg ha^{-1}) and JS 93-05 (2111 kg ha^{-1}).

Promising entries of soybean

JS 20-29: Early maturing, high yielding, high germinability, multiple resistant, tawny pubescence, medium pod colour, medium tall, white flower colour, bold seeded and dark black hilum colour.

JS 20-30: Medium maturing, high yielding, high germinability, multiple resistant, white flower colour, tawny pubescence, medium tall and dark pod colour.

JS 20-34: Extra early, thermo-insensitive, high germinability, multiple resistant, dwarf, glabrous and light pod colour.

Breeding soybean utilizing radiation induced mutants and elite lines for resistance against YMV and root rot:

Characterization based on morphological and phenological traits were done for 97 mutants and 13 elite lines.

Root Rot screening: Among 125 entries, those lines were also included which have been found resistant in past years along with some new lines for screening against root rot in sick plot. The previously tested lines are continuously put to the screening so that their stability of resistance can be tested further. Resistance was shown by 112 entries against root rot. A number of entries have been evaluated for more than three years. The entries which showed resistance over years were utilized in crossing programme.

YMV screening: Total 48 entries were evaluated out of which 42 were found to be resistant against YMV. In this, those lines were also included which have been found resistant in past years and some new lines for screening against YMV. The previously tested lines are continuously put to the screening so that their stability of resistance can be tested further for new strains. The entries showing resistance for more than three were utilized in hybridization programme.

Assessment of soybean varieties for productivity and profitability

Among the tested varieties of soybean, JS 97-52 variety was superior with the highest yield of 1852 kg ha^{-1}, net income of Rs 29214 ha^{-1} and B:C ratio of 4.44.

Chickpea

JG 12: Desi chickpea variety tested in IVT and being identified at university level for State release. It is early (105-115 days), brown and medium seed, semi spreading profuse branching, suitable for both irrigated and rainfed condition of M.P having yield potential of 20 q ha^{-1}.

Identification of high yielding and wilt resistant varieties of chickpea

Among the wilt resistant varieties of chickpea evaluated, SAKI 9516 was the best variety with a maximum yield of 2453 kg ha^{-1}, net income of Rs 43054 ha^{-1} and B:C ratio of 4.59, while JG 322 was the 2nd best variety with a marginally lower yield of 2353 kg ha^{-1}, net income of Rs 40834 ha^{-1} and B:C ratio of 4.40.

- JG 2004-3 and JG 2000-14, identified as stable resistant against wilt based on three years data in multi-location trials.

JS 20-34 Plot

JS 20-34 Single Plant

Root rot Screening

- MPJG 2001-04 and JG 2000-7 were found resonant to moderately resistant at 3 locations out of 5 locations.
- JG 2003-14-16 was found as wilt and dry root rot resistant in multi-location trial.
- JG 2003-95, JG 74,JG 2001-80,JG 2-125 and MPJG 2001-04 found resistant against Dry Root Rot at one location out of three locations.
- GJG 0419, GJG 0505, Rajas, GNG 1756, Phule G 9621-8, H 02 – 113 were found to be resistant against wilt & dry root rot.
- IC 269266, IC 269274, IC 269511, IC 269685, IC 269696, IC 269737, IC 269750, IC 269826, IC 269853, IC 269891 exhibited resistant reaction (< 10%) to collar rot and wilt.
- Based on three years data, IPC 2004-52, PG 9425-9 and H 82-2 are stable resistant against wilt.
- Reaction of differential genotypes against races of *Fusarium oxysporum* f.sp. *ciceri* isolates indicated the presence of race 2 and race 4.

Wheat

MP 1215: A durum wheat variety notified and released by CVRC (August, 2009) for irrigated timely sown condition of Central Zone having high yield potential with high protein content and resistant to rust and diseases.

MP 3269: A semi dwarf, long ear, bold grain with high yield potential wheat genotype suitable under partially irrigated condition. Identified by JNKVV varietal Release committee for the farmers of Madhya Pradesh.

MP 3288: A semi dwarf with profuse tillering, long ear, and bold grain with high yield potential wheat genotype suitable under rainfed and partially irrigated condition was identified.

- Attempts have already been made for incorporating resistance against Ug 99, the new race of black rust due to which the wheat production of whole world is under threat. The resistance genes Sr 25^{+} Sr 27^{+},

YMV Screening

Field view of JG 2001-12

Sr 28$^+$, Sr 30$^+$ and Sr 32$^+$ are being incorporated through hybridization. The breeding materials are already in advance stage. However, total 300 new crosses have been made during 2009-10 crop season.

- High temperature is major concern. To overcome this problem early generation material has been exposed to 33-36 ºC continuously for two weeks at grain filling stage. Using the criteria of "delayed senescence", section was made in the material. Success is apparent and 900 single plants have been selected from F_{2-}-F_5 materials. Total 25 advance lines were also exposed to higher temperature and seven lines gave higher yield and higher grain weight than checks, indicating high level of temperature tolerance. This line will be given for testing in All India Coordinated Trails.
- Variety MP 1237 got place in AVT (CZ) under late sown condition. Similarly MP 1230 and MPO 1232 (d) also occupied place in AVT (CZ) during 2009-10. Our varieties were promoted to AVT in other zones also. MP 1227 has been tested in North Western Plain Zone in AVT under rainfed condition. Variety MPO 1232 (d) has been promoted in peninsular zone for AVT under rainfed condition.
- Total 6000 valuable germplasm have been maintained by planting in field during 2009-10. Out of which 30 germplasm were used in crossing programme for high temperature, quality component and other agronomic traits.
- More than 11,000 single plants and 300 advance generation bulks, belonging to different filial generations were planted. These materials were given the high load of black and brown rusts though artificial inoculation followed by continuous spray. The intensity of rust development was high, while no rust pustule was observed at farmer's fields. However, approximately 10,000 new resistant single plants have been selected form F_2 to F_6 generations. 325 new bulks have been made from advance generation materials.

Hybrid Wheat Research

Maintenance of CMS lines: All the 10 CMS lines and its B lines planted well in isolation to maintain the A lines as well as used in diversification by making the crosses. During current year, 70 testers were used in diversification programme.

Study on flower traits: Flower traits including opening of flower, stigma length, pollen length, pollen extrusion, pollen viability, fertility by hand and stick pollination have been worked out.

Conversion of maintainers and restorers lines: 130 F1's wheat hybrids were planted to study their fertility and sterility behaviour for conversion of maintainers and restorers lines in our own back ground. Many lines were found suitable and most appropriate lines were back crossed.

Status of released varieties: Recently released varieties namely JW 3020, JW 3173, JW 3269 and JW 3211 have become very popular among farmers under partially irrigated condition. These water use efficient genotypes have played a major role in the phenomenal increase in area and save water as well fertilizer and will fetch the market by its quality attributes also.

Green Gram

TM 37: The BARC varieties TM-37 was found significantly superior in grain yield (1388.5 kg ha^{-1}) over other genotypes tested.

TM 99-37: An early maturing (65 days) variety developed by BARC. It is a cross between Kopergaon x TARM-2. Its yield potential is 11 qha^{-1}. The variety is moderately resistant to YMV.

Black gram

JU 2: It matures in 70 days and it was developed by JNKVV. Its yield potential is 13.0 q ha^{-1}. The variety is suitable for Madhya Pradesh and tolerant to *Macrophomina, Cercospora* leaf spot and YMV.

Screening of high yielding and mosaic resistant varieties

Among 8 high yielding and mosaic resistant varieties of black gram tested, PDU 1 was found to be superior with a significantly higher yield of 1373 kg ha^{-1}, net income of Rs 20549 ha^{-1} and B:C ratio of 3.85.

Linseed (irrigated)

- A total of 208 germplasm lines of linseed were maintained and utilized in crop improvement.
- Extra early variety PKDL 21 and irrigated variety PKDL 41 has been identified by State varietal identification committee.
- PKDL 52 (Irrigated condition) and PKDL 62 (double purpose) are doing well and have been promoted to final year testing in AVT.
- PKDL 62 was found to have multiple disease resistance/ tolerance and has been recommended as donor in breeding programme.

Sesame

- A large 414 germplasm lines of sesame were maintained for utilization in crop improvement programme at Powarkheda.
- JT 11 (PKDS-11, Brown seeded) identified for summer cultivation for Central and Northern Zone of India. It is a selection made from the local lines.
- JT 12 (PKDL 12, white seeded) released for Madhya Pradesh for summer cultivation. It is also a selection made from local lines.
- JT 14 (PKDS 8, black seed colour) released for Madhya Pradesh. It is as result of hybridization and pure line selection.

Oat

JO 2003-91: It has been developed from a cross between OS6 x JHO822 and has performed well in different locations in India. The green fodder yield is about 475-525 q ha^{-1} and dry matter yield 100-115 q ha^{-1}. It has medium duration (82-87 days for 50% flowering) and resistance to leaf blight, root rot and powdery mildew under field conditions. It gave the seed yield of 18-20 qha^{-1}. This has been identified by Central Variety Release Committee.

Sugarcane

Early Group: Under early group, the best performing entries were Co 05002 followed by Co Snk 05103, Co Snk 03632 and Co 05001 which recorded 120.57, 114.20, 113.41, and 112.93 t ha^{-1} yield; and 12.45, 13.20, 11.01 and 11.81 t ha^{-1} CCS t ha^{-1}, respectively.

Mid Late Group: Under mid late group, Co Snk 05104 followed by Co VSI 05123, Co 0409 and Co 0416 were the best performing entries which recorded 130.40 tha^{-1} 128.86, 124.23, 116.51, t ha^{-1} yield and 15.57, 11.93. 13.52, 12.97 t ha^{-1} CCS respectively.

Jawahar entries: Co JN 98-23, Co JN 99-21 (early group), Co JN 98-06, Co JN 99-17 (mid late group) have entered "Initial Varietal trial". Co JN 95-05 (mid late group) has been accepted for "Initial Varietal Trial". The clones tested in "AVT" viz., Co 95003, Co 95006, Co 99004 and Co 99006 are in demonstration trials and will be proposed for release in the State.

Kodo millet

- Improved varieties of Kodo millet (JK 48 and JK 439) and little millet (JK 8) have been recommended for cultivation in farmers field.
- Kodo millet entries, DPS 63 and DPS 19 ranked 2nd and 4th in Madhya Pradesh while, DPS 63 ranked 5th all over India. Our entries, DPS 63, DPS 36 and DPS 45 were

promoted for the second year advanced varietal trials.

- Variety JK 65 developed through single plant selection has been released and notified (No. S.O. 449 (E) dated 11.2.2009) at national level. The variety matures in 104 days with average grain yield of 23.00 q ha^{-1}. The variety is resistant to drought and moderately resistant to head smut and shoot fly.
- Under germplasm exploration conservation and evaluation programme, about one hundred fourteen germplasms of small millets (kodo millet, little millet, finger millet and foxtail millets) were collected from various parts of Dindori, Mandla and Umaria districts of Madhya Pradesh.
- 478 land races of Kodo millet, 133 of little millet, 68 of barnyard millet and 79 of foxtail millet were collected from Rewa and Shahdol divisions of Madhya Pradesh. These land races were evaluated for yield, yield traits, biotic stresses etc. and are being maintained.

Little Millet

- In little millet, DLM 4 and DLM 9 were promoted for the second year advanced varietal trials. DLM 4 promoted for agronomy trials. Little millet *viz*., DLM 14 and DLM 18 have been submitted for Advanced Varietal Trial.
- Maximum grain yield of little millet is obtained when sowed early (23rd June to 10th July).
- Crossing programme was initiated in little millet for the first time at Regional Agricultural Research Station Dindori and three crosses were successfully crossed.

Maintenance breeding: Under maintenance breeding work, nucleus seed of released varieties of kodo (JK 41, JK 48 and JK 439) and little millet (JK 8) were produced through SPS grown in progeny rows.

Hybrid Rice

- Rice hybrids Pro-Agro 6444 , JRH 2, JRH 4, JRH 5, PAC 801 and PRH 10 were found to be most promising rice for obtaining higher grain yield (80-90 q ha^{-1}) under irrigated ecosystem.

Maize

Full season experimental hybrids & composites: Fifty two entries were tested against four checks. Entries differed significantly from each other. NK 6246 (8590 kg ha^{-1}) gave the highest seed yield followed by NK 6267 (8556 kg ha^{-1}) and MCH 39 (7535 kg ha^{-1}).

Ten entries were tested with four checks. The entry KMH Super 244 (7532 kg ha^{-1}) gave the highest yield followed by SMH 4502 (6486 kg ha^{-1}) and MCH 38 (6402 kg ha^{-1}).

Two entries were tested with four checks. The entry MDMH 101(10064 kg ha^{-1}) gave highest yield followed by X6B-260 (7312 kg ha^{-1}).

Jawahar Oat 2003-91

Kodo Millet genotype with compact irregular panicle

Medium maturity experimental hybrids & composites: Forty one entries were tested with three checks. The entry JH 31292 (8013 kg ha^{-1}) followed by MCH 42 (7738 kg ha^{-1}) and Vivek 09-2 (7483 kg ha^{-1}) performed well.

Two entries were tested with three checks. The entry Bisco-855 (4661 kg ha^{-1}) and Bisco-555 (4332 kg ha^{-1}) gave higher yield than the standard check Malviya Makka 2 (4071 kg ha^{-1}).

Early maturity experimental hybrids & composites: Seventeen entries were tested with one check (Prakash). Entry Bio-605 (5214 kg ha^{-1}) gave highest yield followed by FH 3506 (5144 kg ha^{-1}), KH 9560 (5042 kg ha^{-1}) and EHL 162408 (4849 kg ha^{-1}).

Two entries were tested with two checks. Both entries were found to be significantly inferior than the best check Vivek QPM 9 (4762 kgha^{-1}).

Extra early maturity experimental hybrids & composites: Nine entries were tested with two checks. The entry FH 3478 (5475 kg ha^{-1}) gave the highest yield followed by FH 3483 (5310 kg ha^{-1}).

Early to medium maturity experimental hybrids & composites: Seven entries were tested with two checks the entry KMH 3712 (5184 kg ha^{-1}) gave the highest yield, followed by BH 408005 (4776 kg ha^{-1}) and EH 1877 (3632 kg ha^{-1}).

Early and extra early maturing experimental hybrids and composites: Only one entry was tested i.e., JH 31110 (4647 kg ha^{-1}) which gave higher yield as compared to the standard check Pratap Makka 4 (4384 kg ha^{-1}).

Experimental hybrids: Nine entries were tested with three checks. The entry VEHQ 3019 (4248 kg ha^{-1}) gave highest yield than the standard check HQPM 7 (4096 kg ha^{-1}).

PM-AET 1: Two entries were tested with three checks. The entry VEHQPM 302 (5094 kg ha^{-1}) gave higher yield as compared to the standard check HQPM 1 (5090 kg ha^{-1}).

Sweet corn: Seven entries were tested with two checks. The entry HKISCSTXINSEC 2 (3722 kg ha^{-1}) followed DULCINO (3444 kg ha^{-1}) and AMINOXHKISCST sweet corn hybrid (3056 kg ha^{-1}).

Early to medium maturing experimental hybrids and composites: Twenty five entries were tested with four checks. The entry EH-2080 (5034 kg ha^{-1}) gave higher yield than the standard check Bio-9637 (5004 kg ha^{-1}).

Extra early maturing experimental hybrids and composites: Nineteen entries were tested with four checks. The entry EH 2094 (6166 kg ha^{-1}) gave higher yield than the standard check Pratap Makka 3 (3003 kg ha^{-1}).

Pop corn experimental hybrids and composites: Seven entries were tested with one check. The entry HKIPC-5XWPII (4357 kg ha^{-1}) gave highest yield followed by WPIIXHKIPC 5 (3869 kg ha^{-1}) and HKIPC-7XWPII (3745 kg ha^{-1}).

- Among the medium HM-10 (4918 kg ha^{-1}) proved the best followed by BISCO-555 (4439 Kg ha^{-1}) and significant by superior over rest of the varieties. The lowest yield was recorded by BISCO-855. In case of nitrogen level, yield gradually increases with increase in dose of nitrogen.
- Among the early varieties, PRATAP Makka-5 (5098 kgha^{-1}) was found to be significantly superior over rest of the DMR varieties in case of nitrogen level, yield gradually increasing with increase dose of nitrogen.

Maize seed production

Jawahar Makka-216: The nucleus seed production of yellow maize composite released from this research station has been taken as per programme of the JNKVV, Jabalpur in 2:1 ratio of female to male rows. Row to row and plant to plant distance was 75 & 20 cm with row length of 4m.

Jawahar Makka 12: Another white seeded maize composite JM 12 has also been released from this research station having maturity of 88 days. The nucleus seed production program was undertaken, ratio of female to male rows was 2:1 row-to-row and plant-to-plant distance were 75 and 20 cm, and row length was 4m.

Jawahar Makka 8: A white composite of 82 days maturity has been released from this research station. The programme was undertaken as per demand. The ratio of female to male rows was 2:1 with row to row and plant to plant distance of 75 and 20 cm respectively and the row length, 4m.

Rice hybrid seed production

Seed of short duration hybrid can be produced successfully in Eastern part of MP mainly in Kymore Plateau and Satpura hills and Chattisgarh plains with average yield of 4.0 q ha^{-1}. Hybrid seed can also be produced successfully in Chhattishgarh plains during summer.

Pigeon pea hybrid seed production

Hybrid seed can be produced successfully in Kymore plateau and Satpura hills and Bundelkhand agro-climatic zones with the average yield of 2242 kg ha^{-1} .

Soybean seed production

Ridge and furrow and raised bed methods are suitable for production of seed. Significantly higher yield of quality seed in comparison to conventional method was obtained. Processed seed yield was 14.9% and 21.9% higher, respectively under raised bed and ridge and furrow method of sowing in comparison to control with higher vigour index.

Effect of method of planting on seed yield and quality of soybean

Kabuli chickpea seed production

The cost (Rs. 46604 ha^{-1}) : benefit ratio of 1:2.74 based on the proposed price of Rs. 90 kg^{-1} and yield 1600 kg ha^{-1} showed that seed production of Kabuli chickpea is a profitable venture in MP.

Maintenance breeding in major crops

Soybean

Out of 38 varieties in active seed multiplication chain at national level, seeds of 34 varieties are maintained through single pod selection.

Genetic purity testing at seed level

Sesame: Studies on 4 samples of ODV representing two varieties TKG 8 and TKG 55 were sorted out as of other distinguishing varieties by seed analyst of MPSCA based on seed coat colour. The result showed 89.62% correctness of identification. It advocates that ODV in sesame has positive and significant correlation with genetic impurity observed at plant level in GOT. However, apart from genes, expression of seed coat colour of testa is also influenced by other stresses.

Performance of hybrid rice seed production at different locations of MP

Location	Hybrid	Area (ha)	Seed yield (q/ha)
Kaymore Plateau and Satpura hills			
Jabalpur BSP (Field crops)	JRH 5	8.00	1.25
Jabalpur BSP (Groundnut)	JRH 5	7.00	3.57
Jabalpur BSP (Soybean)	JRH 5	1.50	3.3
Seoni (KVK)	JRH 5	2.50	7.0[a]
Rewa	JRH 5	1.10	5.0[b]
Jabalpur (Horticulture)	JRH 8	6.00	6.0[ab]
Chattisgarh plains			
Balaghat (Badgaon)	JRH 5	1.80	5.5[b]
05	2	27.4	3.9

Evaluation of pigeonpea hybrids at farmers' field: Hybrid ICPH 2740, ICPH 2671 along with variety Asha as check were demonstrated in 0.2 ha land in farmers field at Harda, Jabalpur, Narsinghpur, Panna, Powarkheda, Rewa, Sagar, Seoni and Sidhi districts. In all the seven locations, performance of both hybrids ICPH 2671 (1940 kgha^{-1}) and 2740 (1640 kg ha^{-1}) was better than the check Asha (1326 kg $^{-1}$).

Development of experimental hybrid of pigeon pea for M.P.: In all, 58 hybrid crosses were made involving five female lines viz., ICPA-2090, ICPA-2098, ICPA-2089, ICPA-2078 and ICPA-2050 and 20 R lines.

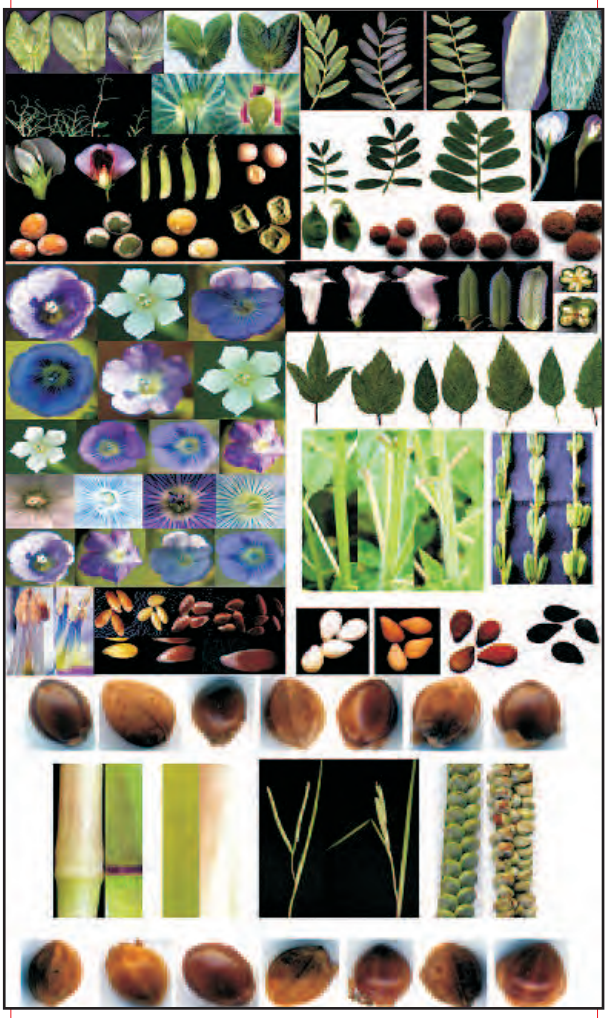
Mango

- Germplasm collections of two hundred cultivars were maintained and 30 germplasm accessions were evaluated for different growth, yield and fruit quality at Rewa.
- Under new germplasm collection of the mango cultivars, Vasibadami, Zillika, Dadamaio and Khajura were significantly superior in growth characters, whereas Sindhu and Alampur Beneshan were inferior in growth.
- The highest fruit yield (100.3 kg plant^{-1}) was recorded in Bangalora followed by Jagatswami (28.31 kg plant^{-1}) and Chotakaliya (23.3 kg plant^{-1}). Average weight per fruit was maximum in Bangalora (364.72 g) closely followed by Dilsad (351.92g) and Sunderja (348.31 g).
- In varietal trials, S.B. Chausa, Langra and Fajri were significantly superior in growth and vigor than other cultivars, whereas, Neelum, Kesar and Mulgoa were found to be significantly inferior in morphological characters. Maximum fruit

Plant varieties protection and DUS testing

	Field pea	Lentil	Linseed	Sesame	Kodo millet
Varieties	46	30	69	71	08
Characteristics	20	13	16	20	20
Astric mark	12	12	15	11	-
Grouping traits	06	06	05	06	-
Reference varieties	20	17	22	37	-

Maintenance of soybean varieties



Characterization of field crop varieties for implementation of PPV & FR act

yield (31.80 kg plant^{-1}) was recorded in Mallika followed Bangalora (28.20 kg plant^{-1}) and Krishnabhog (18 kg plant^{-1}). Maximum Varieties shows "off year."

- Under hybrid trial, the cultivar Langra (control) was vigorous than hybrid varieties, while within hybrids, Mallika and Mahmood Bahar showed vigorous than other hybrids. Highest yield was recorded in Mallika (17.40 kg plant^{-1}) followed by Neeleshan (13.9 kg plant^{-1}).
- In germplasm collection, Dahiyar was observed to be free from floral malformation closely followed by Kalepad, Taimuria and Bangalora.

Guava

Three accessions were added in germplasm collection during 2009-10. The cultivars Sardar, Chittidar, Portugal, Guthneewala, Dhareedar and Allahabad Safeda were found significantly superior than other varieties at Rewa.

Seed Health

Monitoring and detection of rice bunt

In all, 163 seed samples from the produce of kharif 2008 and 2009 were obtained from 8 districts of the State belonging to farmer's own seed of commonly grown 7 varieties. The seed samples were tested by NaOH seed soak method. Rice bunt was recorded in the range of 0.01 to 0.20% in 58 seed samples. Kranti and IR 36 varieties were found susceptible. Maximum numbers of infected seed sample were from Jabalpur, Seoni and Balaghat district. The intensity of disease was within the certification limits.

Monitoring of bacterial leaf blight and false smut

Disease incidence was recorded on the visual symptoms observation basis in the standing crop during random plot survey in 6 districts at 248 fields, out of which 63 were found infected. Bacterial blight disease was severe at Jabalpur, Rewa and Katni, in few fields where Kranti and IR 36 are being grown with farmers own saved seeds. False smut was recorded in the range of 2.0 to 10.0 per cent.

Rice samples from seed production unit and processing plant

In all, 70 seed samples from seed production (40) and processing plant (30) at Jabalpur were analyzed. Ten seed sample were recorded to be infected with bunt, and false smut.

Seed health status of farmer's own saved seed of soybean

In all, 6 major mycoflora were found associated with soybean seeds from 8 district. The association of *Macrophomina phaseolina* ranged from 1.0 to 10.0 per cent in seeds from Betul district while *Colletotrichum dematium* (3.0 to 7.0 %) was in seeds from Chhindwara. Seeds from Narsingpur district revealed maximum association of *Fusarium oxysporum* (10.0%) whereas seed rot due to *Aspergillus niger* and *Aspergillus flavus* was noticed in seeds obtained from Jabalpur district (10.0 and 5.0 %, respectively). The purple seed stain disease caused by *Cercospora kikuchii* ranged from 2.0 to 14.0 per cent was observed in seeds from Hoshangabad.

Studies on soybean mosaic virus

Incidence of soybean mosaic virus was recorded in farmer's field (5 districts and 46 fields), research experiments (6 fields at Jabalpur) and seed production plots (12 fields at Jabalpur). The incidence was recorded when the crop attained the age of 25-35 days. It was identified on the basis of visual symptoms. The diseased plants at Jabalpur were tagged. After 35 days, the development of yellow-mosaic of soybean (white fly transmitted) was severe and a mixed-complex situation was noticed. At farmers field the soybean mosaic virus incidence was maximum (6%) at Jabalpur in JS 335, followed by 5 and 4 per cent at Seoni and Chhindwara.

Determination of losses in soybean

Symptoms of soybean mosaic virus are clearly visible up to 30-35 days after planting, afterwards other viral disease develops and mixed infection makes the situation grim and leads to the heavy losses. In JS 335, the 100 seed weight was 10.90 g in apparently healthy plants that was reduced up to 6.50 g in case of mixed infection. It indicates that about 10-15% losses are due to viral infection. No seed discoloration or hilum-bleeding symptoms were recorded in the seeds obtained from pre-tagged diseased plants. No visual changes were recorded in the seeds from infected plants.

Screening of rice hybrids and their inbreeds against seed borne diseases

Rice hybrids JRH 4, JRH 5, JRH 10 and JRH 12 were evaluated. Bunt and bacterial blight was not recorded in any of the rice hybrids developed by the University. Sheath blight caused by *Rhizoctonia solani* was recorded in the range of 3.0 to 45% , being maximum in JRH 4 (9-45%) and JRH 5 (5-35%) scale 5 respectively whereas the false smut pathogen (*Ustilaginoidea virens*) was recorded in scale 3 (less than 5% disease incidence) at Jabalpur.

Standardization of methods of detection of seed borne pathogen

Green Gram

The association of *Macrophomina phaseolina* ranged from 11.0 to 20.0 % whereas the association of *Colletotrichum dematium* ranged from 5.0 to 14.50 % and *Fusarium oxysporum* was recorded in the range of 11.0 to 19.0% in naturally infected seeds. For the detection of *Macrophomina phaseolina,* standard blotter method was the most suitable. The method was also effective for the detection of *Colletotrichum dematium* and *Fusarium oxysporum* with green gram.

Sesame

Standard blotter method was most suitable for the detection of *Macrophomina phaseolina* and *Fusarium oxysporum* associated with sesame seeds as the maximum counts were recorded. Test tube water agar method was also promising.

Efficacy of available commercial formulations of bio-agents against seed and seedling diseases of soybean

Effect on seed germination

Maximum seed germination (79%) was recorded in seeds that were treated with chemical fungicide (Thiram plus carbendazim) while maximum seed germination (81.5%) was observed in seeds treated with bio-pesticides, *Trichoderma viride* followed by *Trichoderma harzianum* and least 65% in *Pseudomonas fluorescence*, as compared to control untreated seeds (68%) .

Effect on seed and seedling diseases

Minimum seed rot (17.0%) was observed in seeds treated with Thiram and Carbendazim (0.3%) while among bio-pesticides *Trichoderma viride* treated seeds had least (16%) seed rot as compared to 32.0% in control. Bacterial bio-pesticides were not found to be marginally effective in the management of seed rot as it resulted in 28-35% disease. The seedling decay was minimum (4.0%) in Thiram and carbendazim treated seeds as compared to control untreated seeds (15%). In seeds treated with bio-pesticides the post-emergence mortality was 7.0 to 14.0 %.

