VISION

2050

Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola
444104 (MS) India

DR. PANJABRAO DESHMUKH KRISHI VIDYAPEETH, AKOLA

V I S I O N – 2 0 5 0

DR. PANJABRAO DESHMUKH KRISHI VIDYAPEETH AKOLA-444104 (MS)
www.pdkv.ac.in

University Publication No. Booklet/Dr. PDKV/PUB/533/September 2018

Vision 2050

Dr. Panjabrao Deshmukh Krishi Vidyappeth, Akola-444 104, Maharashtra

Published by:
Dr. Panjabrao Deshmukh Krishi Vidyappeth, Akola-444 104, Maharashtra

Year of Publication: 2018

Published by: Dr. Panjabrao Deshmukh Krishi Vidyappeth, Akola-444 104, Maharashtra, India.
Printed at : Milind Traders, Akola

Foreword

Dr. V. M. Bhale
Vice Chancellor
Dr. PDKV, Akola

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola was established on 20th October 1969 after the name of Dr. Panjabrao Deshmukh, the illustrious son of the soil, a great visionary, a social reformer and real friend of the farmers of their region where agriculture is mostly rainfed. The University was established with strongly committed in absorbing newer paradigms and using them to develop excellent human resource, innovative technologies and their dissemination, so as to serve the farming community of the state, region in particular and the country in general.

Agriculture is facing acute crisis of decline in availability of land and water. Therefore, our approach to agriculture needs to be redefined in the context of this changing scenario. Increased production will require enhancing productivity levels of existing resources. Therefore there is growing consensus for launching a Second Green Revolution in the country. The First Green Revolution was almost confined to irrigated areas. More technologies are needed to give impetus to the agricultural growth in the rainfed agro-ecosystems. Resource Conservation Technologies integrated with frontier technologies of remote sensing, GIS, GPS and micro-processor based variable rate application technologies result in very efficient agricultural production systems. The precision farming techniques maximize returns to the farmers in agricultural and allied sectors and also it brings out quantifiable changes in production and productivity, thus economically uplifting the farmers. The farmers can be empowered with the precision farming technologies and related advisory services can be extended to the farming community.

Agricultural education is needed to be harmonized with existing and emerging issues related to WTO and free market economies. Worldwide, agriculture is becoming competitive price-wise and its produce acceptable quality-wise. Greater infusion of frontier science subjects (biotechnology, nanotechnology, precision agriculture and information and communication technology), legal aspects, good practices of trade, ethics of IPR and GMO, market intelligence and modern information and communication techniques have become more important to promote efficiency, awareness, equity and competitiveness in agriculture. Linkages and partnerships among SAUs and

other public and private sector institutions will play an important role in improving efficiency in financial management and add value to output.

This University jurisdiction covers three different agro-climatic zones namely Eastern Vidarbha Zone, Central Vidarbha Zone and Western Vidarbha Zone. Paddy is major crop in eastern region, whereas, cotton, soybean, sorghum, pigeon pea, black gram, green gram and other oilseed crops are dominant crops of the western and central Vidarbha. Citrus is mainly cultivated in Nagpur, Wardha and Amravati districts. Chickpea is the predominant crop of rabi season and mustard, safflower, linseed, rabi sorghum, wheat are also grown. The University has so far developed 1376 need based technologies including 169 high yielding improved varieties of different crops and 23 farm implements to enable farmers to achieve higher yield with better quantity. However, crop diversification, agricultural mechanization, organic agriculture, pest management through bio control, secondary agriculture, development of climate resilient crop varieties and integrated farming system approach needs more emphasis in future. The core of PDKV's operating philosophy is to create the partnership between the farmers and committed academics and scientific research as the basics for sustainable agricultural development in the country in general and in the region in particular.

This document highlights the achievements and proposes new research concepts to develop and promote innovative and need based scientific technologies to meet the demand of continuously changing social and economic needs together with an explicit analysis of our weaknesses and strengths. It is expected that approaches and advance concepts presented in the **"Vision 2050"** document will prove useful for educationists, scientists and extension educationists to address the future challenges for growth and development of agriculture and related sectors of Vidarbha.

The present document is a reflection of the activities envisaged by Dr. PDKV, Akola towards 2050 which has been drafted, edited and documented by Dr. V. K. Kharche, Director of Research and his team members. I do express my deep sense of appreciation to all those who were instrumental in bringing out this document.

Place: Akola **V. M. Bhale**
Date: October 20, 2018

Preface

Dr. V.K. Kharche
Director of Research
Dr. PDKV, Akola