Standardization of seed coating technique with botanicals and synthetic polymers for seed quality enhancement

Seed treatment with polymer coating (Polycoat @3ml kg^{-1} diluted with 5ml of water) plus Vitavax 200 (containing Thiram and Carboxin 37.5% each @2g kg^{-1}) effectively inhibited the association of *Aspergillus flavus, Aspergillus niger, Helminthosporium sativum* and *Fusarium oxysporum* at initial stage. It was evident on the incubated seeds after employing the Standard Blotter method.

Detection, transmission and management of *Alternaria carthemii*

The safflower seed samples (15) were obtained from 4 districts of Western Madhya Pradesh. Detection of the target fungus was tried in 6 ways. Standard Blotter was most suitable for the detection, as 12.25 % seeds exhibited the association.

Evaluation of seed dressing fungicides

Association of *Alternaria carthemii* was detected microscopically after 7 day incubation. Untreated seeds were used as control. Copper oxycloride (0.25), Thiram (0.30), Thiram + Carbendazim (0.30 + 0.20), Thiram + Carboxin (0.30 + 0.20) were the most effective.

New packaging materials for commercial seed storage

Green Gram

Storability of seeds was better in Super and Tyvek bags up to 365 days .The storability of seeds was significantly above MSCS for longer duration in seeds packed at 10% moisture content. Significant differences were observed as effect of different containers at 2, 10 and 12 months of storage.

Paddy

Significant differences were recorded for seed moisture in paddy as affected by different packaging material during the entire storage period. Significant variation existed as effect of different packaging material and interaction.

Standardization of seed vigour tests for field crops

Pea

Seedling emergence had a significantly positive correlation with AAT 48 hours, while AAT 48 hours could be significantly and positively associated with AAT 96 hours and 2 months storage duration. Significantly positive association was evident between AAT 96 hours, AAT 144 hours and 2 months germination. Significant association existed between AAT 144 hours and AAT 192 hours. AAT 192 hours had a significant but negative association with 4 months storage period while 2 months storage duration had a positive association with 4 months storage.

Field emergence had a significant and positive correlation with seedling emergence, first count and 2 months storage. Seedling germination had a significantly positive association with first count and negative association with electrical conductivity.

A negative association existed between electrical conductivity and 2 months storage of seeds, whereas, 2 months storage duration had a positive and significant correlation with seeds stored for 4 months.

Standardization of seed coating with synthetic polymers and additives

The seed moisture ranged between 12.3 to 13.1% at the initial stage. Polycoat seeds had the maximum vigour index and seedling emergence at first and final count followed by seed priming treatment. The field emergence remained unaffected by different treatments initially being significantly maximum in control and at par with primed and Polycoat seeds.

Significant differences existed as effect of the packaging materials, treatments and their interactions for seed moisture, germination per cent, vigour index and field emergence after three months of seed storage.

The germination percentage and field emergence was higher in seeds stored in 700 gauge polythene bag as the seeds were shade dried to safe moisture limits before packing and the absorption of moisture was less in 700 gauge polythene bag.

Priming technology through farmer's participation

Green Gram

Priming of green gram seeds helped in increasing the plant stand and seed yield

marginally. However, no increase was recorded in seed yield as a result of seed priming.

Germination standards and testing media on germination and vigour parameters

Coriander

Top of the paper method, as per ISTA protocols, was superior that resulted in maximum count of germinated seeds at first count and seedling dry weight. Vigour index was also higher as compared to sand method.

Kalonge

Among media, between the paper and top of the paper were suitable for evaluating germination and vigour parameters in Kalonge.

Crop Production Technology

- The result of nutrient management in rice (Kranti)-wheat (GW-273) cropping system for last 25 years showed that treatment receiving 50% NPK through fertilizers + 50% N substituted through farmyard manure/ green manuring to rice and 100% NPK through fertilizers to wheat, produced the maximum yield of rice and wheat and total productivity of the cropping system in comparison to 100% NPK through fertilizers to both crops in association with saving of 50 % fertilizers which ultimately increased profit on the one hand and improved soil health on the other.
- Studies carried on the development of organic farming package for rice (Pusa basmati-1)-potato (Kufri Sinduri) showed that application of 100% NPK through fertilizers to rice-potato system under organic farming package with application of Zn as per soil test values revealed that higher productivity of entire cropping system of rice equivalent yield (7.2 t ha^{-1} per year) closely followed by 50% NPK through fertilizers + 50% N through farmyard manure to both crops and these two treatments were also found remunerative.
- The deficiency of Zn and S have been diagnosed and found to spread specially in intensively cultivated areas in Madhya Pradesh.
- Application of 10 kg Zn ha^{-1} to heavy clay soil and 5 kg Zn ha^{-1} to light textured soils is required to maintain the optional Zn status in the soil. The residual effect of 10 kg Zn ha^{-1} persisted up to 6 crops.

Response of rice to the application of Zn

- Application of 20 kg S ha^{-1} to cereals and 40 kg S ha^{-1} to pulses and oilseed crops are required every year.
- Integrated application of 5 kg Zn along with 5 t FYM ha^{-1} was found to be equivalent to 10 kg Zn ha^{-1} in soybean-wheat cropping sequence.
- The higher level of cadmium (32 mg kg^{-1}) was found to be adversely affected and reduced the size of the bulb of garlic and ultimately reduced the yield. On the contrary, the application of FYM was found to reduce the detrimental effects of cadmium on productivity as well as quality of garlic.
- Integrated application of fertilizer with organic manure resulted in lower content and uptake of cadmium by garlic.

Despite continuous cultivation of inoculated soybean on same field (vertisols) for 7 years, there was significant response of *Bradyrhizobium* inoculation on yields (average increase by 11%) indicating that seed inoculation is mandatory every year and there was residual benefit of 20-30 kg N ha^{-1} by soybean to succeeding wheat crop.

Plant growth promoting rhizobacteria along with fertilizer application (recommended NPK) enhanced the germination in soybean, wheat and chickpea crops and also increased (average 15-20 %) seed yield over fertilized uninoculated control.

Remarks : The application of 20 kg N ha^{-1} with biofetriliser was found to be beneficial for producing higher yields of legumes

Production and supply of biofertilizers

The screened isolates are being used in the commercial production of common biofertilizers viz. *Rhizobium, Azotobacter, Azospirillum,* phophate solubilizing microorganisms and BGA.

Figure is parenthesis is in metric ton. *Rhizobium*, Azotobacter/Azospirillum-pkt 200 g (@ Rs. 10/-pkt), PSB - pkt 250 g (@ Rs. 12/-pkt , BGA soil base – pkt 2 kg (@Rs. 45/- pkt), PSB - pkt 250 g (@ Rs. 12/-pkt), BGA mother culture- pkt 250 g (@ Rs. 50/-pkt)

- Imbalance use of nutrients (100% N alone & 100% NP) adversely affected the productivity as well as the fertility of soil grown for more than three decades under soybean-wheat cropping sequence.

Biofertilizer	Production (000' packets)	Supply (000' packets)
PSB	173.28 (43.31)	173.27 (43.30)
Azotobacter /Azospirillum	57.73 (11.54)	57.72 (11.53)
Rhizobium	79.44 (15.88)	79.40 (15.87)
BGA (soil based)	2.949 (5.89)	2.949 (5.89)
BGA (mother culture)	0.005 (0.002)	0.005 (0.002)
Total	313.404	313.344
MT	76.622	76.592

- The balance use of nutrients in soybean-wheat cropping sequence resulted in achieving higher productivity as well as maintaining the soil fertility of specially black soils in long run.
- Use of sulphur free fertilizers resulted in lower yields (about 7%) of soybean and wheat.

Effect of Zn and cadmium on yield of garlic with and without FYM in vertisol

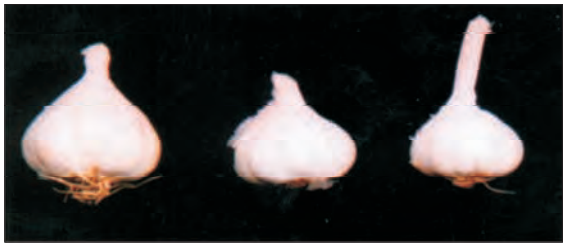
Control | 8 mg Cd kg^{-1} | 32 mg Cd kg^{-1}

5 mg Zn kg^{-1} | 5 mg Zn kg^{-1} + 8 mg Cd kg^{-1} | 5 mg Zn kg^{-1} + 32 mg Cd kg^{-1}

10 mg Zn kg^{-1} | 10 mg Zn kg^{-1} + 8 mg Cd kg^{-1} | 10 mg Zn kg^{-1} + 32 mg Cd kg^{-1}

Diameter of bulb affected by different treatements

FYM | FYM + 8 mg Cd kg^{-1} | FYM + 32 mg Cd kg^{-1}



FYM + 5 mg Zn kg^{-1} | FYM + 5 mg Zn kg^{-1} + 8 mg Cd kg^{-1} | FYM + 5 mg Zn kg^{-1} + 32 mg Cd kg^{-1}

FYM + 10 mg Zn kg^{-1} | FYM + 10 mg Zn kg^{-1} + 8 mg Cd kg^{-1} | FYM + 10 mg Zn kg^{-1} + 32 mg Cd kg^{-1}

Diameter of bulb affected by different treatements

Performance of balance and imbalance fertilization on wheat

- Conjoint use of inorganic fertilizers (100% NPK) with organic manure (FYM) resulted in improvement of organic carbon from 5.7 g kg-1 (1972) to 9.6 g kg-1 (2009), thereby maintaining the favourable physical, chemical and biological soil environment for sustaining higher crop productivity.
- The fertilizer adjustment equations for targeted yield have been generated and verified on farm and off farm in varied agro-climatic soil complex. In this connection these equations have been transformed into following simple workable ready reckoners for the yield goal of dominant crops of the area.
- Application of 40 kg N ha^{-1} gave highest grain yield of 1206 kg ha^{-1}, followed by 20 kg N ha^{-1} (941 kg ha^{-1}) as compared to without application of nitrogen (619 ha^{-1}) in Kodo millet.
- Application of 40 kg N ha^{-1} produced highest grain yield of little millet.
- Enrichment with 100% RDF (NPK) to 5t FYM ha^{-1} (broadcasted) gave higher grain yield of Kodo millet (1689 kg ha^{-1}).
- Under low fertility conditions, application of 50% RDF and inoculation with bio-fertilizers respected in production of higher grain yield of Kodo millet (1055 kg ha^{-1}) when grown under rainfed conditions.

Sesame

- In sesame, inclusion of micronutrient like Zinc, ($ZnSO_4$) @ 20kg ha^{-1} and Iron ($FeSO_4$) @ 25 kg ha^{-1} along with recommended dose of fertilizer (60 kg N_2+ 30 kg P_2O_5 + 20 kg K_2O) with or without organic manure increased the oil content.
- The maximum seed yield of sesame and net profit may be obtained by using RDF 60:40:20 as Soil application + two foliar application of urea @ 2% (at flowering + pod formation).

Maize

- Effect of fertilizer and sources of nutrients on productivity of baby corn based cropping sequence indicated that among the various treatment combinations the higher dose of chemical fertilizer (150 % RDF) + FYM of organic sources of fertilizer was found to be superior over other treatments for the higher corn yield.
- Effect of levels of fertilizer and sources of nutrients on productivity of sweet corn based on cropping sequence indicated

Performance of organic and inorganic fertilization on wheat

Fertilizer recommendations packages followed under FLDs Crop	T=Targeted yield(q ha^{-1})	Soil Nitrogen (SN) (kg)					Soil Phosphorus (SP) (kg ha^{-1})					Soil Potassium (SK) (kg ha^{-1})				
		100	150	200	250	300	5	10	20	25	30	200	250	300	350	400
Wheat	50	180	160	140	120	100	177	154	131	108	85	95	87	79	71	63
Paddy	35	104	81	89	36	40	100	75	51	26	0	38	29	20	11	0
	40	125	102	80	60	35	118	95	69	44	20	48	39	30	21	12
Soybean	20	56	32	10	-	-	83	63	42	22	-	34	23	12	0	0
	25	82	58	34	10	-	109	89	68	48	27	53	42	31	20	9
Gram	20	-	-	-	-	-	87	75	62	50	37	42	32	25	16	8
	25	-	-	-	-	-	112	100	87	75	62	61	52	44	35	27

Wheat :	FN= 4.40 T – 0.40 SN	FP_2O_5 = 4.00 T – 4.58 SP	FK_2O = 2.53 T – 0.10 SK
Paddy:	FN= 4.00 T – 0.22 SN	FP_2O_5 = 2.38 T – 1.40 SP	FK_2O = 2.07 T – 0.08 SK
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
Gram:	FN= 3.73 T – 0.18 SN	FP_2O_5 = 5.00 T – 2.50 SP	FK_2O = 3.80 T – 0.17 SK

the station entry Jawahar sweet - 9 with 150% recommended dose of Fertilizer + FYM organic sources of manure were found to be the most economical treatment for sweet corn.

Horticulture

- Maximum yield of tomato (304.10 q ha^{-1}) along with higher C:B ratio (1:2.29) was obtained in var. JT 99 by three sprays of 100 ppm of Manganese (as Manganese sulphate) in addition to recommended dose of NPK at 30 DAT with an interval of 10 days.
- Spray of 100 ppm GA at 30 and 50 DAS is recommended for higher seed yield of Okra (Bhindi).
- The maximum yield (376.66 q ha^{-1}) along with highest C:B ratio (1:2.67) in cauliflower var. Girija was recorded with the application of Borax (@ 20 kg ha^{-1}) along with Ammonium molybdate @ 1 kg ha^{-1} in comparison to the recommended dose of NPK (200:125:150 kg ha^{-1}) fertilizers.

Integrated Nutrient Management in Rice-Wheat System

Application of 120 kg N, 80 kg P_2O_5 and 40 kg K_2O ha^{-1} have been found optimum dose of rice and wheat for yield maximization on long term basis. Integrated use of 50% NPK through fertilizer and 50% N through FYM along with 25 kg $ZnSO_4$ on soil test value basis has been found as much as effective to 100% NPK applied through fertilizer in rice-wheat system.

Integrated nutrient supply system for rainfed semi arid tropics

In a study carried out with different combinations of N sources for rice - wheat ; blackgram-chickpea; and rice+blackgram-wheat+chickpea in separate blocks, 100% N through compost was superior in all the blocks with a maximum net income of Rs 8838 +36157 ha^{-1}. Rs. 3098 + 41498 ha^{-1} and Rs. 5308 + 38826 ha^{-1} and B:C ratio of 2.00+ 4.23; 1.64 + 4.77 and 1.77 + 4.50, respectively.

Balanced nutrition in soybean chickpea system

- In a balanced nutrition study for soybean in Kharif and chickpea in Rabi, 20 kg N + 40 kg P without $ZnSO_4$ ha^{-1} was found superior for soybean with a net income of Rs. 30,370 ha^{-1} and BC ratio of 4.30. However, 20 kg N + 40 kg P + 10 kg $ZnSO_4$ ha^{-1} gave higher yield (2081 kg ha^{-1}) with a net income of Rs. 29,651 ha^{-1} and B:C ratio of 3.51. In case of chickpea under residual fertility condition maximum net return of Rs. 34,215 ha^{-1} with B:C ratio of 4.42 and yield of 1734 kg ha^{-1} were attained in the plot where 20 kg N + 40 kg P + 10 kg $ZnSO_4$

ha^{-1} was applied to soybean in the Kharif season.

- In soybean, incorporation of 25 kg ha^{-1} Zn and Rhizobium inoculation along with balanced optimal fertilizer (20:80:20) dose gave higher yield and net return. Pigeonpea+Blackgram (2.2) intercropping was found better than the sole crop.

Soybean wheat system

- Soybean-wheat system led to record maximum SEY (12.38 $tha^{-1}yr^{-1}$). As regards the monetary advantages soybean-potato-okra recorded highest NMR (Rs.1,67,470 ha^{-1} per yr) closely followed by soybean-wheat (12-38 $tha^{-1}yr^{-1}$.) Similarly soybean-potato-sesame cropping systems also registered higher SEY and NMR.
- Under soybean-wheat cropping system application of fertilizer on soil test value with other agronomical practices recorded the highest WEY (5.93 t ha^{-1} yr^{-1}) and NMR (Rs.37,246 $ha^{-1}yr^{-1}$) closely followed treatment where integrated nutrient management practices were adopted (5.56 t ha^{-1} per year and Rs.34,278 ha^{-1}).
- In organic farming for soybean-wheat (Durum) cropping system application of 100% NPK through fertilizer along with secondary and micronutrient as per soil test values produced highest WEY (5.86 t. $ha^{-1}yr^{-1}$) and net profit (Rs.37,672 ha^{-1} yr^{-1}) followed by INM 50% NPK + 50% N through FYM with WEY and NMR of 5.39 t ha^{-1} per year and Rs.29,980 ha^{-1} per year respectively.
- Diversification and intensification of need based cropping systems research for Kymore Plateau and Satpura Hills Zone of Madhya Pradesh revealed that rice (Pro. Agro .6444)-marigold (African giant)-maize (Jm-12) and rice (Pro. Agro 6444)-onion (Pusa red)- green gram (Pusa vishal) cropping systems produced higher rice equivalent yield (23.5 and 22.9 t ha^{-1} yr^{-1} respectively) and were also more remunerative (Rs. 98,052 and 81,340 ha^{-1} yr^{-1}respectively) than the existing cropping systems of rice- wheat and rice chickpea. The former crop sequences also produced and the higher system productivity (kg ha^{-1} day^{-1}).

Rice lentil system

Under rice based cropping sequences, lentil was found to be superior with a maximum net income of Rs. 55,145 ha^{-1} and B:C ratio 6.51 from a yield of 2020 kg ha^{-1} attained by applying with 100% recommended fertilizer followed by wheat with a net income of Rs. 38,972 ha^{-1} and B:C ratio of 4.48 .

Rice garlic cropping system

Rice-garlic cropping system gave maximum rice equivalent yield 379.75 q ha^{-1}, NMR 210444 ha^{-1} and B:C ratio 3.19 followed by rice-green pea, rice-berseem and rice-mustard. These cropping systems were superior to existing cropping patterns, rice-wheat and rice-gram in Rewa region of Madhya Pradesh.

Intercropping

Soybean and pigeonpea

In an assessment performance of soybean varieties in intercropping with pigeonpea in combination with 4:2 row proportion tested for suitability, maximum pigeonpea equivalent yield of 2074 kg ha^{-1}, net income of Rs. 35,683 ha^{-1} with B:C ratio 3.11 were attained.

Chickpea and mustard

Intercropping with different row proportions of chickpea and mustard tested for suitability, maximum chickpea equivalent yield of 2265 kg ha^{-1}, net income of Rs. 49,900 ha^{-1} with B:C ratio of 6.87 were attained by chickpea+ mustard (1:1) system with a yield of 1212 kg ha^{-1} of chickpea and 988 kg ha^{-1} of mustard.

Integrated weed management in soybean

- Among different combinations of hand

weeding and use of chemical herbicide tested in soybean with persuit (Imazthapyer) @ 750 ml ha^{-1} (post emergence) was found to be superior with a significantly higher production of grain yield (2828 kg ha^{-1}) net income of Rs. 31,790 ha^{-1} and B:C ratio of 3.68 under rainfed condition.

- Two inter cultivation and one hand weeding produced highest grain yield of 1372 kg ha^{-1}, followed by pre- emergence spraying of Isoproturon @ 0.25 kg a.i. ha^{-1} (962 kg ha^{-1}).
- Keeping the plots weed free throughout the crop growth period gave significantly higher grain yield (1689kg ha^{-1}).
- In weed control treatment in rice, the maximum seed yield (4167 kg ha^{-1}), net monetary return (Rs.86,410 ha^{-1}) and B.C. ratio (5.86) was obtained with one hand weeding at 25 DAT followed by Butachlore @ 1.5 kg ai ha^{-1}) at 6 DAT+weeding by *Taichu gurma* at 25 DAT.
- In linseed, Clodinofop 80 gms and 2-4D @ 0.05 kg ha^{-1} sprayed at 15-20 days after sowing was found to be most effective in controlling the weeds.
- Alachlor-1.5 kg a.i. ha^{-1} pre-emergence +one hand weeding was found to be effective to control weeds in sesame at 30 days after sowing.

Low till farming strategies for resource conservation and soil quality

- In a low till management together with fertilizer for soybean-wheat, low till + weedicide+interculture in combination with 50% N (organic)+50% N (inorganic) was the best treatment with a maximum yield of 1865 kg ha^{-1}, net income Rs. 28,861 ha^{-1} and B:C ratio of 2.45 for soybean in the Kharif season. In case of wheat grown in Rabi season, the treatment of low till+weedicide+ interculture together with 100% (organic) i.e., FYM @ 8 t ha^{-1} was superior with a maximum yield of 2658 kg ha^{-1} , net income of Rs 39,632 ha^{-1} and B:C ratio of 5.17.
- In soybean, the maximum seed yield (1330 kg ha^{-1}) was found under broad bed furrow (180 X 30 cm) planting. The net monetary return (Rs.16,522 ha^{-1}) and B.C. ratio (2.23) was also higher with broad bed furrow (180 X 30 cm) planting.
- In pigeonpea, the maximum seed yield (2191 kg ha^{-1}) was obtained under ridge and furrow planting system, which was closely followed by provision of drainage at 5 m and 10 m spacing. Similar trend was also obtained in terms of net return, B:C ratio and water use efficiency.
- The maximum seed yield and net profit from sesame was obtained by harvesting the crop at optimum time, drying it on tarpoline in upright/vertical bundles and double threshing of 7 and 15 days after harvesting.
- For Karan rai (variety JTC 1) optimum sowing period was found to be around 1st fortnight of November (after soybean) and optimum fertilizer level with of 120 kg N + 60k P_2O_5 + 40 kg K_2O ha^{-1}. However optimum sowing period was found to be around last week of Oct. to 1st fortnight of Nov.

System of Rice Intensification (SRI)

In rice, the system of rice intensification (SRI) gave maximum seed yield of 4190 kg ha^{-1} which was 8.0% higher yield than the farmers practice (3796 kg ha^{-1}). The net monetary return (Rs.87,185 ha^{-1}), B:C ratio (5.91) and water expense efficiency (99.76) were also obtained higher with SRI.

Forage crops

Utera cultivation of berseem

In paddy growing areas, especially under transplanted situation it has been observed

that normal sowing of berseem crop is usually delayed by 20-25 days. For such situations, a technology has been generated for timely sowing without reduction in fodder tonnage. The technology involves direct seeding in standing paddy crop 15 days prior to harvest by increasing 33 percent (40 kg ha^{-1}) seeding rate. It is also advised that surplus stored water may be drained out from the field before sowing operation. The seeds germinate in available moisture and curtail cost of field preparation. This practice gives one additional cutting over normal sowing after harvest of paddy crop.

Irrigated condition

Growing crop sequence of jowar + cowpea in Kharif, berseem+sarson in Rabi and maize+cowpea in summer proved to be superior for getting maximum tonnage of green fodder (1763 q ha^{-1} $year^{-1}$) and net monetary returns of Rs. 57,443 ha^{-1} $year^{-1}$. Similarly, per day productivity (4.83 q ha^{-1}) of green fodder was also found to be higher under this crop sequence as compared to other crop sequences.

Water management

Coriander gave 1215 kg ha^{-1} seed and 4115 kg ha-1 green leaves yield as against 4218 kg ha^{-1} of wheat under assured irrigation. The value of net return (Rs.40,330 ha^{-1}) and B:C ratio (3.57) in coriander were considerably higher as compared to wheat (Rs.34,955).

- In water table study, the maximum ground water depletion was observed in the month of June 2009 i.e,. the depth being 7.81 m from the ground surface.
- In quality of irrigation water study, the well water of Tawa Command could be categorized as good to normal for irrigation purpose.
- On the basis of three years pooled data, significantly maximum seed yield of Rajmash (871.4 $kgha^{-1}$) was obtained under 4 irrigations at 20, 40, 60 and 80 DAS. Application of 120 kg N ha^{-1} gave maximum seed yield (874.4 kg ha^{-1}). As regards to the economics, four irrigation and 120 kg N ha^{-1} resulted in maximum net return (Rs.18,975 ha^{-1}) with B.C. ratio 2.19 and MNR (Rs.19,095 ha-^{1}) with B:C ratio (2.20) respectively. Four irrigation along with 120 kg N ha^{-1} gave maximum net return (Rs.34,129 ha^{-1}) and B:C ratio (2.94).
- In Rajmash crop, application of 4 irrigations at 20, 40, 60 and 80 DAS with 120 kg N ha^{-1} could be recommended for higher seed yield and net monetary returns.

Drip irrigation

Sugarcane

Maximum cane yield of sugarcane (157.8 t ha^{-1}) was recorded with drip irrigation at 0.75 PE under normal planting (90X90 cm). The net returns (Rs.3,21,740 ha^{-1}) were also higher in drip irrigation with normal planting, whereas the WUE was higher with drip irrigation at 0.75 PE in paired planting (120x60 cm). In sugarcane crop, drip irrigation at 0.75 PE with normal planting at 90 cm spacing could be recommended for higher cane yield, net monetary returns, and water use efficiency and to save (27.9%) irrigation water.

Potato

In potato, the maximum and significantly higher tuber yield (213 q ha^{-1}) was found under drip irrigation at 0.8 PE. The water use efficiency (102 kg ha^{-1}) was found higher under drip irrigation at 0.4 PE. As regards the planting method, the tuber yield (206 q ha^{-1}) was higher under ridge method when compared to that under flat bed (189 qha^{-1}). The net monetary returns (Rs. 92,100 ha^{-1}), B:C ratio (2.18) were also higher with drip irrigation at 0.8 PE.

Performance of SRI

A view of water management experiment

Sugarcane under drip irrigation

Crop protection

Soybean

- During the current year 2009-10, there was negligible problem of diseases like YMV, Root Rot and Rhizoctonia Arial Blight etc. On the contrary, tobacco caterpillar was very serious at advance stage of crop which was managed by spraying insecticides.
- Foliar spray of Carbendazim+Mancozeb (Saff) @ 0.2% was effective in minimizing all the diseases viz., Phytophthora, Cercospora leaf spot, MSRR and Phyllody with higher yield, net profit and C:B ratio.
- Profenofos (Celcorn) 50 EC @ 4 L ha^{-1} and Endosulfan 35 EC @ 1 L ha^{-1} recorded minimum damage by pest complex (Semilooper and *Spodoptera*), respectively and also recorded maximum grain yield.

Rice

- Bio-pesticides, Wanis, Neem gold, Biotos @ 5 ml lit^{-1} were highly effective for the management of leaf blast of rice.
- Chlorothalonil (Kavach) 75 WP and Kocide 77 WP were found highly effective fungicide for the control of false smut of rice
- Granular insecticide Carbofurom @ 1000 g ai/ha and Monocrotophos 2ml/lit were found to be highly effective insecticides for the management of rice pest effectively.
- Newly evolved fungicides Sivic 75WP, Tilt, Tricyclazole, Contaf, result 25 EC @ 1 ml/lit were found highly effective for controlling the leaf blast of rice.

Integrated management of sesame diseases

- Seed treatment with *Trichoderma viride* (0.4 %)+soil application of *T. viride* @ 2.5 kg ha^{-1}+spray of Mancozeb (0.25%)+ Endosulfan (0.07%) at 30-40 DAS and 45-55 DAS was most effective in managing the diseases and gaining higher yield with maximum net profit and C:B ratio.
- Seed treatment with Thiram or Captan or Ridomil (25%) for control of *Phytophthora* in the initial stages of sesame crop. Spray

Performance of drip irrigation on sugarcane

Performance of ridge and flat bed plantation in potato

of Mancozeb (dithane M-45) or Ridomil or Difolatan (0.2%) for foliar infection of *Phytophthora* blight and Bavistin 0.1% (Carbendazim) for *Cercospora* leaf spot control. Use of resistant varieties like TC 25, TKG 21, TKG 22 for avoiding losses by *Phytophthora* blight of sesame and TKG 55 for *Macrophomina* root/stem rot disease and TC 25, TC 289, TC 325, JLSC 8, HT 1, HT 6 against leaf curl disease.

- Foliar spray of *Ocimum sanctum* (5%) extract was effective in minimizing the disease incidence with maximum grain yield, net profit and C: B ratio.

IPM in sesame

- Use moderately resistant varieties, TKG 22, JTS 8 and TKG 306. Use recommended dose of fertilizer 60 N:40P:30K kg ha^{-1}. Inter cropping of pigeon pea with sesame in 3:1 (sesame:pigeon pea) row ratio or with black gram in 3:1 or 3:3 row ratio. Keep crop weed free. Two foliar sprays of well emulsified solution of neem oil 1% or NSKE 5% or Endosulfan @ 1.0 a.i ha^{-1} at about 35/40 and 50-55 DAS.
- Incidence of insect pests may be managed with foliar spray of Neem gold 0.3% followed by profenophos, neem seed oil emulsion and NSKE. However, C:B ratio was maximum in NSKE treated plots .
- Incidence of insect pests of sesame may be managed with seed treatment of chlorpyrifos+foliar spray of NSKE along with higher grain yield, net profit and C:B ratio.

Millets

Grain smut incidence was found to be positively correlated with cumulative rainfall, minimum temperature and relative humidity, while it was negatively correlated with maximum temperature.

Pigeonpea

Spinosad 45 SC @ 73 g. *a.i.* ha^{-1} or Pyridalyl 15%+Fenpropathrin 20% EC @ 90+120 g. *a.i* ha^{-1}. Or Bollcure 0.5% recorded minimum grain damage by pod pest complex (pod fly, *Helicoverpa,* plume moth and pod bug) respectively and also recorded maximum grain yield.

Chickpea

Rynaxypyr (Coragen) 20 SC @ 25 g. a.i. ha^{-1} or Flubendiamide 480 SC (Fame 480 SC) @ 36 g a.i. ha^{-1} were found to be highly effective in reducing gram pod borer infestation on chickpea. But this maximum grain yield was recorded and phototoxic effect were observed on the crop.

Management of pod borer

- Installation of synthetic sex pheromone trap @ 10 traps ha^{-1} from first fortnight of December and changing the septae at one month interval up to 100% fruiting of the crop,
- Pegging of 'T' type pegs @ 200 pegs ha^{-1} for bird perching.
- Intercropping of chickpea with fenugreek or coriander or mustard in 4:2 row ratio.
- Two to three foliar sprays of quinolphos (0.05%)/cypermethrin (0.01%) garlic bud+ red pepper extract (1:1 ratio) 1%/cow butter milk 0.8%/Bacillus thuringiensis 0.2%.

Sugarcane

- In early group, the Co 05005, Co M 9903 and Co Snk 05102 were found to be least infested by early shoot borer, pyrilla and scale insect, respectively.
- In mid late group, Co N 03131, Co 0211 and Co VC 05061 found to be least infested by early shoot borer, pyrilla and scale insect, respectively. The Co 0212 showed cross resistance for early shoot borer and pyrilla.
- Maximum temperature 43 to 45°C, minimum temperature 19 to 25°C and

relative humidity 78 to 88 per cent was observed to be favorable for peak activity of early shoot borer in sugarcane.

- During rainy season, maximum temperature 30 to 33°C, minimum temperature 23 to 24°C and relative humidity more than 98 per cent is favorable for initiation of pyrilla activity.
- Maximum number of early shoot borer moth were captured in pheromone traps (0.29 to 0.57 moths/day/trap) during 16th to 20th SMW. During this period, early shoot borer infestation was at peak in field (1.4 to 2.4 % week^{-1}).

Integrated pest management in linseed

- Sowing of crop up to the end of October at 30 cm row spacing.
- Use moderately resistant variety, JLT-26.
- Use 60 kg N peer ha (20 kg as basal and rest in two split as top dressings) along with 40 kg P and 30 kg K ha^{-1}.
- Two foliar sprays of *neem* oil 1% or NSKE 3% (in cow urine) + dimethoate 0.03% first at bud initiation and second at the interval of 15 days.

Aphid management in mustard

- Sowing the crop up to the end of October.
- Two clippings of upper twigs, infested with aphid first just after onset of aphid incidence and second after 20-25 days of first clipping.
- Collect grubs and adults of lady bird beetle and release for predation of aphids on mustard crop.
- Foliar spray of NSKE (in cow urine) 3% + Dimethoate 0.03%/ or Dimethoate 0.045% or Methyl demeton 0.04% as and when required.

Millets

- Timely sowing is recommended for escaping from insect/pests especially shootfly and blister beetle in little millets.
- Seed treatment with imidachlorprid (3 ml 10 lit^{-1}) and chloropyriphos (2 ml lit^{-1}) for low cost management of shootfly in little millet.

Medicinal and Aromatic Plants

- Fecilitation Centre for Medicinal Plants (FCMP) carried out various training programmes in different districts of M.P. with help of KVKs alongwith locally organized trainings. FCMP conducted 9 such training programmes and 376 farmers actively participated in these training programmes.
- Facilitation Centre has been visited by more than 2000 farmers/ entrepreneurs to acquire valuable information on medicinal plants.
- Seeds, planting material and literaturewas distributed among interested farmers and the promotion of medicinal plants as an integral part of crop husbandry.
- The Centre also provided required information to various Govt. bodies from time to time.
- Workshop cum exhibition on commercial cultivation, processing and value addition of medicinal and aromatic plants was organized at the Facilitation Centre on 18-19 August 2009 under the sponsorship of MPCOST, Bhopal. About 160 participants were benefited.
- FCMP organized a Buyer-Seller Meet on Medicinal plants during 27th March 2010 in which about 291 representatives of various companies connected with selling of products from medicinal plants and farmers took part in the meet.

National vegetation carbon pool assessment project

- Global warming is mainly due to major

green house gas i.e., CO_2.

- Vegetation has the capacity to fertilize CO_2 as Carbon Pool which is going to be assessed under a network project of Indian Science Research Organization, Dehradun for which JNKVV is one of the partner.
- The Phyto biomass of teak forest was found to be higher as compared to the sal and mixed forests Research workers engaged in recording the observations in different forests.

Niche Area of Excellence

Germplasm evaluation

Ashwagandha (*Withania somnifera* (L.) Dunal)

- In leaves, maximum withaferin A (%) was estimated in MWS 216 (0.0541), withanolide A (%) in JA 134 (0.0095) and withanolide B (%) in MWS 209 (0.0074).
- In roots, withaferin A (%) was maximum in MWS 132 (0.0050) while, withanolide A (%) in MMS 130 (0.0484) and withanolide B (%) in MWS 142 (0.0513).
- In leaves, withaferin A (%) content was maximum in CHW 1 (0.0564), withanolide A (%) in JA 20 (0.0068) and withanolide B (%) in CHW 12 (0.0088) from the farmers collected seed.
- In roots withaferin A (%) was maximum in CHW 2 (0.0070) while withanolide A (%) in CHW 2 (0.0653) and withanolide B (%) in CHW 8(0.0763) from the farmers collected seed.

Chandrasur (*Lepidium sativum*)

- Among 9 germplasm lines evaluated, germplasm MLS 1002 recorded significantly higher seed yield (233.33 kg ha^{-1}), while maximum Sinapic acid content (%) in seed was estimated in MLS 1007 (0.357), followed by MLS 1004 (0.0333) and minimum in MLS 1002 (0.0117).

Isabgol (*Plantago ovata*)

- Among 19 genotypes evaluated, RI 25 registered significantly higher seed yield (649.611kg ha^{-1}) and seed index (0.19 g).
- Gujarat 2 proved superiority with higher PAR interception (1587.54 µmolm-2 sec^{-1}) and stomatal conductance (183.22 m mol/m2 /s.).
- Maximum content of nitrogen (2.84%), protein (70.75%), fiber (30.97%), ash (3.24%), husk (38.96), swelling (15.39%) and carbohydrates (7.92%) was found in Gujrat.

Safed musali (*Chlorophytum borivilianum* and *C. tuberosum*)

- *Chlorophytum borivilianum* genotype CBI 20 registered improved morpho-physiological yield attributes viz. finger girth (0.092 cm.), number of finger/disc (28.21), weight of finger per disc (65.52 gm.) with minimum days required for 50% flowering (9.82).
- *Chlorophytum tuberosum* genotype MCB 45 recorded superior yield components viz. finger length (10.42 cm.), girth (0.71 cm.), number of finger/ disc (66.64), weight of finger per disc (74.67) and days required for 50% flowering (12.24).

Refinement of agrotechnology

Ashwagandha

- Among INM practices, 75% NPK of RDF (30:30:20 kg ha^{-1}.) + FYM 10 tonns ha^{-1} acquired maximum dry root yield (567kg ha^{-1}). Similar treatment significantly enhanced Withaferin A content in leaves (0.0095), withanolide A (0.0555) and withanolide B (0.0121) content in roots.
- 75% NPK of RDF (30:30:20 kg ha^{-1}) + FYM 10 tha^{-1} recorded maximum fat (3.19%), fiber (18.17%), ash (6.20%), carbohydrate (12.34%), and N (1.97%).

- Physiological parameters revealed that 75%NPK+FYM @10 tha^{-1} gave significantly higher seed yield (567.22 kg ha^{-1}) which was attributed to its higher PAR interception (1151.33µmol/m^2/sec), CO_2 utilization (31.00m mol/m^2/sec) and intercellular CO_2 concentration (Ci) (275.87).

Bhuiamla (*Phyllanthus amarus*)

- A progressive pattern of increase in Phyllanthin accumulation was recorded up to 150 DAS in herb material.
- Maximum Phyllanthin was estimated at 150 DAS (0.111%) as compared to early harvest at 130 DAS (0.099%) and 50 DAS (0.066).

Brahmi (*Bacopa monnieri*)

- Foliar application of IBA (200ppm) significantly increased number of leaves (418.67), leaf area (364.24 cm^2) and total dry matter yield (176.55 g) per m^2.
- However, IBA 150 ppm significantly improved fibre (20.74%) fat (5.9%) and ash (8.91%) and Kinetin 150 ppm had highest nitrogen (3.78%) and protein (23.63%) in herb material of brahmi. Both were at par with IBA 200 ppm.
- Maximum bacoside was estimated in foliar application of Kinetin 200 ppm (0.604%) and minimum in IBA 100 ppm (0.472%).

Chandrasur (*Lepidium sativum*)

Among INM treatment 50% NPK of RDF (50:50:30) + FYM 5 tons/ ha^{-1}+Azatobacter +PSB@ 3 $kgha^{-1}$ each estimated significantly maximum sinapic acid % content in seeds (0.0379) as compared to control (0.0092).

Coleus (*Coleus forskohlii*)

- The growing media 1 FYM:1 Vermi compost:1 sand:1 Cocopeat significantly enhanced number of roots (20.00), root length (19.04 cm), root diameter (18.20 m m) and dry root yield (143.49 g/plant), root nitrogen content (1.67%), protein (10.43%), fiber (23.12%), ash (8.8%) and forskohlin (0.3725%), as compared to other growing media.

Safed musali (*Chlorophytum borivilianum*)

- Foliar application of plant growth retardants Mepiquat chloride and Maleic hydrazide significantly improved morphological yield attributes, yield and quality.
- Foliar application of Maleic hydrazide (200 ppm) significantly increased number of fingers (17.33) and dry weight of fingers (32.11 g $plant^{-1}$).
- Foliar application of Maleic hydrazide (200 ppm) significantly improved the quality of finger as by estimating maximum nitrogen (1.75%), protein (10.92%), fibre (27%) and ash (10%)

Lemongrass (*Cymbopogon flexuosus*)

- Foliar application of 1.25 g urea/ plant (100 kg N ha^{-1}) in winter season gave maximum values of plant height (95.6 cm) and plant spread (73.74 cm) while foliar application of 1.25 g urea $plant^{-1}$ in summer season gave higher fresh herbage yield (3.81 kg/plant) in lemon grass variety RRL 16. Ring application of 1.75 g urea/$plant^{-1}$ (140 kg N ha^{-1}) in winter season was found to be best for oil yield (0.644 %).
- The effect of soil and foliar application of urea on growth and yield parameters in lemon grass variety OD-19 revealed that foliar application 1.5 g urea/plant (T2) gave maximum number of tillers (182.97/plant),CO_2utilization (36.55 µ mol CO_2 mol^{-1}), photosynthetic rate (20.40 µ mol CO_2 mol-2 s-1) and plant spread (182.40 cm). Foliar application of 3.5 g urea/plant (T6) was found to be best for oil content (1.09 %).

Tulsi (*Ocimum basilicum* L.)

- Foliar application of Salicylic acid (100 ppm) recorded maximum eugenol content

(0.8712%) as compared to control (0.6455).

Chitrak (*Plumbago zeylanica*)

- Under moisture stress condition, plumbagin content showed a progressive pattern of increase. Maximum was estimated under 80% moisture stress condition (0.2342%) and minimum in control (no stress) (0.0985%).

Guggal (*Commiphora wightii*)

- Position, length and number of stem cuttings on growth parameter of guggal revealed that base stem cutting 15 cm+ no. nodes 8 had significantly maximum plant height (66.00 cm), number of leaves (130.00) and herbage yield (30.58 n g plant^{-1})

Kalmegh (*Andrographis paniculata*)

- Foliar application (NAA 20 ppm) significantly improved the leaf dry weight (290.19 kg ha^{-1}), herbage (above ground dry weight) (1305.83 kg ha^{-1}) and total (above and under ground) dry weight (2341.47 kg ha^{-1}) along with maximum fat (3.38%), fibre (16.83%), ash (0.80%), protein (11.76%) and andrographolide content (0.2772%) in herbage.
- Application of Azatobacter + PSB @ 3kg ha^{-1} registered significantly maximum leaf dry weight (342.67 kg ha^{-1}) herbage (above ground dry weight)(1542.40 kg ha^{-1}) and total (above and underground) dry weight (2411.11kg ha^{-1}) along with fat (3.60%), fiber (13.73%), ash (0.72%), protein (11.85%) and andrographolide content (0.2851%) in herbage.
- Under moisture stress condition, andrographolides accumulation showed a progressive pattern of increase up to 120 DAS and thereafter it declined sharply. Maximum was estimated under 25% moisture stress condition (0.4790%) and minimum in control (0.1663%).
- Foliar application of salicylic acid 100 ppm +100NAA ppm recorded maximum andrographolide content (0.7627%) significantly followed by Salicylic acid 50 ppm+Kinetin 50 ppm (0.7393%) as compared to control (0.5821%) (without spray).

Mulethi (*Glycyrrhiza glabra*)

- In pot culture experiment, foliar application of Maleic hydrazide (400 ppm) enhanced significantly the root length (28.15 cm, root collar diameter (1.23 cm), root diameter (0.70 cm) and dry root yield (5.88 g plant^{-1})
- Same treatment also improved the root quality parameters viz. fat (0.81%) fiber (1.61%), carbohydrates (29.25%) total ash (1.90%) and *Glycyrrihizic* acid (0.5346%) in roots of mulethi

Patchouli (*Pogostemon patchouli*)

- 20 cm mid stem cutting with 5 nodes maximized plant height (76.0 cm); plant stem diameter (0.75 cm), number of branches (5.25); number of leaves (96.50), leaf area index (2.95), fresh herbage yield (116.0 g/plant) and oil content (1.65%)

Sarpgandha (*Rauvolfia serpentina*)

- In pot culture experiment application of N+P+K+Zn+FYM@ 0.134g + 0.08g + 0.08g +0.054g+5.4 kg/ha significantly improved the plant height (65.10 cm), stem diameter (0.68 cm), number of leaves (31.0), leaf area index (1.18), leaf chlorophyll content index (26.50), root nitrogen (2.24%) and root protein (14.00%) in root cuttings.
- On the other hand, N+P+K+Zn+FYM@ 0.134g+0.08g+0.08g+0.054g+5.4 kg/pot enhanced root length (53.3 cm), root collar diameter(0.96 cm), root diameter (0.95 cm), dry root yield (5.58 g/pant), root fat (0.68%), fiber (1.38%) carbohydrate (10.67%) and ash (7.56%) in sarpgandha root cuttings.

Senna (*Cassia angustifolia*)

- Sennoside A and B content (%) were significantly influenced by stage of harvesting.
- Maximum sennoside A and B were estimated when herb was harvested at 90 DAS (0.385 and 0.332%). The delay in harvesting caused a significant reduction at 130 DAS (0.337 and 0.280%). Similarly, at early harvesting at 50 DAS (0.258 and 0.201%) in Sennoside A and B respectively.

Agro-forestry

Block plantation of multi purpose trees for biomass study

At the age of 21 years (2009), eucalyptus (2 x 2 m) produced maximum above ground biomass (856.1 t ha^{-1}) whereas in 3 x 3 m spacing Shisham produced higher above ground biomass (203 t ha^{-1}).

Guava based Agri-horticulture system

- Open condition recorded significantly

Mandatory Medicinal and Aromatic Plants


Brahmi


Bhui amla


Ashwagandha


Senna


Kalmegh


Isabgol


Buch


Tulsi


Patharchur


Sarpagandha


Safed musli


Chitrak

highest grain yield (647 kg ha^{-1}) as compared to different pruning management and no pruning. Among different pruning intensities, heavy pruning intensities (60 cm pruning) recorded significantly higher grain yield (574 kg ha^{-1}).

- Managed agro-forestry system (pruning) is more profitable (Rs.18,533 ha^{-1}) as compared to unmanaged agro-forestry system i.e. no pruning (Rs.17,121 ha^{-1}), crop alone (Rs.6,659 ha^{-1}) and fruit crop alone (Rs.12,220 ha^{-1}).

Agrisilviculture system

Managed agro forestry system is more profitable (Rs.30,416 ha^{-1}) than growing of crop alone (Rs.15,009 ha^{-1}) and unmanaged agro-forestry system i.e., no pruning (Rs. 24,475 ha^{-1}). Under managed agro-forestry system i.e., growing of crop with different pruning intensities, wheat+ Sissoo in 25 % pruning is more profitable (Rs.32,460 ha^{-1}) as compared to 50% pruning (Rs.30,485 ha^{-1}) and 75% pruning (Rs.28,305 ha^{-1}).

Evaluation of bamboo species in agrisilviculture/silvopastoral system of Agroforestry under wasteland conditions of M.P.

Bamboo based agrisilviculture system

Moong when grown with bamboo recorded significantly higher net profit (Rs 10,612 ha^{-1}) followed by Til (Rs. 4,976 ha^{-1}). Soybean+ Bamboo (Rs. 2,825 ha^{-1}) and Paddy+Bamboo (Rs.2,761 ha^{-1}).

Bamboo based silvopastoral system

Napier grass produced significantly higher green fodder yield during first cutting (3040 kg ha^{-1}) as compared to Guinea grass (1577 kg ha^{-1}) and Anjan grass (1093 kg ha^{-1}). Dicanthium recorded lowest green fodder yield (629 kg ha^{-1}) and at par with Anjan and Guinea grass. Growth of Dicanthium grass was suppressed by stylo during first cutting.

Natural resins and gums

Guggal (*Commiphora wightii*) is a threatened plant species of Indian arid region that yields valuable Guggul gum. The gum is an important ingredient of numerous ayurvedic formulations.

Distribution of *C. wightii*

In Madhya Pradesh, the natural stand of Guggul is found in the ravines of Chambal at Morena, Sheopur, Shivpuri and Bhind districts. While in Gujarat, it is mainly found distributed in Kutch and Jamnagar districts. The plants in M.P. are tall of varying height extending from 3 feet to 14 feet. The bark of the plant is smooth and it is found to fruit in the month of December- January. In Gujarat, taller and shorter Guggul plants are found. The plants are with rough bark and found along the undulated terrain and areas with poor soil. Shorter plants attain height ranging from 2 to 4 feet with dense branching and shorter internodes. Due to shorter internodes and longer spines, they appear more spiny and bushy. These types of plants are found on the rocks, near the rocks or on the skeletal soil. Tall plants attain height varying from 4-12 feet and have rough bark. Taller plants are lesser in number in comparison to the bushy Guggul plants in the natural stand. *C. wightii* are declining rapidly and the six reasons identified for the decline are i. Destructive tapping ii. Encroachment iii. Termite infestation iv. Soil erosion v. Damage by shepherds vi. Fuel wood collection.

Investigation on the thickness of the bark of *C. wightii*.

Guggul is secreted by tissues in the phloem, it means the depth of the incision should not be deep. Unfortunately, in the process of tapping, the depth of the incision varies. It may be due to lack of a clear scientific knowledge. Death of Guggul plants after tapping may also be attributed to this fact.The mean thickness of the bark of Guggul plant varied from 1.8 mm to 2.0 mm. Cutting of secondary branches also

Eucalyptus (2 x 2 m)

Shisham (3 X 3 m)

Bamboo + Agast + Moong

revealed the exudation of oleo resin from the bark. Droplets of oleo resin gathered on the cut portion of the bark in a bead fashion.

Investigation on prevalent tapping system of *C. wightii*

Decline of guggul plants from its natural stand as well as Guggul gum production is related to either faulty tapping method or it's over exploitation. Tapping season in Madhya Pradesh starts from 1st week of March when temperature begins to rise after the cool and foggy winter. Tapping is usually done in the afternoon while collection of Guggul is carried out in the morning, after 4-6 days of making the incision on the bark. Tapping is done with range of local implements varying from a simple pocket knife, sickle or even an axe. In practice, 4 to 5 angular cuts are made on the bark of main stem by dipping a sharp knife in the freshly prepared Guggul solution. Caustic soda and acids replacing the safer activator (solution of Guggul) in a greed to collect more gum and earn more by the new generation of tappers has become a trend. Competitive tapping and deeper cuts with implements (sickle and axe) dipped in chemicals has become a practice, which resulted in the death of Guggul plants.

Designing and development of tapping device

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

The newly design tapping device when provided to the tappers, they tapped bushy Guggul plants by rolling the blade over the main stem. In spite the operation of the new device being easier in comparison to their locally made implement, its short handle was a major constraint as spines of the plant injured their hands. Fitting the handle of the new device into the long handle of their traditional device solved the problem.

Bamboo+August+Napier+Stylo

Newly developed Tapping device

lac cultivation

In Madhya Pradesh, the device was tested by Guggul tappers in Morena and Sheopur districts. The mean yield varying from 250- 450 g guggul per plant was obtained after the use of the new tapping device.

Ongoing propagation techniques of Guggul in Gujarat

Vegetative propagation is the most common practice of propagation of Guggul plant. Propagation through seed is not a general practice. The Department of Forest, Gujarat and Gujarat Institute of Desert Ecology (GIDE) has developed protocol for large scale Guggul propagation through seeds. The viability of Guggul seed is 1.4-3.5 per cent . The propagation of Guggul is generally through cuttings are 60 to 100 per cent while some have tried air layering is 40 to 80 per cent. However, Department of Forest, Gujarat and Gujarat Institute of Desert Ecology (GIDE) have developed the propagation technique through Guggul seed with success rate up to 80 per cent. The visit was very useful as it provide with the actual field experience of Guggul propagation carried out in large scale. The detail of development of Guggul nurseries was also shared by the field workers. Development of large scale planting material and plantation of Guggul is managed systematically.

Agricultural Economics

Ailing Agricultural Productivity in Madhya Pradesh

- The agricultural productivity in economically fragile regions of the State since long remained ailing although present uncommon opportunities for becoming fertile crescent. Cropping pattern has remained almost static. Growth in food grain production is consistently growing and yield of major crops during 2000-05 are growing by 2-5% per annum. The forecasts for one decade (2005-15) using ARIMA model shows that food grain production and yield also expected to grow by 1-2% annually. This poses serious questions for the food and nutritional security of poor farmers where population growth is more than 2%.
- Factors responsible for ailing agricultural productivity are relatively low priorities of public expenditure in agriculture, technological (seed replacement rate between 5 to 20% depending on crops, slowed down fertilizer consumption growth, volatility in growth of irrigated area), infrastructural (un-surfaced rural roads, poor electricity supply), institutional (lengthy procedure or rule debarring marginal farmers for accessing institutional credit, poor access to extension activities), farmers not getting required benefits of the government schemes etc. These interlocking inequalities need serious overhauling for keeping the food growers in the state afloat.
- Farmer's economic capacity largely depends on the public investment in road, research and extension, energy, irrigation, credit, education and health, many of which directly affect the crop productivity and therefore there is an urgent need to improve the synergy among these socio-economic, technological and institutional variables.

Economic impact of Bt. Cotton

- The visible economic impact of Bt cotton production technology was observed in terms of productivity and profitability which enhanced by 56 and 100% respectively. Marketing efficiency and better resource use efficiency was also observed despite of over 19% increase in cost of cultivation when compared with non-Bt Cotton.
- The indirect benefits such as more investment in other inputs, higher female labour participation (16%) and reduction in farmers risk (C.V. reduced by 1.50%) were also observed. Thus, GMO technology is beneficial for meeting out the growing

demand for cotton fibre and for safety of environment, if pesticides are used judiciously.

Agricultural Engineering

Ground water recharge in Narmada Basin

Ground water recharge is assessed for 6 districts covering upper Narmada Basin with a geographical areas of 35 lakh ha. It is 4.449 M ham which is equivalent to 12.84 cm depth over basin and nearly 10 percent of the normal rainfall. This district wise assessment is useful for deciding strategies for further development of ground water and its management.

Status of command area of RABSP

Application efficiency (Ea), distribution efficiency (Ed) and conveyance efficiency (Fe) were determined for four minors namely Jamunia, Jhansi, Pipariya, and Dulhakheda. Ea and Ed were found satisfactory but Ec has been found very poor due to siltation and seepage in minor poor conditions of control structures, low man power availability for operation and maintenance and timely unavailability of irrigation water should be improved.

Enrichment of ground water bank through Haveli system

Annual Ground Water recharge through Haveli fields was estimated to be 26 cm at 30% probability level. Further, remaining storage water may be used for injecting directly through recharge shaft during post monsoon period (SMW 37 to 42) with a intake rate of 4.9 cm hr^{-1}. The catchment area of Haveli may be increased by diverting runoff from an area equal to two times of available area for storage.

Water quality

A study on water quality in Narsingpur district showed deteoriation during the period of 40 years. Another study on water pollution in different Nalas of Jabalpur district showed high pollutants of Na, Cu, Cr, SO_4, Fe, HO_3, Cl TH in the source. Ground water quality index of 51.52 at Motinala has the poorest water quality and soils irrigated by Moti nala water are found higher in total alkalinity.

Treatment	Ground water sample	Surface water sample	Ratio of GW to surface water
Dairy waste	43.5	66.93	0.67
Urdana Nala	47.30	61.53	0.77
Moti Nala	51.52	76.65	0.67
Vehicle factory	40.48	59.44	0.68
Krishi Nagar Farm	31.18	43.48	0.71

Water quality index after Brown et al. (1975)

Land use thematic maps of Tons Basin and Sindh Basin

Land use/land cover map of Tons and Sindh Basin have been prepared under Agricultural Thematic mapping unit as a component of Madhya Pradesh Water Sector Restructuring Project at JNKVV, Jabalpur. Tons basin covers an area of 1.25 M ha comprising of five districts. The map was prepared using 35 satellite imageries on the basis of toposheets (Survey of India) of IRSP6-LISS III camera merged with PAN data and several ground observation throughout the Tons basin during the year 2007-08 and 2008-09.

Sindh Basin covers an area of 2.75 M ha comprising of nine districts. The map was prepared using 5 satellite imageries (full-scene) of IRSP6-LISS III camera and several ground observation throughout the basin during the year 2008-09 and 2009-10.

These Remote Sensing and GIS based maps are supplied to the department of Water Resources, Govt. of MP which are to be further used for decision support system in water sector restructuring program.

Ground water assessment in alluvial areas of upper Narmada River Basin

- Average pre-monsoon to post-monsoon water table fluctuation over the entire Upper Narmada basin varies from 3.4 m to 3.8 m.

- Dominating fluctuation ranges over a period of six years in all four districts of Upper Narmada basin are 1.9 m to 4.9 m for Mandla, 0.9m to 3.9m for Jabalpur, 1.9m to 4.9m for Narsingpur and 1.9 m to 4.9 m for Hoshangabad.
- There is a reduction in water table fluctuation over the entire basin from 2005 to 2008.
- Maps of water table fluctuation contours were prepared for each district for the years from 2002 to 2008 and analyzed to get recharge variation with space.
- Total recharge for Mandla, Jabalpur, Narsingpur and Hoshangabad district is 94569, 116405, 108163 and 130849 ha m respectively. The total recharge for the upper Narmada basin is estimated to be 4.449 M ha m. This is equivalent to 12.84 cm uniform depth of recharge over 35,03,811 ha on total geographical area of the Upper Narmada Basin including all districts, which is nearly 10 per cent of the normal rainfall in the basin.

Management of canal command – a conjunctive use approach

- The study conducted in four minors of left Bank Canal of RABS Project reveals that the application efficiency reduces with the reach of the minor i.e. higher in upper part to the lowest in the tail area. The Ea is considerably good for head and middle reach, attributing adoption of improved irrigation practices. Even in tail reach the Ea is satisfactory in all minors except in Jamuniya.
- The distribution efficiency was found to be quite high in all minors and in all three reaches showing awareness among farmers. As stated earlier, farmers of these commands are familiar with conjunctive use of surface and ground water hence they understand value of water and use of sprinkler irrigation is popular to avoid water logging as it is coming up as menace in nearby commands.
- A comprehensive study of values of efficiencies suggests improvement of conveyance system. Though all minors have been lined, but now lying unattended and are breached out. Higher values of Ea and Ed in all the minors are satisfactory. Low Ec forced to carry out seepage studies in these minors.
- The seepage rate was measured as 0.03117 cumec m^{-1} length of minor in Jamuniya, 0.03191 cumec / m in Jhansi, 0.02008 cumec/m in Pipariya and 0,01730 cumec m^{-1} in Dulhakheda.
- The Delivery Timeliness Ratio and Carrying Capacity Ratio indicate betterment of minor as far as water availability is concerned though it is for the farmers of head and middle reach only, and at the tail end there is a problem of water availability most of time.
- Poor Structure Ratio value as 1 in all minor itself indicates all the existing structures are in poor condition in all of these minor. The same picture is reflected in Maintenance Budget Ratio also which has no budget allotment for the maintenance.
- Low Manpower Number Ratio is the indicator regarding supervision, indicates poor availability of manpower for maintenance. 'Sustainability of Irrigated Area' below 0.5 is the indicator of creation and utilization.
- Relative Ground Water Depth' values are always found more than 1 indicates safe water table depth in all commands and there is no problem regarding water logging at present.

Enrichment of ground water bank through Haveli recharge

- Intake behavior of underground strata below haveli fields were studied and tests were performed by pouring water into the injection wells in early, during and after

rainy season. During a period of 26-30 SMW, owing to greater availability of dry soil depth, the intake rate was found faster which became almost constant at 7.9 cm h^{-1}. During mid monsoon (SMW 31 to SMW 36) the water level came closer to the surface and intake rate was found drastically fallen to 0.8 cm h^{-1} and during post monsoon period (SMW 37 to 42), when water level reduced to 2.4 m, the intake rate increased to 4.9 cm h^{-1}.

- There is a possibility of injecting haveli storage water just in early period of monsoon and after withdrawal of monsoon which shall be a great help to increase ground water bank with system like haveli.
- Trend lines are drawn to represent behaviour of intake capacity of strata beneath haveli fields in different parts of study period. The characteristic equation of each are:

  Early monsoon

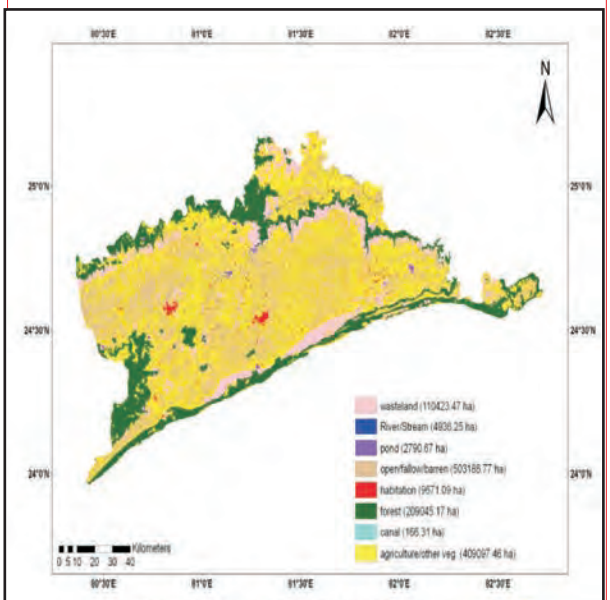
  $Y = 0.0214X + 1.4256, R^2 = 0.78$

  Mid monsoon

  $Y = -2E\text{-}0.5X^2 + 0.004X + 0.53, R^2 = 0.77$

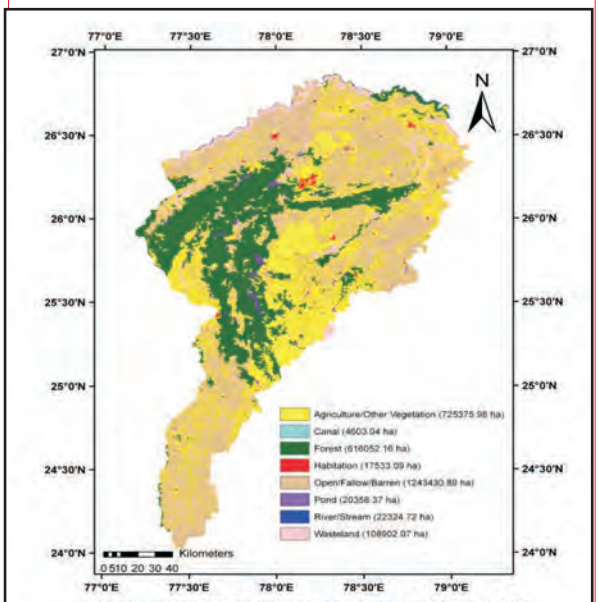
  After monsoon

  $Y = 0.007X + 1.1426, R^2 = 0.69$



LAND USE / LAND COVER MAP OF TONS BASIN

- The total rainfall of 40 years of Jabalpur at 20%, 30%, 40%, 50%, 60% and 70% probability level was found to be 1865 cm, 1051cm, 528 cm, 224 cm, 99 cm and 26.5 cm respectively on the basis of procedure adopted for probability analysis by Weibull formula, which gives the best result.
- The maximum recharge estimated accordingly was 34 cm, 26 cm and 4.83 cm at 20%, 30% and 40% probability respectively.
- Haveli storage and groundwater recharge are not generated every year, but some kind of storage is observed every year in the field which may be attributed to the run off in water in those field. To obtain Haveli storage every year, the runoff of fallow fields, cropped fields, uncultivated lands and any kind of non Haveli fields may be diverted to the Haveli field.
- Quantum of runoff diversion depends on return period selected. If the return period is 3 years than runoff from the areas upstream the Haveli fields should be diverted. The catchment should be equal to two times of Haveli areas.



LAND USE/ LAND COVER MAP OF SINDH BASIN

Ground water pollution

- Study was conducted in Narsingpur district in 18 grids at interval of 15'. All water samples have pH ranging between 6.70 to 7.41 which is excellent for irrigation. All the water samples showed low EC (below 1500), which is suitable for irrigation.
- Out of 14 samples, one from Bachai Sugar Mills whose RSC was 1.15 meq/l another from Surwari whose RSC was 1.40 meq/l, rest of all samples had medium range of RSC value between 1.5-3.0.
- Comparing the water quality obtained 40 years ago with the current quality values, all the parameters were found deteriorating, though, with a slow gradient.
- Analysis of samples collected from different sources of waste water shows that Moti Nala, Dairy waste water and Urdana Nala water contains high Na ions, Cu, Cr, SO_4, Fe, NO_3, CI, TH are within limits.
- TA is higher in most of the samples. RSC has been found very high at Moti Nala and was fair for irrigation purpose at other locations. SAR is excellent for all sources for irrigation.
- The water of Moti Nala was found to be more contaminated. The water quality index of this site is 76.65 followed by Dairy waste site (66.0).
- Ground water quality index of 51.52 at Moti Nala site showed the poorest quality. Ground water quality index 31.2 of Krishi Nagar Farm indicate the least ground water quality amongst all.
- Soils of Krishi Nagar Farm and near Vehicle Nala have high organic carbon both on the surface and at the depth below 30 cm.
- Copper deficit was recorded in all soils except at lower layer at 30 cm depth of Moti Nala soil and upper layer surface soils of Vehicle Nala site. Soil irrigated by Moti Nala waste water are found higher in total alkalinity.

Agro-meteorology

- Block level rainfall of Chhindwara district showed that out of 11 blocks, 8 blocks shown decreasing trend of rainfall and 3 blocks showed increasing trend. Trend of rainy day was also in the same order of rainfall.
- Season-wise rainfall analysis of Chhindwara district at block levels indicated decreasing trends of rainfall and rainy days during Rabi season.
- Decadal temperature (s) variation in four districts, Jabalpur, Indore, Gwalior and Chhindwra was analysed. The above analysis indicated that temperature variability has a decadal trend at Jabalpur and Indore during the winter season, which may be considered in the crop management.
- Crop weather relation of chickpea studies indicated that higher seed yield and higher value of different heat units was accumulated in October sown crop. Among the different chickpea types, Desi type gave higher yield than Kabuli and Gulabi.
- Relationship of temperature with seed yield revealed that day temperatures are more detrimental than night temperature.
- Soybean sown in first week of July gave higher yield than other sowing and also accumulated higher GDD, HTU and PTU.
- Simulated and measured yield analysed by DSSAT model was either over or under estimated.

Temperature(s) trends at Pachmarhi

Temperature analysis of Pachmarhi of Hoshangabad district situated at 1100 msl indicated decreasing trend of minimum temperature in all the months, but the trends

of maximum temperature was declined from month of January to June afterwards i.e., from July to December showed increasing trends.

Month wise temperature trends at Pachmarhi

S.No.	Month	Temperature (°C)	
		Maximum	Minimum
1.	January	-0.003	-0.098
2.	February	-0.011	-0.101
3.	March	-0.054	-0.094
4.	April	-0.079	-0.153
5.	May	-0.008	-0.090
6.	June	-0.010	-0.063
7.	July	0.039	-0.058
8.	August	0.054	-0.055
9.	September	0.027	-0.075
10.	October	0.0126	-0.014
11.	November	0.012	-0.029
12.	December	0.015	-0.066
	Annual	-0.001	-0.075

Trend of rainfall and rainy days in Hoshangabad district

Analysis of rainfall and rainy days at block level of Hoshangabad district of MP out of 5 blocks 3 showed increasing and rainy days trends. During Rabi season, rainfall and rainy days showed decreasing trend in all the blocks of Hoshangabad.

Name of Block	Trend of Rainfall (mm)		
	Annual	Kharif	Rabi
Hoshangabad	6.213	7.791	(-) 1.089
Bankheri	21.697	16.961	(-) 0.673
Pachmarhi	0.477	6.256	(-) 4.219
Sohagpur	(-)7.145	(-) 7.971	(-) 1.017
Seoni Malwa	(-) 7.675	(-) 5.225	(-) 2.620
Name of Block	**Trend of Rainy Days**		
	Annual	Kharif	Rabi
Hoshangabad	0.220	0.308	(-) 0.141
Bankheri	0.555	0.705	(-) 0.029
Pachmarhi	0.343	0.607	(-) 0.07 1
Sohagpur	0.767	(-) 0.045	0.796
Seoni Malwa	0.329	0.467	(-) 0.152

Agricultural Structures and Environmental Engineering

Inverted downdraft gasifier type Biomass Cook Stove (IDBG cook stove)

The Inverted Downdraft Biomass Gasifier Type Cook Stove has been developed for thermal applications for domestic use and in roadside tea stalls and *dhabas*. Wood pieces and biomass briquettes are used as fuel. It offers the advantage of cooking/heating while using a variety of biomass fuel. The thermal efficiency of this cook stove is much higher (28 to 33%) as compared to the improved metal cook stove which ranges between 18-22%. It requires 1.5-2.5 kg wood or briquettes per filling. It operates using natural convection of air. The rate of gas production and heating is controlled by the primary air supply to the gasifier. The stove can be started and operated indoors, with sufficient ventilation without the need of any exhaust fan and it does not create odor of burning wood. The average consumption of the cook stove is about 1 kg/h which is sufficient for making a simple meal for a family of 4-5 persons. The estimated cost of stove is Rs. 500/-.

Solar cabinet drying of fruit and vegetables

The evaluation of a multi rack domestic solar collector indicated stagnation temperature of 50.8°C at an average ambient temperature of 22.9°C. Its evaluation for drying of cauliflower, amla and chilies revealed on an average drying time reduction of 31%, 49% and 42%, respectively as compared to open sun drying. The qualities of the dried product were found to be superior to open sun dried product.

Drying characteristics of Satawar root

The split satawar root samples exhibited higher drying rate and lower final moisture levels than the intact satawar root under hot air tray, solar cabinet, direct sun and shed drying methods. The highest overall drying rate of 68.29 (%db/hr) and lowest final Moisture level of 10.78 (%db) was recorded in hot air tray drying of split samples of satawar root at air temperature of (56-60°C) and air flow rate of 1.8 m/s the Hot air tray (56-60°C), Solar cabinet (42-48°C), Direct sun (30-38°C) and

Shed drying (24-35°C) of split root showed decreasing trend of overall drying rate(%db loss/hr) of 68.29, 59.84, 20.9 and 16.95 and increasing trend of final moisture levels i.e.,10.78,14.05, 30.26 and 126.58 (% db) respectively. the hot air tray, solar cabinet, direct sun and shed drying of intact satawar root showed overall drying rate of 16.61,12.07,10.86 and 7.57 (% db loss/hr) and final moisture level of 45,60,65 and 70 (% db) respectively.

- Temperature and RH (%) of drying air varied in the range of 56-60, 42-48, 30-38, 24-35°C and 14-18, 15-26, 24-36, 30-39 % under hot air tray, solar cabinet, direct sun and shed drying method respectively.
- Maximum microbial load was detected in direct sun and shed dried split root and minimum in hot air tray and solar cabinet dried intact root. Higher microbial load was identified in split root samples as compared to intact root samples in all drying methods.

Users' reaction on use of Solar Cabinet Dryer

- The drying of fruits vegetables and spices in Solar Cabinet dryer is certainly faster, safer and more hygienic than in open sun drying.
- The cost of the dryer is not in the affordable range in view of small capacity and drying requirements.
- The local fabricators are quoting cost of Rs. 6000/- to 7000/- per dryer for its fabrication and supply. If permission is accorded, it is proposed to procure 10 pieces of domestic solar dryer and provide it to 10 KVK of JNKVV for popularization of this environment friendly hygienic drying device.

Farm Machinery and Power Engineering

- Designed, development and testing of furrow openers for tractor drawn till plant machines
- Designed, development and testing of tractor drawn raised bed planter
- Designed, development and testing of isolator for reducing the vibration for tractor operator
- Designed, development of power operated coconut harvesting machines
- Ergonomical studies on work place layout of different models of tractors
- Bio-fuels generation, evaluation and testing under different load conditions
- Wearing studied of tractor clutch plates
- Manual, bullock, self propelled and tractor drawn improved implements / tools were manufactured and supplied to the farmers under the revolving fund scheme.
- Revamping and restructuring of JNKVV farms through land development unit
- Imparted training to the village youth, artisans and agriculture officers

Furrow openers for Till Plant Machine

The furrow openers for the tractor drawn till plant machines was designed, developed and tested at CIAE, Bhopla for different crops and it was found to be suitable for black cotton soil. The field capacity of the machine was found to be 0.489 ha/h. Total time required for tillage and sowing operations was 72.27% less than conventional method i.e. (cultivator x 1 + disc harrow *1+ seed drill x 1). Whereas, the yield and cost of operation was found to be 6.4% more than zero tillage machine (Rs.346 ha^{-1}).

Vibrational characteristics of different tractor seats

Studies on vibrational characteristics of different tractor seats were conducted for different operations to study the seating dimensions of selected tractor seats, based on anthropometric considerations of Indian operators and BIS recommendations. Determination of mechanical properties of

selected rubber materials for vibration isolation and for design and develop suitable vibration isolators for tractor seat, based on mechanical and vibrational considerations.

The perfor-mance of vibration isolators for comfort of tractor operators, under different operating conditions was also available. Therefore, an efficient vibration isolating material, for tractor seat based on vibration transmitted under different operating conditions and speeds was recommended.

It was found under the laboratory study, that the whole body vibrations transmitted at tractor seat-operator interface about 90% of vibration attenuation (maximum) can be achieved by using isolators of different rubber materials for different tractor seats, at corresponding engine speeds. WBV transmitted at tractor seat-operator interface by using rubber isolators of natural, neoprene and SBR materials indicated that vibration attenuation under various field conditions i.e., tar road, farm road and ploughing operation, to about 16.2% by SBR; 26.28% by neoprene and 13.41% by neoprene in most severe vertical direction. However, amplification in vibration was also observed under farm road for lateral acceleration. The cost of vibration isolators is about Rs. 50 per piece only.

Coconut Harvesting Machine

Power operated coconut harvesting machine was designed, developed and tested for harvesting of coconut from 10 to 15 m height from the ground level and found to be suitable for harvesting. The harvesting capacity 40 trees day-1 and has a cost saving of 71 per cent over manual harvesting.

Garlic Planter

A garlic planter was developed with mechanical and economical considerations. It was found that the field capacity was 0.0169 to 0.0173 ha^{-1} with labor requirements of 95 man-h ha^{-1}. The cost of operation was found to be Rs.1444 ha^{-1} whereas, the cost of manual planting required Rs. 4500-5000 ha^{-1} as well as 535 man-h/ha for planting of garlic. It can also be used for sowing garlic, maize, green gram, peas etc.

Testing of Methyl Ester of Jatropha, Mahua, Rice Bran, Karanjia, Soybean and Palm Oil and their Blends

The properties of the methyl esters of soybean, karanj, rice bran, mahua and ratanjot were measured and tested for the engine performance at different blending ratio. The break load capacity was also measured.

The properties were also compared with diesel. Storage properties were also measured for different bio-diesels for six months.

The ethyl esterification of *Ratanjot* was also prepared and its properties were compared with other bio-diesels. The field testing of bio-diesels were also conducted for different tillage operations and transportation.

Performance of Solar Cabinet Dryer

Item dried	Qty. (kg)	Drying duration	Quality of dried product
Spinach leaves	0.5	2 Days	Good quality & taste
Methi leaves	0.5	2 Days	Colour & aroma retained
Coriander leaves	0.5	2 Days	Colour degraded & aroma lost (not good)
Amla (pieces)	1.0	3 Days	Slight discolour, good quality & taste
Potato slices	1.0	3 Days	Good quality & taste
Ginger	1.0	3 Days	Good quality, aroma & taste
Chestnuts	1.0	3 Days	Acceptable
Mango slices	2.0	2 Days	Acceptable
Ber	1.5	3 Days	Acceptable
Turmeric	2.5	4 Days	Acceptable

Biotechnology

Plant Tissue Culture and Transgenics

- Initiated somatic embryogenesis in soybean for its further utilization in genetic transformation.
- Identified genes responsible for male sterility and fertility restoration in wheat.
- Produced potato micro-tubers after disease indexing using ELISA and molecular markers.
- Established efficient protocols for mass *in vitro* propagation of some important medicinal and aromatic plants of Madhya Pradesh including low-cost protocols of *Safed musli* and *Sarpgandha*.
- Developed productive micro-propagation protocols for banana, sugarcane and papaya.

Molecular Biology

- Characterized of *Ashwagandha (Withania somnifera)* and *Chandrasoor (Lepidium sativu)* germplasm on molecular basis.
- Analyzed molecular diversity among soybean cultivars and mutant against root rot and yellow mosaic virus (YMV) disease
- Studied molecular linkage for flag leaf width and leaf hair traits in rice using recombinant inbred lines derived from cross JNPT 89 X IR 64 using SSR markers.
- Characterized and analyzed diversity of *Macrophomina phaseolina* isolates of soybean.

Fermentation Technology

- Developed economically viable production technology for maximum yield of protein rich biomass from waste carbon sources (soy hulls, chick pea hulls and pigeon pea hulls) using *Bacillus subtilis* NCDC 070, *Aspergillus niger* P 12 VII and *Candida utilis NCDC 280.*
- Resulted in better yield of phytase enzyme with mixed substrate fermentation of carbon and nitrogen rich agro by products (rice bran, wheat bran, sugarcane baggese, groundnut shells as carbon source and mustard oil cake, sunflower oil cake cottonseed oil cake, niger oil cake as nitrogen sources) using *Aspergillus niger* IARI 363 and *Aspergillus ficuum* 1461 in compression to single substrate taken individually.
- Obtained higher yield of phytase with combination of chickpea hulls with sunflower oil cake in 1:1 ratio using the strain *Aspergillus niger* IARI 1461.
- Developed low cost production technology for better recovery of microbial pigments from various agro by products such as sugarcane molasses, wheat bran, rice bran, as carbon source, cottonseed oil cake, mustard oil cake, sunflower oil cake as nitrogen source using fungus *Monascus perpureus* MTCC 410 strain employing the techniques of solid state and submerged fermentation. The combination of rice bran and mustard oil cake in 1.5:1 ratio resulted in the highest yield of various pigments fraction i.e. yellow, orange and red. The incorporations of these three pigment fraction in processed products such as sugar candies and jellies showed the better consumer acceptability with respect to various sensory attributes.

Biosynthesis of *Monascus* pigment using agro industrial by-products

The findings indicted that among all the carbon and nitrogen sources, the combination of RB:MOC (Rice bran : Mustard oil cake) 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 55%, temperature of 30^0C, inoculum size of 1.5×10^6 (spores/ml) and incubation period of 12 days

with the combination of RB:MOC as a substrate in 2.5:1 ratio. In submerged fermentation (SmF) also, highest total yield of pigments was recorded using carbon and nitrogen sources (RB:MOC) in 1.5:1 ratio by maintaining the optimum conditions of fermentation variables such as pH of 5.5, temperature of 30^{0}C, inoculum size of 1.5 x 10^6 (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.

Molecular gene cloning of a novel phytase from *Bacillus subtilis*

The *Bacillus subtilis* strains NCIM 2712 and NCDC 070 were chosen for cloning of *phy* gene. From overnight cultivation of *Bacillus* strain in nutrient agar media for 37^{0}C chromosomal DNA was isolated. Primers were designed with known published sequence Acc. No. AF298179 of *B. subtilis*. On PCR amplification of phytase gene, 1059 bp size band were amplified. The *phy* gene of *B. subtilis* NCIM 2712 was cloned into InsT/A cloning vector and the positive clone were confirmed by colony PCR with gene specific primers and restriction enzyme digestion. The newly cloned gene have good potential for producing recombinant enzyme, which will help to enhance the food quality by using as feed supplement in near future.

Molecular diversity analysis in A*shwagandha* [*Withania somnifera* (L.) Dunal]

The 25 decamer primers amplified 204 RAPD marker loci, Out of 204 bands scored by RAPD markers, 152 (74.50%) were found to be polymorphic and remaining 52 (25.50%) were monomorphic. Average number of bands per primer was 8.16±0.60 while average number of polymorphic bands were 6.08±0.51. P10 value ranged from 0.177 to 0.792 (average 0.448±0.035). The genetic similarity based on RAPD primers ranged from 0.74 to 0.87. The cluster analysis of RAPD markers grouped all the Ashwagandha genotypes under study into 2 major groups. Twenty seven ISSR primers amplified 186 ISSR markers loci. Out of these 186 loci, 151 loci were found to be polymorphic (81%, 5.59±0.89 average). The range of PIC scores of ISSRs primers was 0.081 (UBC 846) to 0.671 (UBC 854) (average 0.429±0.031). The genetic similarity coefficients values among 16 Ashwagandha genotypes based on ISSR analysis ranged from 0.66 to 0.91. The cluster analysis divided the Ashwagandha germplasm into 2 major groups. Both the marker system was able to discriminate aM the accession of Ashwagandha used in present study. Several primers amplified specific markers. The average PIC scores of ISSR and RAPD markers were similar. The Mantel Z-test statistic was significant for ISSR and RAPD markers which conclude that both RAPD and ISSR markers provide consistent information for germplasm identification, because the main clusters in the dendrograms were consistent for both marker systems.

***In Vitro* embryogenesis in teak (*Tectona grandis* Linn.f.)**

In this study, diverse explants of immature embryonic axis, immature and mature cotyledonary nodes were cultured on MS medium fortified with different concentrations of auxines and cytokinins. Embryogenesis in teak was induced by culturing explants on MS medium supplemented with BAP (0.1-4 mg/l), NAA (0.1-10 mg/l) and 2, 4-D (3 mg/l). All cultures were incubated at 25±2^{0}C under PAR light and 12/12 hrs light/dark photoperiod cycle. On the basis of regeneration percentage obtained from different explants, immature embryonic axis was found to be the best as compared to the other explants. During the present investigation it was found that shoot differentiation on teak via callusing takes place when basal medium is supplemented with lower concentration of NAA.

Animal Biotechnology

Cloning and sequencing of *M* Gene of Avian Infectious Bronc hitis Virus: 20 IB suspected samples which were positive by UTR1 specific primer were taken for M gene amplification. Out of 20 UTR1 positive samples only 4 samples gave M gene amplification. M gene was then sub cloned in pQE-TS vector maintaining the correct frame resulted the plasmid pQE-TS/M, which was further confirmed by release of identical sized fragment with restriction enzymes and colony PCR. An attempt was taken to express the M protein in *E. coli* on induction with IPTG and analysed by 12% SDS-PAGE. But no desired M protein band was observed on SDS-PAGE.

Molecular characterirization of Infectious Bursal Disease Virus of poultry and development of shRNA construct against its *VP2* Gene: Transformed colonies on nutrient agar were confirmed by colony PCR showing amplicon size of 245bp with vector specific primers and restriction enzyme digestion. In MP for the first time molecular diagnosis of IBD has been carried out by RT PCR followed by sequencing of field isolates. Alignments of both field isolates of MP are of very virulent type. Phylogenetic tree analysis indicates their closeness to Asian and European vv strains as compared to USA strains. Although they showed very high similarity among themselves and other Indian isolates from different parts of India but few amino acids and nucleotide substitute were reported.

In vivo studies of ShRNA construct for knock down effect on MSTN gene in goat (*Capra hircus*): Inhibition of myostatin results in to heavy muscle development. RNAi can be used to myostatin activity at RNA level. RNAi in combination with SCNT may be used for production of myostatin knockdown goat. The shRNA construct showing best results (sh1) was selected for in vivo study of its effect on myostatin expression. Electroporation technique was optimized for in vivo transfection of shRNA construct into the three selected goat kids. The results were analyzed by real time experiment. Approximetely 66% silencing was obtained in third animal.

Hand-made cloning technique for creation of SCNT embryo in Jamnapari goat: In this study, HMC has been modified using micromanipulator for bisection of oocytes and fusion process. This study compares the cleavage and embryonic developmental rates of goat embryo using different reprogrammed cell donor groups, with different activation protocols groups and culture media. Higher cleavage and embryonic developmental rates were observed in parthenogenetic activation of matured oocytes with DMAP+Ca-inophore groups in RVCL culture medium. It was concluded that the low rates embryonic development may be due to a variation in acceptability of RVCL medium by different species.

***In vitro* fertilization and embryo sexing in buffalo:** In this investigation, standardized the protocol for *in vitro* capacitation and subsequent *in vitro* fertilization in buffalo. Also, the protocol for embryo sexing using embryonic DNA by PCR was standardized. The result shows that the bovine Y-chromosome specific primers can be used to determine the sex of buffalo IVF embryos, from 4 cells to blastocyst stages. 28 IVF-derived embryos (4 cells t the early blastocyst) were used for sex determination. It was observed that 4 cell buffalo embryo is sufficient for sex determination by PCR. No misidentification was observed within the embryo samples using PCR methods suggesting that a technique is a highly reliable method for sexing buffalo embryos.

Conservation of Jamnapari breed of goat by cryopreservation of embryos and somatic cell line: This study was conducted on ten Jamnapari goats superovulated either with PMSG or FSH. The protocol for superovulation and synchronization involved either one injection of $PGF_2\alpha$ or double injection schedule of $PGF_2\alpha$. The oestrous

response and the tracting of the oestrous cycle were done by visual signs of oestrus and by exfoliative vaginal cytology. Superovulation was monitored by laproscopy and embryo collection and transfer was done by laprotomy. For molecular characterization of the jamnapari goats, a total of 14 animals were evaluated by RAPD-PCR technique to study the polymorphism at DNA level. DNA polymorphic bands recorded (fragment data) were entered in a computer file as a binary matrix and analyzed using NTSYS-PC software.

The band sharing value ranged from 0.74 to 0.93. The samples of animal No. S1, S3, S4, S6, S9, S10 formed one cluster, in dendogram based on Jaccards similarity coefficient.

***In vitro* studies on the effect of anti-MSTN sh RNA constructs on interferon response:** In the present investigation, shRNAs which were expressed from modified cytomegalomavirus (CMV) promoter were used to silence the myostatin gene. It showed efficient down regulation of myostatin mRNA ranging between 50-86%. However, two classic IFN stimulated genes (OAS1 and IFN-β) wre also induced by all the shRNA cinstructs. Silencing was also carried out at gradual dosage of anti-MSTN shRNA construct; sh1, by transfecing caprine foetal fibroblast cell line using lipofectamine. Real time PCR analysis was performed to measure the relative expression of MSTN and IFN stimulated genes like OAS1 and IFN- β after normalizing their expression to a housekeeping gene, GAPDH.

It was found that IFN- β was less expressed as compared to OAS1 against all the shRNA constructs used for transfection and even at lower dose (1.6 ug and 0.8 ug) of the best construct *i.e.* sh1. On the basis of the efficiency to down regulate myostani mRNA level and capability to induced the least IFN response, it was found that sh1 was the best construct among all and it could further be used for future studies.

New Projects sanctioned

- Voluntary Center on AICRP on spices, sponsored by ICAR, New Delhi. PI: Dr. A.K. Nigam, outlay: Rs. 3.80 lacs.
- National network programme on onion and garlic sponsored by ICAR, New Delhi. PI: Dr. B.R. Pandey, outlay Rs. 52.16 lacs.
- Voluntary Center on biological control of pests and weeds sponsored by ICAR, New Delhi. PI: Dr. O.P. Veda, outlay: Rs. 5.10 lacs.
- Rural service hub-business catalysts for rural competitiveness and inclusiveness sponsored by IFPRI, Asia Office, New Delhi. PI: Dr. A.K. Sarawgi and Dr. B.B. Beohar, outlay: Rs. 23.10 lacs.
- Tracking changes in rural poverty in household village economy in South Asia sponsored by ICRISAT, Hyderabad. PI: Dr. P.K. Awasthi
- AICRP on arid zone fruits, under 11th Plan Period sponsored by ICAR, New Delhi. PI: Dr. S.K. Pandey.
- AICRP on MULLaRP , under 11th Plan Period, PI: Dr. Sammiya, by ICAR, New Delhi.
- Deployment of molecular markers in chickpea breeding for developing superior cultivars with enhanced disease resistance sponsored by DBT, Govt. of India. PI: Dr. Anita Babbar, Senior Scientist (Breeding), outlay: Rs. 318.42 lacs; duration: 5 years.
- Improvement heat tolerance in chickpea for enhancing in warm growing conditions and mitigating impacts of climate change sponsored byISOPOM. PI: Dr. Anita Babbar, Sr. Scientist (Breeding),outlay: Rs. 302.84 lacs; duration: 4 years.
- ICAR has upgraded the AICRP Sub centre on chickpea at Jabalpur to Lead centre in 11th plan functioning from July 2009 with

special emphasis on focused research activities on biotic streams, multiple race resistance against wilt as well as enhancing the productivity through physiological approaches for resistance tuning the chickpea plant types. The Lead Centre at Jabalpur will address genetic improvement of chickpea along with the generation of transferable technologies required in the change in the climate including terminal drought tolerance.

- Experiential learning for B.Sc. (Ag.) students. An amount of Rs. 70 lacs have been sanctioned jointly to the Department of Entomology & Plant Pathology, JNKVV, Jabalpur during 2008-09. P.I.: Dr. O.P. Veda, Professor & Head (Entomology).
- During the 11th Fifth Year Plan, ICAR has sanctioned a Voluntary Centre under AICRP on biological control of crop pests and weeds to the Department of Entomology, College of Agriculture, JNKVV, Jabalpur from 2009-10. PI: Dr. S.B. Das, Assoc. Professor (Entomology).
- All India Network Project on ethno-veterinary medicine has been extended to 11th plan with an outlay of Rs. 102 lakh. PI: Dr. Y.P. Sahni Professor & Head, Veterinary Pharmacology, Jabalpur.
- All India Network Project on drug residues and environmental pollutants was sanctioned to Department of Pharmacology and Toxicology, College of Vety. Sci. and A.H., Jabalpur. PI: Dr. Y.P. Sahni, Professor and Head, Veterinary Pharmacology, Jabalpur; duration: 5 years, outlay Rs. 87.50 lacs.
- Evaluation of clinical efficacy of ayurvedic formulation in dog sponsored by Central Council for Research in Ayurveda and Siddha, New Delhi. PI: Dr. Y.P. Sahni, Professor and Head, Veterinary Pharmacology, Jabalpur, outlay: Rs. 3.74 lacs.
- Surveillance and documentation of ITK practices in tribal areas of Hoshangabad District of M.P. sponsored by National Innovation Foundation, Ahmedabad. PI:Dr. Y.P. Sahni, Prof. and Head, Veterinary Pharmacology, Jabalpur; outlay: Rs. 3 lacs.
- Centre for wildlife forensics and health sponsored by Ministry of Forest, M.P. Bhopal, with an outlay of 4.32 crores for 10 years duration in the Department of Wildlife Health and Management, College of Veterinary Science & Animal Husbandry, Jabalpur.
- *Approval of Business Planning and Development Unit:* The Business Planning and Development units endeavour to build and strengthen partnership with many organisations and act as mentors, trainers and as channels to markets with specific objectives viz. promotion of market responsive products and technologies through effective entrepreneurship development for commercialization; promotion of public private partnership for commercialization of technologies and human resource development for entrepreneurship development and commercialization of technologies. The technologies and services identified for JNKVV are, hybrid seed technologies; soil, seed & plant conditioning bio-agents (Rhizobium, Azotobactor and Jawahar enriched bio-organics); medicinal & aromatic plants and their derivatives (Ashwagandha, Isabgol, and Kalmegh production & processing technologies). Financial outlay: Rs. 327.362 lacs. The project will create a climate for sustaining new breed of entrepreneurs and farmers to generate wealth from agricultural technologies, products and services.
- "Business Planning & Development (BPD) Unit at Directorate of Farms, JNKVV, Jabalpur sanctioned by ICAR under NAIP

Component-I for Rs. 327.36 lakhs, duration 2 years 6 months. Principal Investigator : Dr. S.K. Rao, Dean, College of Agriculture, Rewa and Director Farms, JNKVV, Jabalpur.

- "Rapid conversion of normal maize inbreds to quality protein maize and further enhancement of limiting amino acids in elite inbreds through market assisted selection" sanctioned by the Department of Biotechnology, Ministry of Science & Technology, Govt. of India, New Delhi for Rs. 52.61 lakhs. Principal Investigator Dr. Navinder Saini, Scientist, Biotechnology Centre, JNKVV, Jabalpur.
- "Establishment of nurseries in five districts of Madhya Pradesh" sanctioned by Madhya Pradesh State Medicinal Plant Mission, Bhopal for Rs. 100.00 lakhs for 2009-10. Principal Investigator : Mr. A. B. Tiwari, Sr. Scientist).
- "Development of molecular markers in chickpea breeding for developing superior cultivars with enhanced disease resistance". sanctioned by ICRISAT, Hyderabad for Rs. 56.39 lakhs, duration: five years. Principal Investigator: Dr. (Mrs.) Anita Babbar, Senior Scientist, (PB), College of Agriculture, Jabalpur.
- "Biotic Stress (Rusts)", sanctioned by the Directorate of Wheat Research, ICAR, Karnal for Rs. 5.05 lakhs, duration: 3 years. PI: Dr. P.C. Mishra, Principal Scientist (Plant Breeding & Genetics), Zonal Agric. Research Station, Powarkheda.
- Asia Pacific Association of Agricultural Research Institution (APAARI) has assigned a project on "Evidence Generation and Policy and Institution Mapping on Food and Biofuel" to Prof V.K. Gour, Associate Professor, Department of Plant Breeding and Genetics to conduct this study in India and Pakistan.

Business Planning and Development (BPD) Unit, JNKVV, Jabalpur (a NAIP-ICAR-JNKVV Venture)

JNKVV is a leading Agriculture University in Central India with substantial investments in agricultural research and development programmes funded through State, National as well as International agencies i.e., IFPRI, ICRISAT, ICARDA, World Bank, IRRI etc., for the cause of improving the livelihood security of farmers. Several transferable commercial technologies like genetically improved varieties/ hybrids, biofertilizers and bio control agents, medicinal and aromatics, etc. for promotion with entrepreneurs and benefit of farmers are being considered in Phase-I of BPD-JNKVV project. The BPD-JNKVV project will play a vital role in the entrepreneurship development of the small and marginal investors and the product delivery will be at a faster rate by reducing the length of supply chains. These facilities can easily flag the transferable technologies through incubator, protection through IPR, licensing, commercialization, market linkages, networking of stake holders, research institutions, quality assurance systems, capacity building of the human resources etc. These strategies will deliver the products and services at the right destinations within a reasonable time and at lowest cost. To manage all these activities, basic infrastructure facilities of agric business incubator, human resources with a mind set to commercialize will be helpful for better mobilization of technologies to the farmers. Promotion of production and processing technologies medicinal plants especially Ashwagandha, Isabgoal and Kalmegh will provide better health services at a reasonable cost.

Capacity building of the technical manpower of Agri business incubator as well as entrepreneurs will be helpful to popularize the technologies among the beneficiaries. The

establishments of farmers' seed cooperative societies are an example in M.P. which resulted in increased availability of certified seed to the farmers at a reasonable cost as well as generated huge employment in the rural areas with high seed replacement rates. This will ensure the livelihood security of farmers and strength-en the food and nutritional security as well as promote rural employment and income generation ultimately reflecting in increasing gross domestic product through agriculture sector.

Creation of Business Planning & Development (BPD) Unit is acknowledged to be an effective way for fostering the growth of sustainable business endeavour and is expected to provide a wide range of services ranging from incubation facilities such as research support and business planning to business services such as office space, access to information and communication technologies, advice on manage-ment, marketing, technical, legal and financial issues. The BPD Unit is also expected to promote entrepreneurial attitude and raise awareness about the opportunit-ies that the entrepreneurship can bring into the local business environment. The BPD units have been developed in an institutional system to organise and promote the sharing of information among small and medium entrepreneurs and farmers.

One of the chief objectives of BPD unit is also to help the entrepreneurs to market their commodities by offering broad scale support system to build a network of active and practical backers along with market feasibility studies. The BPD unit is in essence an endeavour to build and strengthen partnership with many organisations such as service providers, universities, emerging entrepreneurs, govt. departments, finance providers, large MNCs to help as mentors, trainers and as channels to markets.

Three technologies and products have been identified in the first phase for technology incubation and commercialization.

- Hybrid seed technologies
- Soil, seed & plant conditioning bio-agents (Rhizobium, Azoto-bactor and Jawahar enriched bio organics)
- Medicinal & Aromatic Plants and their derivatives (Ashwa-gandha, Isabgol and Kalmegh production & processing techno-logies).

The financial outlay of the project is Rs. 327.362 lakhs and duration is two & half years. The project will create a climate for sustaining new breed of entrepreneurs and farmers to generate wealth from agricultural technologies, products and services.

National Agricultural Innovation Project (NAIP) Component-III

Integrated farming system modules to ensure sustainable rural livelihood security for the peasants of disadvantaged districts of Madhya Pradesh

Objectives

- Identify and demonstrate suitable agro technologies and promote crop diversification
- Demonstrate integrated farming system approach, which can be incorporated in existing resource base to improve livelihood of rural poor
- Enhance carrying capacity of land and other natural resources
- Employment generation and income ehnacement through agro processing, value addition and linkage to credit institutions and markets.

Achievements

- IPM treatment- Pheromone and use of *Trichoderma, Psudomnas* and NPV
- Improved vegetable seeds (hybrid seeds)
- Stacking in Tomato and brinjal crops
- Improve variety of Rice Ashoka, JR-201 and Pusa Sugandha-3

- Improved varieties of Maize (white seeded variety GM-6)
- Poultry- Kadaknath synthesis bird and dual purpose colored birds
- Seed treatment practice
- SRI method
- Line sowing with proper stand establishmentl
- Inter-cropping of maize with the vegetables
- Lac cultivation
- Field bunding
- Water management – Stop dams
- Micro finance
- Dairy – AI
- Implements for reducing women drudgery.

Capacity building

- 540 farmers were tarined on Lac Cultivation, Integrated farming system, Land & Watershed Management in 4 disadvantages district (Mandla, Betul, chhatarpur and Tikamgarh)

Salient features of innovations

- Demonstrations on Lac Cultivation have been completed: 205 farmers were benefited and 15000 host trees taken for lac inoculation, results awaited
- Dissemination of improved varieties of Wheat and Soybean seed among the farmers
- By promotion of wheat variety GW-322 (Rabi,2008) yield increased by 6-8 q /ha (Baseline yield 18-20 q/ha)
- By Promotion of Soybean variety JS 93-05 (Kharif, 2009) yield increased by 2-3q/ha (Baseline Yield 8-10q/ha).
- Four (4) Stop dams structures have been completed- 127 ha area will irrigate and 120 farmers will be benefited. Increased yield 4-5 q/ha and it will enhance the ground water and recharging of the open wells & tube wells
- Market Linkage of Farmers (Producer company – 220 Farmers) – Each member were benefited by Rs.3000-3500/- per year through dividends and doing several agribusiness activity with the company viz.- receiving agri-inputs, collective sale of produce , etc.
- 50 groups were formed for micro finance, 300 farmers 60% Woman, 30% landless poor
- Backyard poultry- Adoption of the Kadaknath birds and dual purpose birds, 35 farmers and ready to scale up the activities.

Detail of Product testing

S. No	Sponsoring Agency	Amount (Rs.)	Name of Product	Crop	Location
1.	BASF India Ltd., Mumbai	56,180	Chlormaquat Growth hormone	Soybean	Jabalpur
		56,180	Bavestine Fungicide	Soybean	Jabalpur
		1,12,360	Odessey-herbicide	Soybean	Jabalpur
		56,180	Insignia-fungicide	Soybean	Jabalpur
		1,12,360	BAS-9446- herbicide	Soybean	Jabalpur
		56,180	Persuit–herbicide	Soybean	Jabalpur
		56,180	Stamina- fungicide	Maize	Chhindwara
		1,12,360	Topramizone - Herbicide	Maize	Chhindwara
		56,180	Insignia-fungicide	Gram	Jabalpur
		56,180	Herbicide residue	wheat	Jabalpur
		56,180	Stamina-fungicide	Gram	Jabalpur
		56,180	Intrepid-insecticide		Jabalpur
2.	Bayer India Ltd., Mumbai	1,10,300	Hybrid seed	Rice	Jabalpur/Rewa
		55,150	Soloman 300OD iinsecticide	Soybean	Jabalpur
		56,150	Imidacloprid 600 FS insecticide	Soybean	Powarkheda
		55,150	Fame 480SC	Gram	Jabalpur
3.		3,30,900	Imazathyper Soybean	Soybean	Jabalpur
4.	Excell Industries Ltd Mumbai		Endocel-insecticide	Soybean	Jabalpur
			Calron-insecticide	Soybean	Jabalpur
			Paclobutrazole Growth regulator	Soybean	Jabalpur
5.	Monsonto	1,12,360	Seed	Maize	Chhindwara
6.	Syngenta India Ltd., Bhopal	55,150	Cruser 35-inscticide	Soybean	Jabalpur
		55,150	Emomectin Benzoate	Soybean	Jabalpur
		55,150	Cruser 35 insecticide	Maize	Chhindwara
		56,180	Emomectin Benzoate, insecticide	Gram	Jabalpur
7.	Nuziveedu Seeds Ltd., New Delhi	1,12,360	Hybrid seed	Rice	Jabalpur/Rewa
8.	Dhanuka Pesticides Ltd., New Delhi	1,10,300	Herbicide	Soybean	Powarkheda
9.	Sumitomo,Mumbai	55,150	Insecticide	Soybean	Jabalpur
10.	Mahyco, Mumbai	1,12,360	Veg. Hybrid seed		Jabalpur
11.	Coromandal Fertilizers	56,180	DAP 4%S – 5% K Fertilizer	wheat	Jabalpur
12.	Devgan Seeds, Hyderabad	1,10,300	Hybrid seed	Sorghum Pearlmillet	Tikamgarh
13.	TERI, New Delhi	56,180	Insecticide	Pigeonpea	Jabalpur
14.	Unikill Pesticide, Vidisha	56,180	Emadchloprid insecticide	Paddy	Jabalpur
15.	Parijat Agro Chem., New Delhi	56,180	Imazuthypr Herbicide	Soybean	Jabalpur
		55,150	Herbicide residue	Wheat	Jabalpur
16.	Hindustan Pulverizing Mills, New Delhi	56,180	SuperXL, Fungicide	Chilli	Jabalpur
		56,180	SuperXL- fungicide	Rice	Jabalpur
17.	Rallis India, Ltd., Mumbai	56,180	Emadachloprid insecticide	Wheat	Jabalpur
		56,180	Ergon-fungicide	Gram	Jabalpur
18.	Crystal Phosphate, New Delhi		Herbicide	Wheat	Jabalpur

List of ongoing All India Coordinated Research Projects/Network Projects

Name of Project	Centre
Crop Improvement	
Maize Improvement	Chhindwara
Rice Improvement	Rewa
Niger	Chhindwara
Linseed	Sagar
Linseed	Powarkheda
Sesame	Tikamgarh
Sesame	Powarkheda
Soybean	Jabalpur
Chickpea	Jabalpur
Millets Improvement	Dindori
Millets Improvement	Rewa
Wheat Improvement	Powarkheda
Wheat Improvement	Sagar
Sugarcane	Powarkheda
Barley Improvement	Rewa
Forage Crops	Jabalpur
NSP - Breeder Seed Production Unit	Jabalpur
NSP - Seed Technology Research Unit	Jabalpur Jabalpur
Production of Breeder Seed of Annual Oilseed Crop	
- Soybean	Jabalpur
- Groundnut	Jabalpur
AICRP on MULLaRP	Sagar
Plant Protection	
Nematode Pests & their control	Jabalpur
NWP on Betelvine	Jabalpur
Natural Resource Management	
Cropping System Research	
(i) MAE	Jabalpur
	Rewa
	Powarkheda
(ii) ECF	Seoni
	Katni
Micro-nutrients of Soils	Jabalpur
Soil Test Crop Response	Jabalpur
Long Term Fertilizer Exp.	Jabalpur
Dryland Agriculture	Rewa
NWP on Biofertilizer (BNF)	Jabalpur
Water Management	Powarkheda
Agro-Forestry	Jabalpur
Horticultural Crop Improvement	
Vegetable Improvement	Jabalpur
Potato Improvement	Chhindwara
Sub Tropical Fruits	Rewa
NSP – Vegetables Seed Production (Merged with AICRP on Vegetable)	Jabalpur
AICRP on Arid Zone Fruits	Jabalpur
AICRP on Spices	Jabalpur
Agricultural Engineering Division	
Farm Implements & Machinery	Jabalpur
Optimization of Ground Water Resources through Wells & Pumps	Jabalpur
Harvest & Post Harvest Technology	Jabalpur
Renewable Energy Sources	Jabalpur
Agro-meteorology	Jabalpur

EXTENSION

Number, location & lead function of extension centers

Jawaharlal Nehru Krishi Vishwa Vidyalaya has well established extension based centers which are situated at each college campaii, Zonal Research Stations, Regional Research Stations and Krishi Vigyan Kendras. At present, the State has two Agricultural Universities. Twenty five districts of the State are under the administrative control of JNKVV. The Directorate of Extension Services, located at Jabalpur monitored all the extension based programmes of the University. The publication aspect is being looked after by the Communication Centre located at Jabalpur. Twenty KVKs located at district level are controlled by this University. These establishments have following lead functions:

Lead function of extension centers

Directorate of Extension

Directorate of Extension is committed to serve farmers through well - organized network covering six 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 transferring them to the ultimate users. The technologies are being transferred to the farmers through demonstrations, training programmes, field days, Kisan Melas, print and electronic media, maintaining a close linkage with Department of Farmers Welfare & Agriculture Development and other agencies for technological backstopping, covering 25 districts of the State. The motto of the university is reach the unreached through extension system in Madhya Pradesh. The main objectives of the Directorate are given below:

- Transfer of technologies, assessment, application, refinement and feedback for the researcher.
- Up gradation of knowledge and skill of extension functionaries as well as farming community.
- Development and dissemination of technologies through print and electronic media for mass communication.
- Catering needs of farming communities through single window system.
- Linkage with line departments.
- Reviewing the activities of KVKs and technological backstopping of KVK Scientist and help in formulating action plan.

Communication Centre

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

Agricultural Technology Information Centre (ATIC)

Agricultural Technology Information Centre 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

- Conducting "On Farm Testing" for identifying technology in terms of location specific sustainable land use systems.
- Organize training programmes to up date the extension personnel with emerging advances in the agricultural research on regular basis.
- Organize short and long - term vocational training courses in agriculture and allied vocations for the farmers and rural youths with emphasis on "learning by doing” for higher production on farm and generating self-employment.
- Organize Front Line Demonstration on various crops to generate production data and feed back information.

Location of KVKs

The information on establishment of KVKs are 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



Visit of dignitaries to KVK stall and field demonstrations

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.

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 Campaii are being funded by the ICAR and State Government.

Faculty and scientists involvement

Unit	Scientist (Nos.)	Supporting staff (Nos.)
Directorate of Extension Services	6	10
Communication Centre	1	2
ATIC	2	3
KVKs	123	64
Total	132	79

Silent accomplishments of extension activities

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.

National exhibition

The JNKVV has participated in the National exhibition organized during the National Conference of KVKs, held at Pantnagar from December 27-29, 2009. Different achievements of the University were highlighted in the exhibition.

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.

Communication Centre

The Communication Centre publishes magazines, periodicals, bulletins and leaflets 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, horticultural crops and animal husbandry are being published. During 2009-10, 18,500 copies of Krishi Vishwa and other related technical literature were published by the Communication Centre. 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 185 programmes on production technologies during 2009-10. 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, 103 TV talks were broadcasted through Doordarshan Kendra, Bhopal.

Radio Programme

The following radio talks recorded during the 2009 at Communication Centre studio and spools were given to AIR Jabalpur for broadcasting in programme "Krishi Vishwa Vidyalaya Se Kheton Tak" on every Monday between 7.20 to 8.00 pm (Prime Time)

January		
Irrigation management in Rabi crops	-	Dr. Deva kant
Important points milk production	-	Dr. A.K. Gour
Package of practices of summer sugarcane crop	-	Dr. D.K. Pahalwan
Improved agriculture technology of mulathi & sadasuhagan	-	Dr. A.S. Gontia
February		
Improved production technology of cucurbits crops	-	Dr. P.K. Jain
Production technology of beetal crops	-	Dr. U.K. Khare
Production technology of summer cowpea crops	-	Dr. R.K. Shrivastava
Importance and production of varmi compost	-	Dr. S.B. Agrawal
March		
Production technology of summer okra	-	Dr. A.K. Nigam
Importance of research field visits to the farmers	-	Dr. K.K. Saxena
Insect pest management of summer vegetable	-	Dr. Anoop Saxena
Maintenance and care of tractor	-	Dr. A. Shrivastava
April		
Mushroom cultivation	-	Dr. Sushma Nema
Seed storage, methods and precaution	-	Dr. (Smt.) S. Rao
Income generation through bee keeping	-	Dr. A.K. Bhowmick
Production technology of guggal	-	Dr. A.B. Tiwari
May		
Production technology of zinger and turmeric	-	Dr. T.R. Sharma
Insect management in grain storage	-	Dr. A.S. Thakur
Storage and processing of medicinal crops	-	Dr. (Smt.) A. Upadhyay
Seed testing methods	-	Dr. D. Khare

June		
Production technology of Kharif fodder crops	-	Dr. S.K. Billaiya
Medasker method of paddy cultivation	-	Dr. R.S. Sharma
Production technology of soybean cultivation	-	Dr. A.N. Shrivastava
Production technology of Kharif urd and moong	-	Dr. D.K. Pahalwan
Production technology of Kharif oilseed crops	-	Dr. M.R. Deshmukh
July		
Improved agriculture technology of amla cultivation	-	Dr. L.D. Koshta
Weed management of Kharif crops	-	Dr. M.L. Kewat
Maintenance and transplanting of fruit plants	-	Dr. S.K. Pandey
Integrated insect management of paddy crop	-	Dr. O.P. Veda
August		
Integrated pest management of paddy crop	-	Dr. V.K. Khare
Pest management in soybean crop	-	Dr. R.K. Verma
Production technology of lemon grass, rosa grass and khus	-	Dr. Naveen Patle
Insect management of Kharif oilseed crops	-	Dr. (Smt.) S. Shrivastava
Pest management of Kharif oilseed crops	-	Dr. V.K. Khare
September		
Importance of nursery in rural area	-	Dr. (Smt.) S. Gour
Characteristics of high yielding varieties of pea and lentil	-	Dr. (Smt.) Om Gupta
Production technology of arkil pea	-	Dr. A.K. Naidu
Seed production by farmers	-	Dr. P.K. Moitra
October		
Production technology of gram	-	Dr. (Smt.) A. Babbar
Production technology of unirrigated and semi-irrigated wheat	-	Dr. R.S. Shukla
Importance and method of seed treatment in Rabi crops	-	Dr. A.R. Wasniker
Production technology of lentil	-	Dr. S.K. Vishwakarma
November		
Integrated pest management in field crops	-	Dr.(Smt.) A. Moitra
Insect management of arhar crops	-	Dr. S.B. Das
Integrated insect management of gram crop	-	Dr. Abhishek Shukla
Production technology of rose cultivation	-	Dr. D.P. Sharma
Important pest management of Rabi season vegetables	-	Dr. (Smt.) Usha Bhale
December		
Production technology of late sown wheat	-	Dr. V.B. Upadhyay
Integrated pest management of potato	-	Dr. A.G. Nema
Maintenance of agriculture implements	-	Dr. A. Shrivastava
Integrated insect management of potato	-	Dr. S.B. Das

Krishi Vigyan Kendra

The Vishwa Vidyalaya has 20 KVKs, located at Chhindwara, Sidhi, Shahdol, Seoni, Tikamgarh, Balaghat, Betul, Panna, Dindori, Rewa, Jabalpur, Powarkhera (Hoshangabad), Sagar, Harda, Damoh, Narsinghpur, Katni, Chhattarpur, Mandla and Umaria.

These 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

Vermi compost unit

Income generation - lac cultivation

Women empowerment

improved varieties of maize, cotton and rice and introduction of 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.

Training programmes

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. It has an extensive programme of imparting skill-oriented trainings to the farmers and extension officials. To update the knowledge and skill of extension functionaries, KVKs arranged courses to benefit extension officials during 2009-10. These courses were formulated looking to the needs of field extension functionaries. In training programmes, emphasis was given for skill Improvement on various aspects of crop management like plant protection, identification of symptoms of diseases, pest damage, nutrient deficiency and their management practices. Field extension personnel were offered the latest production technology of field crops, vegetables, fruit crops, medicinal and aromatic plants. As livestock is an integral part of the farming system, the field staff was also trained on various aspects of livestock management.

One of the mandates of KVKs is to organize trainings for farmers and farm women. During 2009-10, 1308 training programmes were organized to benefit 31641 participants. These need based training programmes facilitated them to update the knowledge and skills for improved farming.

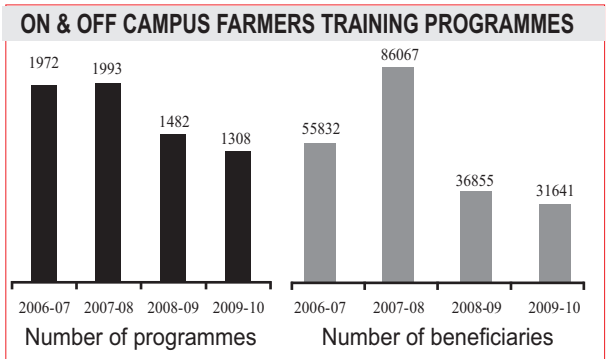
Efforts were also made to organize vocational training courses for rural youths, school

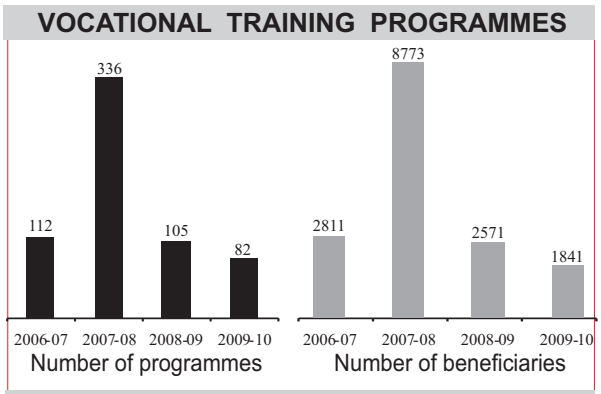
Year	Funds received from ICAR (Rs. in lakh)	Funds utilized (Rs. in lakh)
2006-07	1138	1087
2007-08	1721	1620
2008-09	692	633
2009-10	829	847
Total	4380	4187

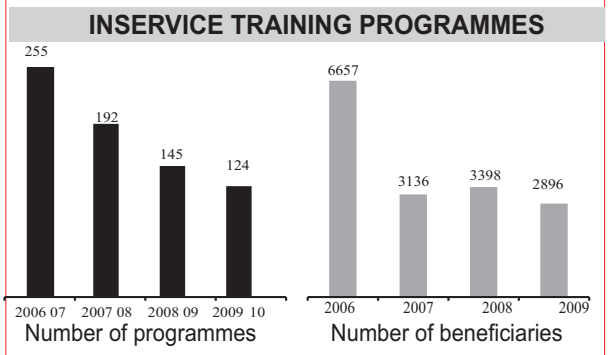
Farmers-scientists interface

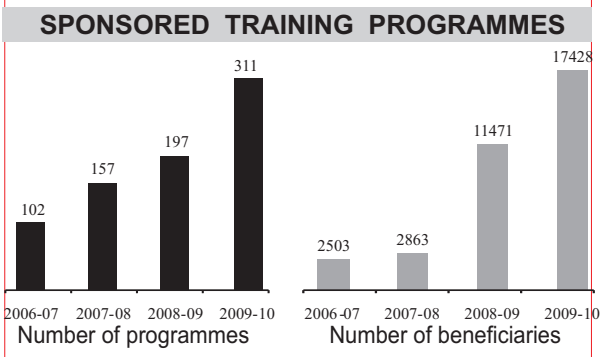
Farmers-scientists sangoshthi

Farmers-scientists-entrepreneur interface









dropouts etc. with the aim to generate employment opportunity for them. These 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 2009-10, 82 vocational training courses on various aspects were organized to benefit 1841 participants in order to facilitate them to be self dependent.

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 76 training programmes for 621 days were organized for the empowerment of women.

Beside this, 124 in service training programmes and 311 sponsored trainings were conducted during 2009-10 benefitted 20324 farmers and field extension personnel.

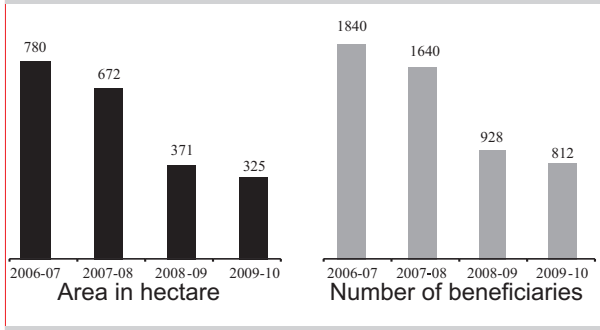
Frontline demonstrations

The University conducts large number of field demonstrations to make the farmers aware of the new technologies generated by the scientists. Front Line Demonstrations ere regularly conducted in Kharif and Rabi seasons on need based components of production technologies.

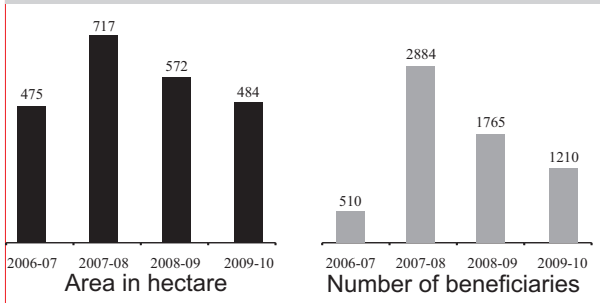
A comprehensive FLD programme on oilseed (soybean, niger, sesame, groundnut, linseed mustard) and pulses (arhar, moong, urid, lentil, pea and gram) was taken up on farmers field through KVKs for transferring the improved location specific technologies. FLD on oilseeds and pulses covered 325 hectares area and 812 farm families during Kharif 2009-10. FLD programme on other than oilseeds and pulses were organized in 484 hectares, covering 1210 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.

FLDs ON OILSEEDS & PULSES



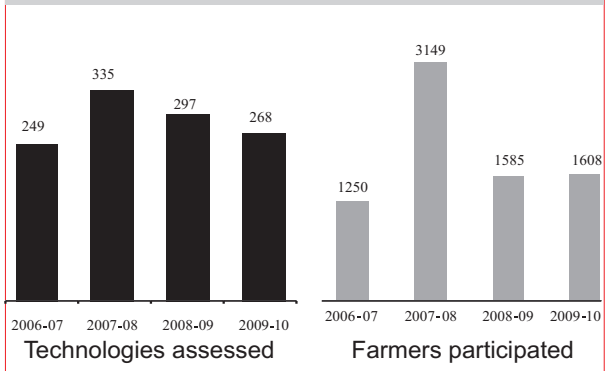
FLDs ON OTHER THAN OILSEEDS & PULSES



On farm testing

During 2009-10, 268 OFTs on different aspects of crop production and protection were conducted by KVKs. These were conducted in participatory mode on 1608 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 technologies identified by the scientists were taken in the FLDs programmes for their wider acceptability and horizontal expansion.

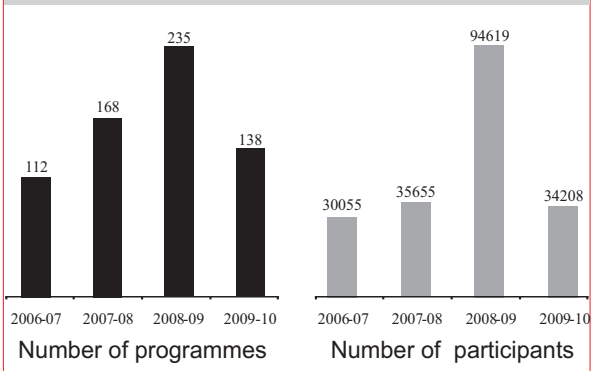
ON FARM TESTING



Kisan mela and kisan sangosthi

Kisan Mela, Kisan Sangosthi and Crop Days are the regular features of the extension activities of the university. They 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 209-10, 138 such events were organized in which 34208 farmers have participated.

KISAN MELAS & FIELD DAYS



Frontline demonstration on gram

Frontline demonstration on moong

Ridge furrow system in soybean

Crop cafeteria - soybean

Crop cafeteria - moong

Crop cafeteria - groundnut

News letter

All the 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 sandesh

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. During 2009-2010, 725 SMS messages were sent to farmers and other users.

System of Rice Intensification (SRI)

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 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.

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 objective 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.

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.

Crop cafeteria - urd

Crop cafeteria - maize

Crop cafeteria - wheat

Seed production programmes

Each KVK has implemented the seed production programme both in Kharif and Rabi season and produce the quality seeds on the instructional farm. During 2009-10, 5070.84 quintals quality seeds were produced by the KVK which were made available to the farmers and government farms for further multiplication.

6.5.11 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.

Crop variety cafeteria

This new programme was implemented by all the KVKs and seeds of 124 new crops varieties/ hybrids of Kharif and rabi crops were made available to them with the object to assess and demonstrate the suitability of new crops cultivars. About 16,256 farmers visited he demonstrated plots. This programme also facilitated the scientists to develop seed bank of different varieties. The most appropriate varieties were identified for conducting OFTs and FLDs on farmers' fields.

Variety replacement in tribal areas

This project is implemented in three KVKs for improving the crop productivity in tribal dominated districts viz Chhindwara, Mandla and Dindori. Quality seeds of improved varieties of important Kharif and Rabi crops were provided to them by the University. This programme has made a remarkable impact in tribal areas.

Publication of KVKs

KVK wise list of extension literatures and other publications (2009-10)

KVK: Badgaon

Newsletter

Vainganga Krishi Sandesh (quarterly)

Booklets

Tikau Kheti : Jasivik Khati

Folders/Pamphlets /Leaflets

- Gehoon ki unnat utpadan taknik
- Chane ki unnat utpadan taknik
- Mitti Parikshan ki upyogita
- Greesh Kaleen Moong Urad ki kheti
- Sankar Dhan beej Utpadan karyakram JRH 5
- Tur ki kheti kheton ke medhon par
- Dhaan ke keet avam rog ki pehachan lakshan va niyantran ke ypay
- Balaghat Zile ke liye Gehoon va Chana Faslon ki anushansit kesmen avam Krishi karyamala

Other publications

- Aaz ki avashyakata unnat beej
- Krat sankalp ho paryavaran bachane
- Disease caused by the low intake of vital nutrients in the diet
- Vermi compost a means of sustainable and organic agriculture
- Importance and use of proper nutrients in daily diet
- Dhan beej ke samanya sidhdant avam vidhiyan
- Balaghat ke kisanon ne svaym ke khet mein banaya sankar dharn ka beej
- Gehoon ki unnat saghanikaran vidhi
- Ganne kit utpadan taknik

  Sanknkar Dhaan utpadan taknik

KVK: Betul

Newsletter

Satpura Krishi Darshan (quarterly)

Booklets

Pramukh sabziyo ki utpadan taknik

Folders/Pamphlets /Leaflets

- Pheromon Prapanch (2009-10)
- Prakash Prapanch (2009-10)
- Dimak ka prabhavi niyantran kaise kare (2009-10)
- Phal Vraksh Lagane ki vidhi(2009-10)
- Sabziyon me Poudh Shala Prabandhan (2009-10)
- "Pashu Palan" Krishi Ki Pratham Awashaykta (2009-10)
- Ganne ki Labhdayak Kheti (2009-10)

- Samanvit Keet niyantran- Samanya Sidhhant (2009-10)
- Samanvit padap rog niyantran- Samanya siddhant (2009-10)
- “Jaivik Pidaknashi” Keet Avam Rog Prabandhan Ke Liye mahatvapurna hai (2009-10)
- Jaivik Krishi (2009-10)
- Nadep Compost Kaise Banaye (2009-10)
- Vormi Compost (2009-10)
- "Sinchai ki Vidhiya" Tulnatmak Vishleshan (2009-10)
- Mushroom Utpadan Dwara Atma nirbhar kaise bane (2009-10)
- Kheto ke liye verdan "Madhumakkhi palan" (2009-10)
- Gobhi vargiya sabziyo me unnat utpadan taknik (2009-10)
- Mirch ka vipul Utpadan(2009-10)
- Tamatar Utpadan ki navintam Taknik (2009-10)

KVK: Chhattarpur

Newsletter

Chhatrasal Kheti (quarterly)

Folder/Pamphlets/Leaflets

- Production technology of Blackgram
- Animal Disease And their Control
- Production technology of Wheat
- Production technology of Mustard
- Production technology of Sesame
- Production technology of Lentil
- Production technology of Safflower
- IPM in Vegetable
- How to prepare Bordeaux Mixture
- Intensive farming of wheat (Do and Do not)
- Soil and water Conservation
- Organic farming of Pulses in Bundelkhand
- Soil Testing and INM
- Rearing of Goats for income generation
- Ginger Cultivation
- Nutrition at low cost
- Balance nutrition for adolescents
- Eliminate mal nutrition
- Animal Disease Management
- Leadership development in farmers

KVK:Chhindwara

Newsletter

Satpura Krishi Samachar (quarterly)

Booklets

- Fasal Suraksha ke mahatvpoorna pandrah sootra

Folders/Pamphlets /Leaflets

- Makka fasal taiyari
- Soybean fasal ki unnat takneek
- Dhaniyan
- Ekreekrat keet prabandhan
- Pyaj avam lahsun ke poshak tatv avam aushadheeya gun
- Trycoderma dwara pyaj lahsun ke pramukh mittee janit rogon ka prabandhan
- Jaivik kehti mein neem ka upyogg
- Prapanch (Jaal) keet ke nireekshan avam niyantran hetu apnayen
- Svayam banaye kenchua khad
- Pyaj utpadan ki unnat vidhi

Other publications

- Chhindwaras jile ki Kharif faslen (Unnat Krishi takneek)

KVK: Damoh

Newsletter

Kisan Darpan (quarterly)

Folders/Pamphlets /Leaflets

- Self Help Group
- Soybean: Its importance and uses
- Improved Production Technology of wheat and gram
- Gotery: An additional source of income
- Post harvest technology of Rabi crops
- Production technology of linseed
- Improved varieties of linseed
- Vegetable and fruit preservation

KVK: Dindori

Newsletter

Kisan Mitra (quarterly)

Folders/Pamphlets /Leaflets

- Improved cultivation of chilli
- Insect Pest Management in cucurbitaceous crops
- Insect Pest Management in okra

- Integrated Disease Management in paddy
- Insect Pest Management in paddy
- Insect Pest Management in arhar
- Insect Pest Management in gram
- Wilt Management in gram
- Control of Soil and Seed Born diseases
- Jal Shudhikaran Avam Jal Sansadhan Swachata
- Labhkari Sabji Bhindi ki Unnat Kheti
- Unnat Krishi Yantra
- Jal Sangrahan Jalashay
- Baigan Ki Unnat Kheti
- Tomatar Ki Unnat Kheti
- Lahsun Ki Unnat Kheti
- Mushroom Utpadan Taqnik Avam Prachar Prasar
- Phaslo me Deemak Niyantran
- Chuho ka Safal Niyantran
- Soyben se banne wale vyanjan
- Mrida parikshan hetu mitti ke namune akatra karne ka tarika va suchna patrak
- Anajo, Khadyano va beejo ka surakshit bhandaran

KVK: Harda

Newsletter: Narmadanchal Krishi Samchar

Booklets

- Agroeco-logical Situations of Central Narmada Valley District Harda
- जैविक खेती
- सोयाबीन बीज उत्पादन तकनीक

Folders/Pamphlets /Leaflets

- Soybean mein ekreekrat nassheejeev prabandhan [IPM]
- Soybean ki unnat kheti
- Bt Kapas utpadan takneek
- Sabjiyon se bharpoor utpadan hetu unnat prajatiyan
- Sabjiyon mein ekreekrat nassheejeev prabandhan
- Soybean mein kharpatvan niyantran
- Dhaan ki medagaskar padhdati
- Tilhan avam Dalhan faslon mein gandhak ki upyogita
- Faslotpadan badhane avam mrada - swasthya hetu jaiv urvarakon ki upyogita
- Chane ki fasal mein ekreekrat nasheejeev prabandhan
- Gehoon utpadan takneek
- Usar bhoomi mein Falon ki kheti
- Mittee pareekshan avam uska mahatv
- Ganna utpadan takneek
- Chana utpadan takneek

Other publications

- Aam mein ekreekrat nassheejeev prabandhan
- Tilhan avam Dalhan faslon mein gandhak ki upyogita
- Chane mein samanvit poshak tatv prabandhan ke upay
- Bhindi mein lagne vale pramukh rog avam unka samanvit prabandhan
- Bordeau mixture: bageechon ki upyuke aushadhi
- Abhee se hi apnaye soybean mein ekreekrat nasheejeev prabandhan
- Gann eke liye ati upyogi jaiv urvarak : Acetobactor
- Arhar ke pramukh keet avam rog avam unka prabandhan
- Rabi dalhani faslon mein samanvit uktha rog prabandhan
- Soybean mein ekreekrat nasheejeev prabandhan (IPM)
- Soybean ko pahnaye ekreekrat prabandhan ka kavach
- Mili bug kapas ka pramukh shatru keet
- Soybean mein ekreekrat nasheejeev prabandhan

KVK: Hoshangabad

Newsletter (quarterly)

Folders/Pamphlets /Leaflets

- Dhan Saghanta Padhati (SRI), Medagaskar padhati se dhan ki kheti kar adhik utpadan prapt kare
- Med nali padhati se soybean ki kheti

Other publications

- Medagasker padhati se dhan ka adhik utpadan prapta Karen
- Soybean ki bumper utpadan takneek

- Alsi Kheti ki unnat takneek
- Bhojan Sambandhi Bhrantiyan our unka nidan,
- Antarrashtriya vyapar hetu til utpadan me savdhani
- Til ka aushadiya avem audhyogik mahatva
- Javik urvarak: mruda urvarta avem fasal utpadan badhane me ahem
- Nirjalikaran phal avem sabji parirakshan ki sasti vidhi
- Medagasker padhati (SRI) se dhan ka adhik utpadan
- Medh nali padhti se soybean ki kheti
- Purane bagicho ka jernoddar
- Trikoderma ek sasta avem sulabh kavaknashi

KVK: Jabalpur

Newsletter

Jawahar Krishi Sandesh (quarterly)

Booklets

KVK, Jabalpur at a Glance (2004-2009)

Folders/Pamphlets /Leaflets

- Sarson ke pramukh keet
- Gazar ghas unmoolan mein jan sahbhagita
- Sagaun avam siris ki ropan takneek
- Baans avam neem ki ropan takneek
- Vraxhh prajatiyan – nursery avam ropan takneek

Other publications

- Ageti sabji Matar Ki Kheti
- Ankuran pareekshan ke madhyam se utpadan lagat mein kamee layen
- Papeete ki tudai uparant rakhrakhav
- Krishi vaniki mein neem ka yogdan
- Anupayogi bhoomi mein bel ki unnat kheti
- Adhik aamdani avam paryavaran suraksha ke liye baans topan karne ki takneek
- Kam lagat wali kheti
- कम लागत वाली खेती. दैनिक भास्कर
- Amrood Kaise hoon Khub
- Amrood Ke Paude Taiyar karne Ki Unnat Taknique

KVK: Katni

Newsletter

Jawahar Krishi Samachar (quarterly)

Folders/Pamphlets /Leaflets

- Soil and environmental pollution : causes & remedies
- Resource management for sustainable agriculture & better soil health
- Environmental imbalance due to imbalance use of agro chemicals and human health
- Effect of agro chemicals on soil and soil microbial processes
- Improved cultivation technique of maize

KVK: Katni

Newsletter

Jawahar Krishi Samachar (quarterly)

Folders/Pamphlets /Leaflets

- Soil and environmental pollution : causes & remedies
- Resource management for sustainable agriculture & better soil health
- Environmental imbalance due to imbalance use of agro chemicals and human health
- Effect of agro chemicals on soil and soil microbial processes
- Improved cultivation technique of maize

KVK: Mandla

Newsletter: Krishi Gatha (quarterly)

Folders/Pamphlets /Leaflets

- Bengan ki unnat kheti
- Tamalar ki unnat kheti
- Dhania ki unnat kheti
- Papita ki unnat kheti
- Amrud ki unnat kheti

KVK: Narsinghpur

Newsletter

Shri Narsingh Krishi Samachar (quarterly)

Folders/Pamphlets /Leaflets

- Pest & disease management in chickpea
- Pest & disease management in pea
- Oyster mushroom cultivation
- Pest & disease management in mango
- Jaiv urvark ki upyogita
- Kenchua dwara nirmit khad
- Genhoon ki unnat kheti
- Mitti ki jaanch

- Kichen garden
- Poly bag nursery dwara ganna beej samvardhan
- Moong ki vegyanik kheti evam samanvit rog evam keet niyantran

KVK: Panna

Newsletter

Jawahar Krishi Amrit Samachar (quarterly)

Booklets

Machli Utpadan Labhkari Dhandha

Folders/Pamphlets /Leaflets

- Kans Ke Khatarnak Kharpatwar Avom Iska Prabandhan
- Vermicompost Ke Uttam Khad
- Tilhan Phaslo Me Kharpatwar Niyantran
- Gajar Ghas Ka Jaivik Niyantran
- Gehon Ke Phasal Me Needa Niyantran

Other publications

- Madhumakhi Palan.
- Krashi Me Desaj Gyano Ka Mahatwa.
- Phal Utpadan :
  Pramukh Samasyan Avam Samadhan
- Aaj Ke Awasyakta – Tikau Kheti
- Soury Urja – Paudh Rog Niyantran Ka Paryavaran
  Mitra Vikalp
- Mushroom Ke Utpadan Takneek

KVK: Rewa

Newsletter: Vindhya Krishi Patrak (quarterly)

Folders/Pamphlets /Leaflets

- Panne ka shudhdikaran
- Mrida Pareekshan
- Chhota kulpa bada kaam mehnat ko banaye aasan
- Kharif faslon mein samanvit paudh poshak takneek
- Soybean ka mangoshake avam milk shake
- Soybean ka doodh
- Soybean ka paneer
- Jaiv urvarak avam unka mahatv
- Bhojan banana ki unnat vidhi dvara paudhtik aahar
- Sookshm paudhak tatv
- Urvarak pareekshan vidhi
- Pashuon mein santulit aahar ka mahatv
- पशुओं में संतुलित आहार का महत्व ।
- Doodharon pashuon mein teekakaran
- Paryavaran sarankshan mein vrakshon ka mahatv
- Maleriya bukhar avan diabeties ke liye ramban aushadhi - Kaalmegha
- Beej prakriya avam beej pareekshan hetu namoone lena
- Doodharon pashuon ka iver pactene dwara antah avam bahua parjeevee
- Pashuao mein antah avam bahya parjeevee
- Mrida pareekshan ka mahatv
- Yeast culture dwara rumen ke kriyasheelta badhana
- Khadhya suraksha hetu parati banjar bhoomi mein seetafal layagen
- Rashtreeya khadhya suraksha mein faslon ki unnat prajatiyan
- Sankat ke samay mein khadhya suraksha
- Khadhya suraksha mein jaiv urvarakon ka yogdan
- Jaivik grah vatika lagayen bina rasayan ki paushtik sabjoyan bharpoor lagayen
- Jaiv urvarakon ka upyog
- Doodharon pashuon mein bypass fat ka mahatv
- Murgi palan mein avas prabandhan
- Doodharon pashuon mein by pass fat ki upyogita
- Doogdh utpadan avam prabandhan

KVK: Sagar

Newsletter: Satpura Krishi Darshan (quarterly)

Folders/Pamphlets /Leaflets

- Jayad mausam mein moong ki jaivik kheti kaise Karen
- Pramukh keeton avam rogon ki jaivik niyantran vidhi
- Vartman mein jaivik kheti ki avashyakata kyon
- Hari khad ka mahatv
- Gobar dwara khad banana ki unnat vidhi avam upyogita

- Gobar gas slurry ka sangthan unnayan avam khad ke roop mein upyog
- Kenchua khad banana ki takneek
- Kenchua palan avam kenchua khad utpadan ki nursery bed vidhi
- Kheti mein mycoriza culture ki upyogi vidhi
- Kheti mein jaivik khad avam jaiv urvarakon ki upyogita
- Krishi mein plastic mulching ka prayog
- Anar ki unnat kheti
- Faldar paudhon ki paudhshala sthapana
- Sabjiyon mein tudai uprant prabandhan
- Amrood ki unnat kheti
- Bet ki unnat kheti
- Bel ki unnat kheti
- Foolgobhi ki unnat kheti
- Pattagobhi ki unnat kheti
- Palak ki unnat kheti
- Adrak ki unnat kheti
- Sabjoyoon mein sinchai jal prabandhan
- Sabjoyoon mein neenda prabandhan
- Urad utpadan takneek
- Gehoon mein sinchai prabandhan
- Sabjoyon mein ekreekrat keet niyantran

KVK : Seoni

Newsletter

Seoni Krishi Samachar Patra (quarterly)

Booklets

- Khadya prasanskarad adharit Lagu avm Kuteer Udhog.

Folders/Pamphlets /Leaflets

- Bahupyogi avm Swasthya Wardhak Aonla ke Utpad
- Gehun ki unnat Kheti.
- Chane ki elli ka ekikrit Niyantran.
- Aam ke poorane avm anutpadak Bago ka Jirnodhar
- Soybean ka Khadya prasanskaran

KVK: Shahdol

Newsletter: Vikas (quarterly)

Booklets

- SRI Padhiti Se Dhan Utpadan
- Krishi Upyogi Taknik

Folders/Pamphlets /Leaflets

- Jaivik Vidhi Se Kharif Pyaj Utpadan
- Galghotu
- Sukhe Chare Ka Urea Upchar
- Dalhani Phasloan ke Mukhiye Kit avam unka prabandhan
- Mrida Parikshan Vidhi
- Alsi ki Vgyanik Kheti

Other publications

- Kahrif Pyaj
- Sugandhit Phasloan ki Kheti
- Til
- Wheat
- Matsya Palan
- Jawahar Dhan Chinhankan Yantra

KVK: Sidhi

Newsletter

Sonanchal Krishi Darpan (quarterly)

Folders/Pamphlets /Leaflets

- Dhan mein samanvit keet prabandhan takneek
- Jaivik kehti se dhan ki upaj badhane ki medagaskar padhdati
- Kenchua se vermicompost utpadan taknik

Other publications

- Milky mushroom ki Utpadan takniki in Krisak Chetana, Jabalpur (Accepted in Kharif Visheshank 2010)
- Bhumi ki utapadan chhamata badane me jaiv urverkoka mahhatava in Khad Patrika, New Delhi (communicated)
- Urd ki Unnat kheti in Krisak Chetana, Jabalpur, (Accepted in Kharif Visheshank 2010)
- Dhan me Samanvit Keet Avum Rog Prabandhan takniki in Krishak Jagat, Kharif Visheshank 2010)
- Rabi Ki Dalhani Phaslo ki Pramukh Uannatshil
- Prajatiya in Khad Patrika , New Delhi (Rabi Visheshank) 2010

KVK: Tikamgarh

Newsletter: Kishan Patra (quarterly)

Folders/Pamphlets /Leaflets

- Zile Ke Liye Bakari Paalan-Ek Mahatpurn Vyvasay
- Varsh Bhar Pyaz Ki Kheti ?
- Papita Duganaa Labh Ki Kheti
- Mirch Ki Vaigyanik Kheti
- Safan Tamator Utapadan Takanik
- Mahila Swa-Sahita Samuh Samudayk Vikash Ka Aadhar
- Varsh Bhar Hare Chare Ki Upalabadhata
- Grishmkalin Til Utapadan Takanik
- Vermi-compost Kaise Banayein
- Khar Ke Pichhawade Murgi Palan
- Varsh Bhar Sabjeon Ki Upalabadhata Grahvatika Se Kaise Karein
- Krashak Mahilavon Ki Shram Sakati Unnat Krashi Yantron/Upkarono Ke Prayog Se Kam KaranaVarsh
- Khetihar Mahilono Ki Aay Adhik Kaise Badayein?

KVK: Umaria

News letter

Bandhavgarh Kirishi Samachar (quarterly)

Folders/Pamphlets /Leaflets

- Soybean ki unnat utpadan taknik
- Mushroom utpadan praudyogiki
- Genhoo utpadan ki Aadhunik Takneek

The Agricultural Technology Information Centre (ATIC)

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

- To provide a "Single Window Delivery System" for the products and plant species available from JNKVV and its institutes to the farmers and other interested groups as a process of innovativeness in technology dissemination at the institute level.
- 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.
- To provide mechanism for feedback from the users to the institute.

Technical progress

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.

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.

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.

Un-priced publication

The Directorate of Extension / College / ZARS

Sale Through ATIC

S.No.	Item	Rupees
1.	Sale of Publication	2,40,329/-
2.	Sale of Honey Bee	36,953/-
3.	Sale of Seed	97,535/-
4	Training	25,200/-
	Total	4,00,017/-

/ 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.

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.

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".

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.

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.

Technology displayed

About 12 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.1000 of each Folder on different technology have been prepared for distribution to the farmers/trainees.

Enquiry / Letters

About 15 letters received and replied during 2009-10, 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 team visited

About 1668 Farmers, Farm women, Trainees and state level farmers visited the centre to learn/know the various technologies of the University The team members belongs to various district of Madhya Pradesh and other State.

Off Campus Programme

Sr Scientist of ATIC imparted training of Fruits and Vegetable Preservation held 16th July 2009 at Gardarwara Dist. Narsinghpur under M.S.Swaminathan Research foundation Project. Also a training on Soya Processing held on Jan. 7, 2010 at Gardarwara Dist. Narsinghpur under M.S.Saminathan Research Foundation Project.

Details of calls received during the year 2009-10 (Under Kisan Call Centre-II Level)

Faculty	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
Plant Pathology	07	1	-	-	02	01	04	-	01	-	-	-	16
Entomology	01	-	-	-	02	02	02	-	-	-	-	-	07
Agronomy	53	84	104	02	05	19	22	03	04	01	02	02	301
Soil Science	04	-	01	-	-	-	-	-	-	-	-	-	05
Horticulture	06	-	01	03	01	01	02	01	01	04	01	03	24
Medicinal Plant	-	02	03	09	-	-	06	02	02	02	-	-	26
Veterinary	01	01	-	-	-	01	-	01	01	01	01	04	11
Agri. Engineering	04	02	-	-	-	-	01	03	-	-	-	-	10
Food Science	01	-	02	03	02	-	01	-	-	-	-	03	12
Miscellaneous	03	07	-	01	02	01	02	03	0	01	01	02	23

Radio Talk

Name of Scientist	Topic	Broadcast Date
Dr. Deva Kant	समस्या समाधान – किसानों के प्रश्नोंउत्तर	26.04.09
Dr. Deva Kant	जलमग्न भूमि का सुधार	26.08.09
Dr. (Mrs.) Archana Pandey	समस्या समाधान – किसानों के प्रष्नोंउतर	02.08.09
Dr. (Mrs.) Archana Pandey	समस्या समाधान – किसानों के प्रश्नोंउत्तर	16.12.09
Dr. Deva Kant	समस्या समाधान – किसानों के प्रश्नोंउत्तर	24.01.10
Dr. (Mrs.) Archana Pandey	सोयाबीन के विभिन्न पौश्टिक व्यंजन	17.02.10

Grand total of calls: 425

Training: ATIC organized one day six training of Kisan Call Centre Experts on dt: 9th ,19, 26 Feb., 2010 and 6th, 15th, 26th March 2010.

Farmers' team of M.P. and other states visited ATIC

Date	District	Attendant (No.)
30.05.09	Kota	24
28.10.09	Balaghat	16
17.12.09	Hoshangabad	49
24.12.09	Sagar	50
04.01.10.	Sagar	20
28.01.10	Hoshangabad	20
04.02.10	Tikamgarh	22
15.02.10	Damoh	17
15.02.10	Sagar	11
19.02.10	Chitrakoot	27
23.02.10	Sagar	50
25.02.10	Narsighpur	26
26.02.10	Sagar	50
05.03.10	Seoni	75
09.03.10	Sagar	53
10.03.10	Raisen	23
12.03.10	Mandla	25
15.03.10	Chitrakoot	25
20.03.10	Damoh	20
	Total	603

Year-wise Progress of Agricultural Technology Information Centre (ATIC)

S.No.	Particulars	Year-wise progress							
		2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Total
1.	Technology Production								
	Seed (quintals)	-	-	-	914	139	680	-	1733
	Honey (kg)	-	-	-	233	224	101	135	693
	Bee Keeping Box (Nos.)	-	02	-	-	-	-	-	02
2.	Publications								
	Book sale (Number)	-	895	1746	4284	2500	3230	11157	23812
	Booklets Published (Number)	-	11	04	09	-	-	-	24
	Extension literature like folders, leaflets, bulletins, brochures Farm magazines etc. (Number published)	19	04	06	06	04	72	10	121
	Electronic information - packages like CD ROM, Video films, audio cassettes, digitized Photo etc. (Nos.)	20	13	10	28	-	-	71	
3.	Diagnostic Services								
	Plant Clinic (Number of samples)	05	25	37	48	38	25	20	198
4.	Farm Advisory Services								
	Personal visit by farmers (Number)	742	2233	3223	1362	3506	2524	900	14480
	Advice through letters (Number)	74	104	15	43	11	20	15	282
	Telephone calls replied	615	916	1196	548	1182	435	298	5190
5.	Any other relevant information								
	Training organized for farmers/women/youth etc.	12	10	02	07	-	1	7	39
	Training (off campus)	11	04	02	03	03	4	-	27
	Farmer team visited (State level)	24	29	12	15	25	16	20	141
	Dignitaries visited	04	23	13	08	11	-	2	61
	Radio Talk	-	05	08	02	10	2	4	31
	T.V. Talk	04	05	06	09	04	-	-	28
6.	Funds allotted by ICAR	-	5,00,000	-	-	-	-	-	500000
	Funds utilized by ATIC	67764	97680	36264	1236242	891772	690139	345160	3425186
	Resources generated by ATIC	104200	221077	488048	1325702	1171146	1756113	400017	5429478

2. CALL RECEIVED AT KCC LEVEL - II, DISTRICT WISE

S.No.	District	2009-10
1.	Anuppur	-
2.	Ashoknagar	-
3.	Burahanpur	02
4.	Bhopal	02
5.	Betul	02
6.	Raisen	03
7.	Rajgarh	02
8.	Sehore	-
9.	Vidisha	03
10.	Hoshangabad	15
11	Harda	03
12.	Indore	05
13.	Khandwa	06
14.	Dhar	01
15.	Barwani	01
16.	Ujjain	04
17.	Dewas	03
18.	Neemuch	02
19.	Mandsaur	05
20.	Ratlam	04
21.	Shajapur	02
22.	Rewa	10
23.	Satna	16
24.	Sidhi	06
25.	Shadol	07
26.	Umaria	06
27.	Jabalpur	192
28.	Katni	14
29.	Mandla	03
30	Balaghat	04
31.	Chhindwara	05
32.	Dindori	04
33.	Narsinghpur	36
34.	Seoni	08
35.	Sagar	10
36.	Guna	04
37.	Jhabua	05
38.	Bhind	04
39.	Datia	03
40.	Morana	02
41.	Shivpuri	01
42.	Panna	02
43.	Chattrpur	04
44.	Tikamgrah	03
45.	Gwalior	-
46.	Lalitpur	02
47.	Allahabad	-
48.	Raipur	02
49.	Durg	02
50.	Jamshedpur.	-
51	Damoh	04
52	Beena	01
	Total	425

EXTENSION ACTIVITIES

- Three training programmes & kisan sangosthi on integrated farming system were organized under NAIP in four disadvantaged districts of M.P., i.e. Betul, Mandla, Tikamgarh & Chhattarpur.
- Farmers awareness programme on soil and water conservation was organized on July 28, 2009 by MSSRF Project at Gadarwara. Dr. A. Rajgopal, Dr. Shantilata and Dr. Shushanto Mahapatra addressed the Kisan Sanghosthi. Dr. B. Sachidanand, Project Incharge highlighted the work done and interventions made at the Bandhanala watershed site.
- Two days meeting was organised under Tata Trust Funded MSSRF Project in the Department of Soil Science and Agricultural Chemistry, JNKVV, Jabalpur.
- A Kisan Gosthi at Gadarwara under community managed bio-industrial watershed for sustainable use of natural resources and enhanced livelihood" was organised during the visit of Dr. A. Rajgopal Principal Project Coordinator Chennai. About 160 farmers participated in the Sangosthi.
- Hybrid varieties of maize, pigeon pea and rice were distributed to the farmers of M.P. and the parental lines of maize hybrids were also supplied to Bihar as well as West Bengal.
- *Crop Variety Cafeteria Programme:* A panorama of various crops and their recently released varieties of field and horticultural crops have been planted as 'crop varieties cafeteria' in all the 20 Krishi Vigyan Kendras of JNKVV to attract the farmers and apprising them the

appropriateness of different varieties suitable for different farming conditions. A large number of farmers and field extension personnel visited these plots and assessed the crop varieties as per their requirements and farming situations. This programme has been appreciated by the visitors and also enables the KVK scientists to develop a seed bank of both Kharif and Rabi crops. This programme makes it possible to select the most ideal and appropriate varieties and hybrid for designing the action plan of KVK to be implemented.

- ***Technology diffusion programmes:*** All the KVKs have developed a diffusion model for strengthening the transfer of technology programme in the district. The establishment of Technological Park at the Instructional Farm of all the Krishi Vigyan Kendras is an important and innovative accomplishment of the University through which appropriate technological models and modules will be set up at KVK farms to demonstrate them for productivity improvement and resource management. The technology for productivity improvement in Kharif crops especially soybean and pigeon pea crops through Ridge and Furrow technology was demonstrated by all the KVKs on farmers' fields which enhanced the productivity and profitability of the crops. A gigantic effort was made to popularize the SRI method of rice cultivation in Jabalpur, Seoni, Betul, Balaghat, Mandla, Dindori, Rewa, Umaria, Shahdol, Tikamgarh, Damoh, Chhattarpur, & Katni Districts. Hybrid seed production programme of rice (JRH-5) has been taken up in 3 KVKs viz Jabalpur, Katni and Balaghat. The seeds of hybrid rice produced were made available to the farmers.
- *Technological backstopping through training programmes:* The Directorate of Extension successfully organized two training programmes for the extension functionaries on coarse cereals and pulse crops. Seven special training programmes on technological backstopping for Programme Coordinators and Scientists of Krishi Vigyan Kendras were organized during April to Oct. 2009. Recommendations were developed by all the KVKs for mitigating the drought situation in the State and were made available to line departments for wider adoption. Facilities have been created for establishment of ERNET in six KVKs namely, Rewa, Chhindwara, Betul, Balaghat, Tikamgarh, Dindori, Shahdol and Jabalpur.
- *Automatic weather station:* Automatic weather stations are to be installed at all the Instructional Farms of KVKs with the financial support of Department of Meteorology, Government of India.
- *Organic Farming:* A special programme was launched to popularize Organic Farming in the State with a total outlay of Rs. 82 lakhs. This programme is being implemented by all the KVKs of the University. The farmers were educated on use of organic inputs including bio-fertilizers, bio gas slurry, plant protection inputs and use of resistant varieties. Besides this, a large number of training programmes were organized for the benefit of farmers and farm women.
- A Kisan Mela was organized on 26-27 September 2009 at Krishi Vigyan Kendra, Katni in which Hon'ble Minister of Agriculture, Government of Madhya Pradesh, Dr Ramkrishna Kusumariya participated as Chief Guest. Director Extension Services, JNKVV was the Chief Guest. All the Krishi Vigyan Kendras celebrated the Technological Week. Special feature of this programme was to educate the farmers on different location specific and problem solving technologies

for improving the crop yields with lesser inputs and higher efficiency.

- At Krishi Vigyan Kendra, Jabalpur, under the theme, Empowerment of Farm Women, a training of 30 days on Tailoring and Stitching was conducted from 15th July to 17th Aug., 2009. A total of 30 farm women and school drop-out girls participated the training programme.
- Shri Gendalal Kushwaha and Gaurav Sharma, village Kevlari, block Panagar attended the vermicompost training at KVK, Jabalpur. Following the training, the technology was used for rice & vegetable farming at their farm and a mark able response. Vermicompost is now being produced commercially at their farm and surplus is sold giving them an extra earning of Rs.4000 and Rs.2500 per month by selling the vermicompost.
- Farmer to farmer and farmer to scientist interaction session was organized at KVK, Jabalpur in association with State Agriculture Department during the month of September 2009. Hundred farmers participated actively in the programme and discussed the ways to overcome the problem of moisture stress in kharif and formulate future strategies for rabi.
- Farmers of other states and different districts of Madhya Pradesh visited the KVK/University instructional farms.
- Department of Agriculture Jabalpur and KVK, Jabalpur jointly organized Kharif Kisan Mela 2009. This mela attracted more than 10,000 farmers, youths, scientists, extension functionaries, officers of the various government departments, NGO,s and prospective input delivery agencies/organizations from Jabalpur and adjoining districts.
- VI National Workshop of KVK was held at TN Agriculture University, Coimbatore from Nov. 6-8, 2009. Dr. K.K. Saxena, DES and Dr. T.R. Sharma participated in the Workshop. An exhibition was organized by the KVK, Tikamgarh highlighting the technologies to mitigate the drought situation of Bundelkhand region.
- XVI Zonal Workshop of KVKs of Madhya Pradesh, Chattisgarh and Orissa was held at IGKVV, Bilaspur during November 24-27, 2009. All the KVKs working under JNKVV participated in the workshop and presented the achievements and the action plan for next year. The programme was inaugurated by Dr. K.D. Kokate, DDG (Extension), ICAR, New Delhi. Dr. Kokate appreciated the progress made by the KVKs and congratulated the staff for their achievements. Prof. Gautam Kalloo, Vice Chancellor, JNKVV chaired the Valedictory Session of the Workshop.
- Directorate of Extension Services, JNKVV, Jabalpur organized the technological backstopping programme for KVK scientists on establishment of progeny orchard and horticultural nursery at the KVK Instructional Farm during Dec. 29-30, 2009. Detailed plan was worked out for establishment of technological park at each KVK.
- A three days training programme cum field visit was organized in collaboration with IFFCO during October 27-29, 2009 for 40 farmers of nine districts of the State.
- A team of Doordarshan, Bhopal visited the University Headquarter on October 1, 2009 and recorded eight talks on different aspects of technology for productivity improvement.
- A Training programme entitled "Introduction to Medicinal Plant Cultivation, Value Addition and Marketing" was conducted by the Facilitation Centre for Medicinal Plants on Oct. 27, 2009 at JNKVV, Jabalpur. The prime objective of the training was to introduce extension workers of Agriculture Technology

Manage-ment Agency regarding potentials of growing medicinal plants.

- Facilitation Centre for Medicinal Plants conducted two days training programme entitled "Commercial Cultivation, Value Addition and Marketing of Medicinal Plants during Dec. 29-30, 2009 at Exhibition Hall, Herbal Garden, JNKVV, Jabalpur.
- Four training programmes under NAIP Component - III were organized during October 2009, in Mandla, Betul, Tikamgarh & Chattarpur. 120 participants participated in the training on cultivation of lac technology and integrated farming system.
- Under the NSS, Eco Water Literacy Campaign and Science for Sanitation Programme sponsored by M.P. Council of Science and Technology, Bhopal was organised at College of Agriculture, Rewa during November 21-22, 2009. Dr. A.S. Chauhan, Programme Officer and Dr. S.K. Rao, Dean addressed the NSS students.
- Dr. (Smt.) Om Gupta, Principal Investigator, Crop Protection (Chickpea) organized training programme on Chickpea Pathology (Feb. 15-20, 2010) at IIPR, Kanpur under the auspices of AICRP on Chickpea. During one week training programme, lectures and practicals on disease diagnostics, screening techniques, procedure for mass multiplication of inoculum, disease scoring scales, disease rating for donor parents and promising entries, development of differentials for identification of races, maintenance of purity of pathotypes, molecular character-ization of FOC, host resistance, viral diseases of pulse crops, and visits to important laboratories, green house facilities and disease sick fields were organized. A training manual was also given.
- A five day training programme on "Seed Certification" at Seed Technology Research Unit, Department of Plant Breeding and Genetics, JNKVV, Jabalpur was organised during March 2010 in two batches, each of 25 participants with the financial assistance from Madhya Pradesh Seed Certification Agency, Bhopal. Fifty newly appointed Assistant Seed Certification Officers of Madhya Pradesh Seed Certification Agency, Bhopal participated in the programme.
- State level "Krishi Parichar-cha" was organized at College of Agriculture, Rewa on Feb. 20, 2010. Dr. Rajendra Pathak, Krishak Ayog Chairman, Dr. D.P. Singh, Member, Dr. D.P. Dubey, Secretary, Dr. R. Pastore, Commissioner and Mr. R.S. Charmakar, Joint Director Agriculture, graced the function. Five hundred farmers, scientists and KVK staff attended the programme.
- A one day awareness Progra-mme on "Protection of Farmers Varieties : Issues and Challenges" was organized at College of Agriculture, Rewa on March 12, 2010. Dr. S.K. Rao, Dean, CoA, Rewa delivered the lecture.
- Seed growers training programme was organized at College of Agriculture, Rewa under Mega Seed Project and Rice Fallow-chickpea Project. Fifty participants attended in each training of both the projects. A total of 21 trainings were conducted during mid Feb. to March 2010 at College of Agriculture, Rewa.
- A one day training on "Management of Bamboo in Agro-forestry" was organised at KVK, Jabalpur on Mar. 18, 2010. More than 35 farmers/farm women participated in the programme. The training programme created awareness among the farmers about the income generation through bamboo plantation.
- A ten days vocational training was organized at KVK, Jabalpur during Feb. 15-24, 2010 for entrepreneurship

development to rural woman. The participants learned and prepared various value added bakery products like pizza, cake and cookies.

- A 10 days training programme was organised by KVK, Jabalpur during Jan. 27 - Feb. 5, 2010 on preparation and preservation of vegetables and fruit products for rural women and school drop out girls. Thirty rural women and girls participated in the training programme. They were trained in preparation and preservation of tomato ketchup, pickles, jam, jellies and products of aonla.
- In order to enhance the seed replacement rate of Rabi crops like vegetables, pea and gram, improved seed of varieties PSM-3 and JG-16 were provided to farmers with financial support of Govt. of India under Seed Village Programme and NSFM Project with the collaboration of JNKVV and ICRISAT, Hyderabad.
- Participants of QRT Workshop (Sesame & Niger) were given overview and on-line training on CERA (Consortium for e-Resources in Agriculture) on March 26, 2010 at Central Library by Dr. (Mrs.) V. Pandey and Mr. Siddarth Nayak to make participants familiar of on-line knowledge resources provided by ICAR, New Delhi.
- Krishi Vigyan Kendra, JNKVV, Jabalpur celebrated "World Food Day" on Oct. 16, 2010 to create awareness among the people for production, protection and proper utilization of food. 250 persons participated in the programme.
- A "Kisan Sangoshthi on Arhar" was organised under FLO programme in village Magarmoha on Feb. 23, 2010. The function was inaugurated by Dr. N.D. Mazumdar, Project Coordinator (Pigeon pea), Indian Institute of Pulses Research, Kanpur. He appreciated the FLDs conducted on farmer's field. Dr. O.P. Veda, Director Instruction, JNKVV, Jabalpur welcomed the Chief Guest. Dr. S.B. Das, Sr. Scientist, explained about integrated approach for the management of pod borers and other pests of pigeonpea. About 200 farmers and extension officials attended the programme.

EVENTS

- A meeting was held at College of Agriculture, Rewa on Nov. 28, 2009 for adoption of new technologies in Rewa division. Dr. R. Pastore, Commissioner, Rewa Division presided the meeting.

Shri Prabhat Parashar, Commissioner, Jabalpur Division addressing the gathering

Gerbera plantation

Women participants during the training

Dr. S.K. Rao, Dean delivered special talk on seed production technology and formation of seed societies in the region.

- A State level Workshop on "System for Rice Intensification (SRI)" was organized on Feb. 6, 2010 at College of Agriculture, Rewa. Dr. A. Satyanarayana, Ex. Director Extension, ANGRAU, Hyderabad and Dr. S.K Rao, Dean addressed the participants. Joint Director Agriculture, Rewa, Shahdol, Deputy Director Agriculture, Rewa, Satna, Sidhi, Shahdol, Umaria, Panna, Anooppur and Singrauli attended the workshop.
- A one day Workshop on "Promotion of Biofuel" was organized at the College of Agriculture, Rewa on March 6, 2010. The workshop was sponsored by National Council of Rural Institutes, Hyderabad. Dr. R. Seetha Rama Rao addressed the participants and major stress was given on Jatropha propagation.
- Gerbera, a new option for State farmers: Under experiential learning on polyhouse, cultivation of gerbera, coloured capsicum and dutch roses are in progress on the concept of 'Earn While You Learn'. Each crop is grown in 1120 sq. m. Gerbera performs well and is going to emerge as a new profitable crop for the farmers of the State
- A two days Annual Review Workshop on “Integrated Farming System Modules to Ensure Sustainable Livelihood Security for the Peasants of Disadvan-taged District of Madhya Pradesh” of National Agricultural Innovation Project, Component-III was held during March 29-30, 2010 at the Directorate of Extension Services, JNKVV, Jabalpur. The workshop was inaugurated by Prof. Gautam Kalloo, Vice Chancellor, JNKVV, Jabalpur. Dr. S.S.Tomar, Director Research Services and Dr. K.K. Saxena, Director Extension Services addressed the participants.Dr. N.K. Khare, CPI presented the achievements in brief and progress done during 2009-10. Consortia Partners - ASA, BAIF, GVT, Pragya Research and Programme Coordinators of Mandla, Betul, Chhattarpur & Tikamgarh Krishi Vigyan Kendra along with the host farmers participated in the workshop.
- The Facilitation Centre for Medicinal Plants organized one day training programme for women participants from Narsingpur district on December 22, 2009. In this programme, participants were trained to prepare household remedies from herbs/medicinal plants. The training aimed to develop an aptitude in women farmers to earn livelihood from herbal production, ensure prudent preparation, use and conserve the traditional system of medicine.
- A buyers-sellers meet was co-organised by Facilitation Centre for Medicinal Plants, JNKVV and Madhya Pradesh Consultancy Organization Ltd., Bhopal on March 27, 2010 at JNKVV, Jabalpur. The core goals of the event was buyer-seller interface, focusing quality aspects, elite germplasms, venture appraisals, scheme execution and crop management. A large group of medicinal plants growers and buyers like Baidyanath, Patna; Sami Labs, Bangalore; Himalayan Herbals, Dehradun; MFP Processing & Research Centre, Bhopal along with extension workers and scientists discussed the modalities of production and marketing of prioritized medicinal plants. The meet was inaugurated by Shri Prabhat Parashar,Commissioner, Jabalpur Division and chaired by Prof. Gautam Kalloo, Vice Chancellor, JNKVV, Jabalpur. The programme was coordinated jointly by Dr. S.D. Upadhyaya, Professor (Botany), JNKVV, Jabalpur and Mr. Manoj Jain, MPCON, Bhopal.
- An interactive Workshop on "Guggul" was organized on October 13, 2009 under the Chairmanship of Prof. Gautam Kalloo,

Vice Chancellor, JNKVV, Jabalpur. Dr. Bangali Baboo, Director, Indian institute for Natural Resins and Gums, Ranchi and Project Coordinator of Networking Project on "Harvesting, Processing and Value Addition of Natural Resins and Gums" was the Chief Guest. Scientists from State Forest Research Institute, Government College of Ayurved, renowned ayurvedic practitioners, ayurvedic industrialists, scientists of JNKVV and students participated. In the workshop, there was sharing of knowledge on medicinal, environmental and economic importance of guggul which is the red listed plant in India. Dr. Baboo in his presentation, focused on the economic importance of natural resins and gums on livelihood of forest dependent community in India. Prof. Gautam Kalloo in his Presidential Address expressed concern on the decline of guggul and need for holistic approach involving all the stake holders for promotion and sustainable harvesting of guggul in Madhya Pradesh. Dr. S.S. Tomar, Director Research Services, JNKVV, delivered the welcome address. The programme was conducted by Dr. Moni Thomas, PI.

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 I 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 returns through JNKVV Farms

(Rs. in lakh)

Year	Gross Receipt	Gross Expenditure	Net Receipt
1981-82	49.36	46.25	3.11
1990-91	112.24	96.27	15.97
1991-92	149.92	126.27	23.55
2001-02	447.08	304.18	142.90
2004-05	650.79	377.91	272.88
2005-06	691.97	429.22	262.75
2006-07	756.81	487.66	269.15
2007-08	967.58	571.69	395.89
2008-09	618.93	383.52	235.41
2009-10	564.19	423.37	141.22

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 Amla, 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.

Size of seed production programme

Crops	Number	Varieties
Field crops	32	250
Vegetable crops	13	23
Spices	11	26
Fruit plants	05	15
Medicinal & aromatics	20	35
Flowering plants	20	40
Total	101	389

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

Breeder seed production of field crops in quintals

Year	India	JNKVV	Contribution (%)
1990-91	23783	2845	12.20
1995-96	34341	4589	13.40
2001-02	40754	9439	23.16
2002-03	44229	9708	21.95
2003-04	54142	15203	28.08
2004-05	60793	16828	27.68
2005-06	69507	16250	23.38
2006-07	77663	22144	28.51
2007-08	92059	20863	22.66
2008-09	91883	22329	24.30
2009-10	90000*	20012	22.23*

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

Maintenance breeding

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 the 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 wrer 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

New areas of seed production

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

Medicinal and aromatic plants

The area has been strengthened by providing 25.0ha additional land for maintenance of improved varieties and their Nucleus and Breeder seed production.

Micro propagation

(a) Sugar cane varieties
(b) Banana
(c) Microtuber production of potato

ISOPOM Project

"Development and Popularization of 'Model' Seed System(s) for Quality Seed Production of Major Legumes to Ensure Seed-Sufficiency at the Village Level"

Good quality seed is essential for desirable production in any agricultural production system. However, resource poor farmers face serious constraints when sourcing healthy, high quality seed. The health of seed is important, not only with regard to the direct yield losses caused by seed-borne diseases, but also for perpetuation of epidemics, spread of diseases, food and feed safety (absence of toxins) and storability. Further benefits of using good seed include, lower pesticide requirements, no need for poisonous seed

Seed village programme during Rabi 2009-10

Centre	No. of Farmers	Crop	Variety	Total requirements of Foundation Seed (q)	Seed rate per acre (kg)	Total Area (acre)	Total Produce seeds (q)	Trained Farmers
Budgaon	150	Gram	JG 11	41.05	30	150	1000	150
Sagar	138	Wheat	C 306	55.2	40	138	1158	138
Rewa	222	Gram/Wheat	JG 130/JW17	56.1/14	30/40	222	1312/490	222
Sidhi	150	Wheat	JW 17/273	60.0	40	150	699	150
Panna	150	Gram	JG 335	45.0	30	150	840	150
Shahdol	150	Mustard	P. Agni/Tarak	1.5	1	75	363	150
Jabalpur	72	Pea	PSM 3	7.2	10	15	123	72
Umaria	150	Wheat	JW 17	60.0	40	150	716	150
Tikamgarh	150	Wheat	GW 322	60.0	40	150	1506	150
Chhindwara	111	Gram	JG 130	33.30	30	111	640	111
Seoni	150	Gram	JG 218	45.0	30	150	658	150
Powarkheda	150	Wheat	GW 322	60.0	40	150	2570	150
Betul	144	Wheat	JW 3173	57.60	40	144	1728	144
Garhakota	133	Gram	JG 322	39.9	30	133	5078	133
Harda	150	Wheat	GW 366	60.0	40	150	2600	150
Narsinghpur	144	Wheat	JW 3173	57.60	40	144	1728	144
Ganjbasoda	138	Wheat	GW 273	55.20	40	138	2400	138
Total	2452			808.65	591	2350	25609	2452

Season	No of trained farmers	Quantity of seed produced (q)	Coverage of area (in acre) 2009-10
Kharif	-	-	-
Rabi	2452	25609	2350
Total	2452	25609	2350

dressings, usability for organic cropping, no rejection of expensive multiplication seed, improved seed export potentials, better quality of food and feed, better quality for industrial purposes, reduced seed rates, faster emergence and more vigorous growth and reduction of farmers risks. Production and trade of healthy seed thus constitutes a large and readily accessible, yet largely unexploited, potential for pro poor development. Demand of quality seed at village level cannot be fulfilled without the participation of farmers. Only formal seed sector can not fulfill the requirement. Introduction of high yielding varieties suitable for the area and organization of training for seed production technology will certainly play significant role in achieving the goal. In Rabi 2009-2010 environment was more favorable for quality seed production at farmer's field in both the districts. Fortunately Incidence of dry root rot and Pod borer was not reported in both the districts at stake holder's field

To ensure availability of quality seed of chickpea, 500 new farmers from 10 villages of two blocks were selected in each districts for Rabi season 2009-10. Seed of farmers preferred varieties were distributed to the stake holder farmers between 15-20 October 2009. Training programmes were organised regarding seed production practices at different stages of crop during crop season. During 2008-09 project activities were conducted in two blocks of each district, for this purpose 10 villages of Vidisha and 10 villages of Sagar were selected.

Seed Village Programme

Year	:	Rabi 2009-10
Crop and variety	:	As per list
No. of farmers	:	2452
Area (acre)	:	2320.00
Seed quantity	:	808.65 quintals
Type of seed	:	Foundation
Total quantity of produced seed	:	18971.76 quintals
Inputs and training	:	Rs. 12,66,593.00

Beneficiaries: Total 2,452 farmers are benefitted through this Programme. Twenty five thousand six hundred nine quintals of quantity of seed has been produced.

Rice fallow chickpea

District Jabalpur

The area under cultivation of crops in Jabalpur district is 2, 72,700 ha out of which 1,49,171 ha area is rainfed, only 1,23,529 ha area is irrigated which are being cultivated during rabi and Kharif both. The soil of the Jabalpur district is medium black to red yellow gravel. The Jabalpur district covers seven blocks out of which Patan, Sahpura and Panager block comes under the deep to medium black soil where as Sihora, Majholi and Kundum block posses the sandy to loam and red gravel soils, respectively. The total average rainfall of the Jabalpur district is 1350 mm which receives during four months of mid june to mid October. Paddy is the major cereals crop grown during the kharif. However, the pea is growing intensively in the four blocks i.e., Patan, Sahpura, Sihora and Panagar block in fallow-pea-wheat cropping sequence under the assured irrigation. Moreover, in the rainfed areas paddy followed by lentil /gram or paddy fallow cropping sequence are under practice.

Rice-chickpea is the predominant system next to Rice-Wheat cropping system which covers more than 65.0 and 68.0 thousand ha. area during their respective season under rainfed-rice irrigated chickpea, respectively. Moreover, 16,865 ha area comes under the

current fallow due to unavailability of irrigation facilities during Rabi season. Rice and wheat are two most important cereal crops grown in the state which contribute to a major share in food grain production. Rice cultivation is traditionally spread in the Kymore plateau and Satpura hills that covers nearly 50% of the total geographical area.

Medium to long duration Rice (120-130 days) - wheat with high yielding dwarf cultivars gave the assured returns under irrigated condition. However, in rainfed areas farmers either leave the second crop or grow the traditional local varieties of chickpea after rice (long duration) in the stored soil moisture, which yield is very low, hence, it discourage the chickpea production. Unfortunately the farmers of the Jabalpur (Kymore platue and Satpura hills) are least aware with the newly developed short duration rice varieties/hybrids as well as the new cultivars of the chickpea and their improved management practices under rainfed areas. The major constant in the production of chickpea is the losses of soil moisture due to delay in sowing owing to late harvest of paddy crop and infestation of *Fusarium wilt* and *coller rot*. Though, the number of varieties of chickpea have been developed by the University which are high yielding, short duration, pest and drought tolerant and can be followed under improved pulse production and protection technology. The aforesaid interventions under the rice fallow cropping sequence not only increase the overall productivity of the system but also improve the physical. Chemical and biological properties of the soil and helps to make the production system more economical and sustainable. This will also helps to improve the nutritional livelihood status of the isolated poor farmers.

Salient findings on project activities

Two hundred six field demonstrations on improved variety of gram were conducted at farmer's fields during rabi2009-10. The selected farmers / site belongs to the block of Panager (Saliya, Padora, Kevlari,Urdwa and Podi) Sehora (Gidorha, Ghorakoni) Kundam (Imlai) Paten (Chedi and Bilkherwa). Varieties JG 16 and JG 74 were demonstrated on one or half Acre area hence, each demonstration covered the one or half acre land. Crop was sown from Oct. 2009 to Nov. 2009 by using the seed rate of 30 kg /acre (75 kg/ha). Out of 206 demonstrations 85 were consisted of variety JG 16 while remaining (121) comprised of variety JG 74. Treated seed with fungicide was used for sowing and before sowing it was inoculated with Rhizobium Culture and PSB. Simultaneously, PSB was applied @ 4 kg/ha along with 100 Kg of well decomposed FYM) as soil application just before the sowing. The crop received winter rains ranging from 11.6 mm of water in different locations during the month of January 2010. The crop was fertilized by farmer as per their own sources. The integrated pest management approach was followed by using pheromantrap and birdperchers, along with the need based application of insecticide Imabectrin benzoate (misile), trizophose and Indoxacrob (awant) as a single spray. However, most of the farmers left the crop without use of insecticide. Data were recorded with respect to yield and other observation like infestation of disease and insect pest are presented in the Table.

The crop variety showed resistance with respect to disease score (under range 1-10%) at all most all the places. Moreover, the scored plants were found to be infested with Sclerotium (collar rot disease) during the early stage of crop. The rare plants were found to damage with *Fusarium wilt*. Similarly, the incidence of pod borer was also observed in the crop. However, the percent incidence was very low as compared to the crop sown by the farmers in the adjoining area. The demonstrated plots showed the variation at different locations with respect to incidence of heliothis ranging from 15 to 20 per cent observed at podding stage.

Farmers centric Scientist laid in trials for seed multiplication

The performance of demonstrations conducted at various agro ecological

situations on chickpea. The whole district divided into 4 Agro Ecological Situations (AES) on the basis of agro ecological conditions like Soil type, Topography, Rainfall and Cropping system etc. Detail characteristics are given below:

AES-I : In AES-I selected two villages i.e., podi and Imlai. Soil type of the villages are red mixed gravel soil, light to medium, rainfed, av. rainfall 1355 mm, undulated topography, cropping system rice-fallow, rice-wheat, fallow-lentil are under practice.

AES-II : In AES-II belonging to two villages Chedi and Bilkharwa. Soil type deep black soil, Irrigated, av. rainfall 1150 mm, low lying fields, cropping system, fallow-pea/ lentil-black gram, rice-chickpea, rice-wheat are under practice.

AES-III : In AES-III covers five villages Saliya, Padora, Ghorakoni, Urdwa and Kevlari. Deep black soil, fields are low laying, irrigated, av. rainfall1200mm, rice-wheat, rice-chickpea and fallow-lentil cropping system are in practice

AES-IV : In AES-IV belonging to one village Gidorha. Red light soil, low water holding capacity, sloppy, rainfed, av. rainfall 1300 mm, undulated topography, rice-fallow, rice-wheat cropping system are in practice

AES-I : The AES-I consisted the undulated topography and light red soil belonging to two villages Podi and Imlai. Variety JG 74 was demonstrated to show the performance and compared with the farmers practice used locally available seeds of JG 315. Data of 47 demonstrations revealed that the improved variety JG 74 recorded the max. yield of 16.3 q/ha as compared to 14.8 recorded under farmers practice while the min. yield of 12.6 and 10.9 q/ha was recorded under farmers practice respectively. The improved practice gave 58% higher yield with net return (Rs.16,680/ ha) and B:C ratio of 1.79 as compared to net return of Rs. 8,850 and 1.17 respectively.

Further it was also noted that variety JG 74 seems to be a moderately resistant with the infestation of pod borer (>10%) while the disease infestation was between the 5-10%. The improved varieties stand first with respect to nodulation rating as compare to farmers practice.

AES-II : belongs to villages Chedi and Bilkharwa. Two gram varieties JG 16 and JG 74 were demonstrated at 11 and 14 farmer's field respectively. The av. yield data revealed that variety JG 16 and JG 74 recorded 42.3% and 40.5% respectively higher yield over farmer's practice and fetched net return of Rs. 31,700 and Rs. 28,080 per ha with B:C ratio of 3.40 and 3.01 respectively. The introduce varieties gave Rs. 10,450 and Rs. 9,030 an additional net

Table 1 (A) Yield performance of gram variety JG 74 at farmer's field (AES-I)

Variety	Yield under (q/ha)						% increase
	Demonstration			Farmer's Practice			
	Max	Min	Av	Max	Min	Av	
JG- 74	16.3	12.6	12.99	14.8	10.9	8.2	58.4

Table 1 (B) Net return over Farmer's Practice

Variety	Gross Return	Cost of Cultivation	Net Return	B:C Ratio
Improved Practice (JG 74)	25980	9300	16680	1.79
Farmers Practice	16400	7550	8850	1.17

Table 1 (C) Disease and Pest Score

	Av. Plant Stand	Av. Disease Score	Av. Pod borer Score	Av. Nodulation
Improved variety	2.52	2.32	1.0	1.7
Farmer's Practice	2.8	2.8	1.8	1.2

Table 2(A)Yield performance of gram varieties JG 74 and JG 16 at farmer's field (AES-II)

Varieties	Yield (q/ha)						% increase
	Demonstration			Farme'rs Practice			
	Max.	Min.	Av.	Max.	Min.	Av.	
JG 74	22.3	16.3	18.69	15.2	14.0	13.3	40.5
JG 16	24.2	17.2	20.5	16.0	13.8	14.4	42.3

Table 2 (B) Net returns over farmer's practice

Varieties	Gross Return	Cost of Cultivation	Net Return	B:C Ratio
Improved variety (JG 74)	37380	9300	28080	3.01
Farmer's Practice	26600	7550	19050	2.52
Improved variety (JG 16)	41000	9300	31700	3.04
Farmer's Practice	28800	7550	21250	2.8

Table 2 (C) Disease and Pest Score

	Av. Plant Stand	Av. Disease Score	Av. Pod borer Score	Av. Nodulation
Improved variety (JG 74)	2.07	2.21	1.14	3
Farmer's Practice	2.6	2.8	1.8	1.6
Improved variety (JG 16)	2.27	2.18	1.18	3
Farmer's Practice	2.6	2.7	1.7	1.6

return /ha. The plant stand and nodulation were found to be medium to moderate and disease infestation was between the ranges of 5-10%.

AES-III: Comprises five villages namely Saliya, Padora, Ghorakoni, Urdwa and Kevlari and a total of 74 demonstrations were conducted at farmers' field with the use of JG 16 where as JG 74 were demonstration at 22 farmers field both these varieties gave 75 and 57.2% higher yield over farmers practice, respectively. Moreover, the use of variety JG 16 and JG 74 fetched Rs. 37,100 and R.s 27,580 per ha as compared to net profit of Rs.18,850 and Rs.15,850 under farmer's practice. Data of the trails reveal that variety JG 16 and JG 74 seems to be the resistant for plant disease and moderately resistant for pod borer in JG 16 and JG 74 respectively.

AES-IV : 40 demonstrations on JG 74 along

Table 3 (A) Yield performance of gram variety JG 74 at farmer's field (AES-III)

Variety	Yield (q/ha)						% increase
	Demonstration			Farmer's Practice			
	Max.	Min.	Av.	Max.	Min.	Av.	
JG 74	21.6	14.6	18.44	12.6	9.8	11.7	57.2
JG 16	30.2	16.03	23.2	14.8	12.8	13.2	75

Table 3 (B) Net returns over Farmer's practice

Variety	Gross Return	Cost of Cultivation	Net Return	B:C Ratio
Improved variety (JG 74)	36880	9300	27580	2.96
Farmer's Practice	23400	7550	15850	2.09
Improved variety (JG 16)	46400	9300	37100	3.98
Farmer's Practice	26400	7550	18850	2.49

Table 3(C) Disease and Pest Score

	Av. Plant Stand	Av. Disease Score	Av. Pod borer Score	Av. Nodulation
Improved variety (JG 74)	2.09	2.29	1.06	2.69
Farmer's Practice	2.6	2.8	1.8	1.8
Improved variety (JG 16)	2.1	2.07	1.17	2.82
Farmer's Practice	2.6	2.8	1.8	1.8

with integrated pest management practice were fallowed. The yield data recorded 50.4% higher yield over local practice and gave 5.5 quintal /ha additional yield and Rs. 8,400 additional income with B:C ratio of 2.52 against the 2.0 computed for farmers practice. The other parameters related to the insect & disease, shows that there was a infestation of wilt/ Sclerotium disease between the 5-10% ,while the infestation of pod borer was between the 10-20%, as regard to the development of root & nodules, were recorded medium to moderate (2.45) nodules an root of the variety JG 74.

Table 4 (A) Yield performance of gram variety JG 74 at farmer's field (AES-IV)

Variety	Demonstration			Farmers Practice			%
	Max. (q/ha)	Min. (q/ha)	Av. (q/ha)	Max. (q/ha)	Min. (q/ha)	Av. (q/ha)	increase
JG 74	19.9	12.0	16.4	11.4	9.6	10.9	50.4

Table 4 (B) Net return over Farmer's practice

Variety	Gross Return	Cost of Cultivation	Net Return	B:C Ratio
Improved Practice (JG 74)	32800	9300	23500	2.52
Farmer's Practice	21800	7550	15100	2.0

Table 4 (C) Disease and Pest Score

Variety	Av. Plant Stand	Av. Disease Score	Av. Pod borer Score	Av. Nodul.
Improved variety	2.45	2.1	1.05	2.45
Farmers Practice	2.8	3.0	1.8	1.2

Varieties	Av. No. of Branches/ plant	Av. No. of Pods / plant	Av. No. of grains per Pod	Pest Score Disease	Pod Borer	Seed Yield (q/ha)
JG 11	07	58	1.5	2	2	28.33
JG 16	08	65	1.8	2	1	31.3
JG 14	07	43	1.5	2	2	26.6
JG 74	08	57	2	2	1	28.0
JG 130	08	51	1.0	2	2	31.3
JAKI 9218	07	56	1.4	2	2	26.6
JG 63	08	58	1.0	2	2	30.0
JGK 2	07	49	1.2	2	3	16.0

Farmers Participatory Varietals trials

In order to assess the performance of different gram varieties and demonstrated to the farmers at different locations was conducted during Rabi 2009-10. A trail consisted of eight

varieties namely JG 11, JG 16, JG 130, JG 14, JG 63, JG 74, JGK 2 JAKI 9218 were laid out at two locations (Urdwa and Saliya) in Panager block.

Out of these two locations a trail conducted at urdwa did not perform well due to the heavy infestation of weed and excess moisture, another location i.e., Saliya perform well. Data in relation to seed yield showed that the variety JG 16 and JG 130 top the list closely fallowed by JG 63 and gave 31.3, 31.3 and 30.0 q/ha as these varieties JG 16 JG 130 and JG 63 possessed higher no of branches per plant (8 / plant) and bears the pod 65,51 and 58 per plant respectively, as compared to others. All varieties showed resistance to wards the incidence of disease and scored 2 no (less than 5% motility) where as, The variety JGK 2 seems to be a more susceptible to pod borer as it score 3 scale (more than 20% damage) where as JG 16 and JG 74 score 1 rating scale (less than 10% damage).

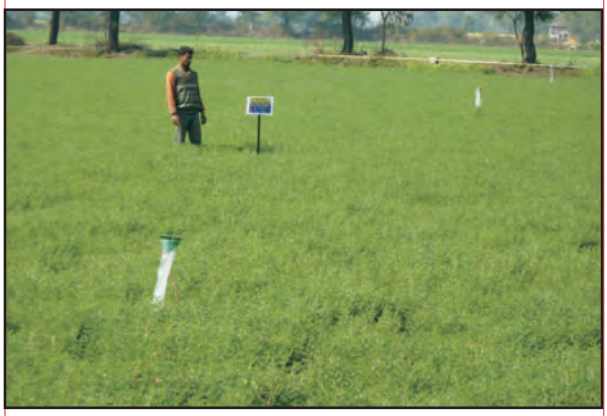
Assessment of Gram varieties at farmer's fields for yield and other traits

Development of village level seed system

The variety was demonstrated at two locations for 2.5 ha area namely Saliya and Umaria choubey for seed production at farmers field. In order to develop the village level seed production system both the farmers were registered in the MP seed certification agency for quality seed production (Foundation Seed). The variety recorded seed yield 29.5 and 24.5 q/ha and farmers possessed 61.5 and 51.0 q seed for further use as a seed, though Vivak Patel of Umaria has sold 12.0q seed to the farmers of near by villages Veeranlal Patel, Yagdutt Choubey, Omprakash Khare, Janarden Choubey.

Farmers' perception and expectation

Most of the farmers desired early maturing variety of paddy so that subsequent gram crop may be grown successfully. The timely availability of quality seed must be ensure, for



Field Photo of VLSS Trail

Field Photo of PVS Trail at Saliya Village

Field View of IPPPT Demonstrations at Gidorha and Saliya

Data Record Sheet No. 4.2- Final observation at harvest (yield): VLSS trails

S. No.	Farmers Name	District	Village	Variety	Area (ha)	Quantity (kg)	Disease Score	Pest Score	Yield (q/ha)	Seed (q/ha)
1	Brijendra Patel	Jabalpur	Saliya	JG- 16	2.5	150kg	2	11.7	29.52	61.5
2	Vivak Patel	Jabalpur	Umariya Choubey	JG-16	2.5	150kg	2	9.5	24.48	51.0

proper utilization to Zero tilled seed drill need to be provided under rain fed situations in order to sown the crop under stored moisture with out loss. Farmers desired to sale the produce as seed gram in the mandi as they have registered their crop for certification (Breeder to Foundation) in the MP seed certification agency.

Constraints

The chickpea is grown under rainfed situation and followed the minimum tillage practices which provide opportunity to grow and florists the weeds. These weeds cause the reduction in yield. The unavailability of safer and effective post emergence herbicides for controlling the weed population in chickpea.

The farmers are using high seed rate as compared to recommended, which provide a environment for the occurrence of coller rot disease at seedling stage.

The farmers are least interested to invest money on protection of crop as they are economically poor. Most of the farmers used to grow gram on marginal lands.

Conclusions

- On basis above findings it could be concluded that variety JG 16 proved better over existing variety (local)
- The quality seed of improved variety gave more yield than locally used grain as seed and proved remunerative
- Both the improved variety JG 16 and JG 74 found to be resistant to wilt and pod borer under field conditions

The spread of variety and coverage area

A total of 5640 kg seed of improved varieties JG 16 and JG 74 were provided to the 206 farmers of the district and variety JG 16 and JG 74 covered the area 35.0 and 40.0 ha in the district, respectively. Presently farmers having the quality seed of about 300 and 600 quintals of variety JG-16 and JG-74 respectively for further use and it is sufficient to cover the area of 1200 ha.

Mega Seed Programme

Planning of Seed Production Programme

The seed production programmes of all crops are being planned on the basis of national and state indents, indents from private seed sector, seed market intelligence reports and also based on previous year sales and demands. The total indent of all sectors put together is being planned on the basis of suitability of a particular variety to different agro-climatic zones. 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 the approved programme is permissible subject to the approval of Director Farms.

Status of Breeder Seed Production

Breeder seed production of field crops is being systematically organized since 1980 at VV level. Prior to this VV has established a nucleus seed production unit with it own resources to meet the seed demands of improved varieties. Total quantity of breeder seed produced during 2008 is given below. JNKVV has been a best performing seed production centre in the country since 1980. Now the seed production programme is well diversified in terms of field crops, vegetables, spices, medicinal & aromatics and fruit plants and saplings with a strong maintenance-breeding programme coupled with a single window system of operation.

Technical programme for achieving targets in respect of seeds/planting materials. (in q)

Crop	Nucleus Seed		Breeder Seed		Foundation Seed		Truthfully labeled Seed	
	Target	Production	Target	Production	Target	Production	Target	Production
Cereals								
Paddy		38.00	227.50	1956.57	-	1179	-	40.40
Kodo		3.00	-	5.20	-	-	-	-
Kutki		1.00	-	2.50	-	-	-	-
Maize		0.50	-	71.70	-	-	-	-
Sorghum		6.00	3.85	13.80	-	-	-	-
Bajra		0.50	-	34.20	-	-	-	-
Total		49.00	-	2083.97	-	1179	-	40.40
Pulse crops								
Pigeonpea		1.00	29.34	342.00	-	150	100	175
Mung		5.00	24.00	34.00	-	-	-	-
Urad		5.00	0.0	34.00	-	25	-	-
Total		11.0	53.34	410	-	175	-	-
Oilseed crops								
Soybean		1926	6850.00	6333.15	-	-	-	-
Niger		0.0	5.40	6.70	-	-	-	-
Groundnut		20.00	43.40	33.25	-	-	-	-
Sesame		2.00	6.35	8.10	-	120	-	-
Total		1948	6905.15	6381.2	-	-	-	-
Fiber crops								
Cotton		0.20	-	12.43	-	-	-	-
Total		0.20		12.43	-	-	-	-
Forage crops								
Berseem		5.00	20.00	58.60	-	-	-	-
Oat		14.80	20.00	57.00	-	-	-	-
Total		19.80	40.00	115.6	-	-	-	-
Rabi 2008								
Wheat		886.20	-	7527.0	-	1179	600	800
Barley		0.00	-	15.00			-	-
Maize		0.00	-	55.00	-	-	120	200
Oat		14.00	-	30.00	-	-		
Total		900.2	-	7627	-	1179.00	720	1000
Pulses								
Chickpea		534.0	-	3584	-	-	-	-
Pea		26.5	-	378	-	-	-	-
Lentill		25.0	-	60	-	-	-	-
Groundnut		0.0	-	0.0	-	-	-	-
Total		585.5	-	4022	-	-	-	-
Oilseeds								
Mustard		9.45	-	301	-	-	-	-
Toria		0.20	-	0.34	-	-	-	-
Niger		0.0	-	0.0	-	-	-	-
Linseed		5.85	-	60.5	-	-	-	-
Safflower		3.00	-	3.79	-	-	-	-
Total		18.5	-	365.63	-	-	-	-
Others								
Sugarcane				1300.00	-	-	-	-
Total				1300.00	-	-	-	-
Fodder crops								
Berseam		5.00	-	46.00	-	-	-	-
Total		5.00	-	46.00	-	-	-	-

Modernization of AU Farms

Farm and its Location	Purpose for which used	Area (ha)
College Farm, Jabalpur	Students, Instructional farm research maintenance breeding nucleus and breeder seed production	334.40
RARS, Dindori		21.50
ZARS, Chhindwara		21.50
RARS, Mohgaon		10.00
RARS, Tendani		14.00
RARS, Waraseoni		15.63
College Farm, Rewa		27.30
ZARS, Kuthulia		74.60
ZARS, FRS, Kuthulia		35.00
ZARS,, Sagar		45.00
DHRT Garhakota		2.00
College Farm, Tikamgarh		127.60
ZARS, Powarkheda		139.00
College Farm, Ganjbasoda		50.00

Budget: (in lakh)

Head	Approved for 3 years	2008 -09		2009-10		2010 - 11
		Released	Utilized	Released	Utilized	Demand
A. Works	6	200	200	250	250	150
B. Equipments/ Implements	1	-		25	25	75
Total	7	200	200	275	275	225

Details of budget utilization (Total in 2 years)

Items	Amount (Rs. in lakh)
Boundary wall	11,73,190.00
Seed store	10,42,716.00
Seed Store Conditioned	10,41,817.00
Seed Testing Lab.	10,14,970.00
Seed Godown - Indore, Powerkheda and Sehore	17,27,307.00
Mega Seed Godown	30,00,000.00
Conditioned Store	15,00,000.00
Processing Shed	15,00,000.00
S.T.R. Building	35,00,000.00
Boundary wall gate implement shed at BSP Unit	7,00,000.00
Threshing Floor	8,00,000.00
Digging of tube well at Shahdol and purchase of HDPE pipes, sprinkler etc.	3,00,000.00
Farm Development land leveling and land shaping at College of Agril. Rewa/ Jabalpur	10,00,000.00
Land leveling and land shaping of JNKVV farms and fields I/c excavation of pond for irrigation	17,00,000.00
Total	2,00,000,00

Works: Year 2009-2010

Items	Amount (Rs. in lakh)
1st installment	
A. Agriculture College, Rewa	
1. Modernization of Farm Office	5.00
2. Modernization of seed store	3.00
3. Modernization of Grader Shed	5.10
4. Repair of Road	7.20
5. Modernization of threshing floor	4.50
6. Modernization of Vermi Compost Unit	8.50
7. Connection of Electric Pump	2.00
8. Pump House (2 No.)	1.50
Total	36.80
B. Agriculture Research Farm, Kuthulia	
1. Common Let (Labour House)	4.00
2. Modernization of threshing floor 60/40 M	27.50
Total	31.50
C. Fruit Research Station, Kuthulia	
1. Road filling and repairing	12.00
D. Agriculture College, Rewa	
1. Modernization of Farm Lab.	9.00
2. Farm Bhawan furnishing	6.90
Total	15.90
E. Kuthulia and Agriculture College Farm, Rewa	
1. Land Development and land Shaping	12.00
F. Irrigation pipe line and sprinkler sets (HDPE)	
1. College Farm	3.80
2. Kuthulia Farm	9.00
Total	12.80
G. Agriculture College, Tikamgarh	
1. Cleaning and repair of tube wells (5)	2.5
2. Digging of open well (4)	18.0
Renovation of existing Farm building	16.0
Completion of Dairy Shed Unit at Tikamgarh	3.50
Total	39.5
H. Regional Agriculture Research Station, Waraseoni	
1. Electrical connection from feeder	2.51
I. Regional Agriculture Research Station, Sagar	
1. Irrigation pipe line and sprinkler (HDPE)	1.49
J. Zonal Agriculture Research Station, Powarkheda	
1. Tube wells	6.00
K. Equipment/Implements (Raise bed planters)	25.0
Land leveling and land shaping- payment of old bills of J NKVV and allied units	25. 0
Processing shed final payment JNKVV, Jabalpur	4.0
Grand Total	225.00
2nd installment	
Conditioned store at BSP Unit	15.00
Mega Seed godown at BSP Unit	35.00
Grand Total	50.00

Details of budget requirement for the year 2010-2011

S.No	Items	Amount (Rs. in lakh)	Justification
A.	Civil Works		
1.	Renovation of Research Farm Building		
	Jabalpur	20.0	All the field research laboratories located in this building were in bad shape, hence renovation is essential for better facilities
	Powarkheda	20.0	All the field research laboratories located in this building were in bad shape, hence renovation is essential for better facilities
	Rewa	20.0	All the field research laboratories located in this building were in bad shape, hence renovation is essential for better facilities
2.	Irrigation Systems including pipe line/ sprinkler tube wells.	-	
	College Farm Jabalpur	20.0	College farm require irrigation pipe lines alongwith sprinkler/drip systems of irrigation
	ZARS Powarkheda Farm	20.0	Farm require irrigation pipe lines alongwith sprinkler/drip systems of irrigation
	Chhindwara Farm	5.0	Farm require irrigation pipe lines alongwith sprinkler/drip systems of irrigation
3.	Electrification		
	Jabalpur Farm	20.0	Needs establish of transformer and electrification works for better power supply to the farms
	ZARS Powarkheda Farm	25.0	Needs establish of transformer and electrification works for better power supply to the farms
	Combine harvester @ 15.0 lakh	15.0	It is essential for harvesting of the seed plot due to increased cost of labourers and also reduce the cost of harvesting time and reduce the losses due to climatic adversities.
	Tractors 55 HP along with implements, trolley etc.-5 @ 6.0 lakh	30.0	It is essential for field operations as well as planting of crops using ridge planter that can mitigate climatic adversities.
	Ridge planters-5	4.0	Ridge planter for planting plots for better water use efficiency
	Laser levelers-2	12.0	It is essential leveling the fields that can save 30 % water requirement as well as increase the productivity.
	Thresher-5 @ 90,000=00	4.5	It is essential for threshing of the seed plots without any mechanical mixture and timely threshing of the seed plots.
	Levelers, cultivators, disc, plough, post hole digger etc.	9.5	These implements are essential for the field operations.
	Total	225.0	

Impact/benefits of grant utilization on education, research and extension activities (during last two years):

Physical

- Increase the quality of experimentation units for practical of graduate and post graduate students
- Better facilities were created for conducting project research work
- Better extension support systems were developed for transfer of technology
- Created better infrastructural facilities for scientists working in research farms

Production, productivity, etc.

- Increase the seed production of field crops upto 22,000 qtls
- Enhance productivity of various crops in seed production plots
- Enhanced quality seed production as well as research experimentation

Financial

- Increased profitability of seed production programme
- More returns on investments in the seed programme

Participatory seed production (in q)

S.No.	Crop	Production
1	Paddy	416272
2	Wheat	326462
3	Chickpea	365676
4	Lentil	9267

STUDENTS' WELFARE

Inter Collegiate Games, Sports and Cultural Meets

- **Youth Festival -** 11th Inter Collegiate Cultural Competition was organized at College of Agriculture Jabalpur from 29-30 January, 2010. The function was inaugurated by Prof. Gautam Kalloo Vice Chancellor as Chief Guest. About 150 students from 5 colleges of Vishwa Vidyalaya participated with great zeal and enthusiasm in literary, fine arts, theatre, music and folk dance competitions.
- **Inter Collegiate Sports Meet -** Volley ball, Kabbaddi and Kho-kho inter collegiate competitions were organised at College of Agriculture, Rewa from February 2-5; 2010, in which 112 students from 5 colleges of JNKVV participated.
- **Inter Collegiate Athletic Meet -** Badminton, T.T. and Athletics inter collegiate competitions were organised at College of Agriculture, Jabalpur from February 15-17, 2010, in which 78 students from 5 colleges of JNKVV participated.
- **Inter Collegiate Sports Meet -** Carrom and chess inter collegiate competitions were organised at College of Agricultural Engineering, Jabalpur from February 15-17, 2010, in which 58 students from 5 colleges of JNKVV participated .

Inter University Competition

- **Excellent performance of JNKVV at 11th AGRIUNIFEST 2010:** The 11th All India Inter State Agricultural University Cultural Competition was organized by Sam Higginbotham Agricultural Technology and Science Institute, Allahabad during February 8-12, 2010, sponsored by ICAR, New Delhi. Students of JNKVV belonging to Jabalpur, Rewa and Tikamgarh campii participated in various events and bagged silver medal in extempore/debate competition.
- **11th AGRIUNISPORTS -** The 11th All India Inter Agricultural University Sports & Games meet was organized at Rahuri (M.S.) from February 20-25, 2010. Students from JNKVV participated in athletics, volley ball, table tennis and badminton competitions and won Bronze medals in javelin throw and high jump.

Employment generation through Placement Cell

Organization/NGO's/Companies/ Banks visited V.V. campus	-	10
No. of V.V. students got employment (April 2009 to March 2010)	-	178

Republic Day Function

National Cadet Corps (NCC)

- NCC activities are carried out at JNKVV Jabalpur, consisting of two infantry troops of Army wing under 1MP Battalion at College of Agriculture, Jabalpur and 3 M.P. Battalion at College of Agriculture, Rewa. In addition to above mentioned Units 2MP Girls Battalion has also been introduced at College of Agriculture, Jabalpur during 2007.
- Cadet Vijendra Raj of Agriculture College Jabalpur got second prize in firing competition held during the National Integration Camp, Khamariya, Jabalpur from December 10-21, 2010. Cadets of NCC girls wing, College of Agriculture, Jabalpur organized pulse polio programme in nearby villages during January 10, 2010. 102 cadets of both the wings attended various camps. Cadets of girls wing got six awards in NCC NIC camp held at Khamariya. Cadet Ashita Rathore passed C certificate with A grade during the session. 41 cadets in B and 9 in C of NCC Boys unit and 40 cadets in B and 13 in C of girls unit were declared successful in NCC certificate examinations.
- NCC cadets of JNKVV presented the "Guard of Honour" to Hon'ble V.C. JNKVV, Jabalpur on 26th January 2010.
- Under the banner of NCC, cadets were provided elementary military training with emphasis on subjects viz. foot drill, weapon training with rifle, LMG, CMG, SLR etc., self defence, 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 and help to people during natural calamities.

Ten days combined NCC camp

2 M.P. Girls Battalion organized a ten days combined NCC training camp from 19th to 28th October, 2010 at Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur under the able guidance of Commanding Officer Lt. Col. Ajit

Placement Cell - selected candidates

Interview in progress

11th AGRIUNIFEST march past

Plantation programme under NSS

Winners being awarded by Hon. Vice Chancellor

Youth Festival 2010

Chavan and Dr. P.K. Bisen, Dean, Student Welfare, JNKVV, Jabalpur. In this camp 630 cadets (350 girls and 280 boys) from Jabalpur, Chhindwara, Balaghat, Shahdol, Narsinghpur and Mandla participated. The objectives of the camp were to provide experience of community living to the cadets, to built leadership quality, team sprit, personality development, competitiveness among them and to train them for Republic Day parade. The best part of the camp was to make cadets aware about agriculture, research activities related to agriculture etc. The other activities of the camp included weapon training, drill, firing, field craft and battle craft, health and hygiene, personality development and career counseling. During this camp, group competitions were also organized.

During the Camp Dr. P.K. Bisen, Dean, Student Welfare, JNKVV, Jabalpur delivered a lecture on opportunities of self employment in agriculture which included aspects like Agricultural Education, Agricultural Products, Agricultural Technologies and Agricultural Research. Dr. Bisen also organized a visit to university so that cadets received valuable information about hi-tech horticulture, medicinal plants, seed production, bee keeping, fishery and dairy etc.

The cadets were educated about the competitive exams pertaining to military services and visited some food products factories so as to create interest among cadets towards self employment. In social service activities, they visited places like Nari Niketan and blind school. A rally was organized to create awareness about health and hygiene, education, humanity, discipline and harmony among the residents of nearby village Suhagi. During this camp, competitions like volley ball, throw ball, tug of war, best drill, poster, slogan, group dance, and group song etc were also organized.

In the last phase of the camp, a cultural programme was presented by the cadets. Hon'ble Vice Chancellor, Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur was the

National Service Scheme

Blood donation camp

Chief Guest, Other dignitaries of JNKVV also participated in this function. Hon'ble Vice Chancellor Dr. Gautam Kalloo distributed the prizes, cadet from JNKVV girls battalion grabbed trophies in best slogan, elocution, best poster, best firing and throw ball competition.

National Service Scheme (NSS)

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

Regular activities

- On December 31, 2009, Red Ribbon Rally was held in which slogans concerning prevention of AIDS were chanted by the students of V.V. In this rally, 62 NSS students participated.
- The National Youth week was celebrated from 12-19 January, 2010 at JNKVV, Jabalpur.
- A special camp was organized during 17-23 February, 2008 at village Gurgavan and the public awareness movement was conducted. Plantation of bamboo trees was also done.
- NSS volunteers participated in training camp on January 12, 2010 and Sadbhavana Rally was organized by Rani Durgavati Vishwa Vidyalaya, Jabalpur.
- Plantation porgamme was organised at village Urdua on August 20, 2010 by the volunteers of College of Agriculture, Jabalpur.

Fellowships/Scholarships

Scholarships awarded to the V.V. students during academic session 2009-10.

National Talent Scholarship	51
Junior Research Fellowship	06
Merit-cum-means Scholarship	04
Merit Scholarship	122
Total	183

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 178 students have been absorbed in various reputed companies during April 2009 to March 2010. 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

List of candidates selected in various organizations (April 2008 to March 2009)

1.	BAIF for SPESD Bhopal	April, 2009	12	M.Sc. (Ag.)/ M.Tech.
2.	Union Bank of India	June, 2009	27	M.Sc. (Ag.)/B.Tech./B.V.Sc./MBA
3.	Union Bank of India	Nov., 2009	10	M.Sc. (Ag.)/B.Tech./B.V.Sc./MBA
4.	Hindustan Petroleum	Nov., 2009	02	M.Sc. (Ag.)/MBA
5.	Dhanuka Agritech Ltd.	Dec., 2009	04	M.Sc. (Ag.)
6.	Bank of India	Jan., 2010	12	B.Sc. (Ag.)
7.	BASIX	Feb., 2010	25	
8.	DPIP, Bhopal	July 12, 2010	40	M.Sc. (Ag.)/MBA
9.	IWMP, Bhopal	Aug. 10, 2010	14	M.Sc. (Ag.)/M.Tech.
10.	Shriram Seeds	Aug. 17-18, 2010	32	M.Sc. (Ag.)/MBA
	Total		178	

help to manage and sort out more than 800 students registered at the Placement Cell, thus simplifying the access to the student profiles.

Tutorial Cell

As per guidelines of ICAR, a tutorial cell is functional in office of the Dean Student Welfare. The following reference materials including question banks are available in the tutorial cell

1. Objective Horticulture
2. Interview Redefined
3. Model Questions for Competitive Examinations
4. Bio Pesticides for Sustainable Agriculture: Prospects and Constraints
5. Group Discussions for Admissions and Jobs
6. ICAR Telephone Directory
7. Books Catalogue 2010
8. India 2010: A Reference Manual
9. Agricultural Statistics at a Glance 2009
10. Crop Nutrition: Principles and Practices
11. Agriculture Refresher
12. Agriculture Terminology
13. Agricultural Research DATA BOOK 2009
14. Economic Survey 2009-10
15. Introduction to Agriculture
16. Objective Agronomy
17. Multiple choice questions for Agricultural Extension
18. Agriculture Year Book 2009
19. Kurushetra Food Security
20. Kurushetra :Climate Change and Sustainable Agriculture
21. Quest for Pest Management
22. Agriculture Question Bank with Answers 2010
23. Technology of Horticulture
24. Ready Reckoner for Plant Breeding
25. State of Indian Agriculture 2009
26. General Agriculture for ICAR Examinations 2010
27. General Agriculture
28. A Hand Book of Jobs and Carrer
29. Indian Agriculture Since independence
30. Objective Horticulture
31. Advanced Techniques of Agriculture
32. Objective Soil Science
33. Agriculture Entrance Examinations 2010
34. Genera Studies
35. Objective Genetics
36. Agriculture General Knowledge
37. Agriculture Made Easy
38. Objective Plant Breeding
39. Plant Sciences at a Glance
40. Plant Breeding Simplified
41. Objective Agriculture for All Competitive Examinations
42. Objective Agriculture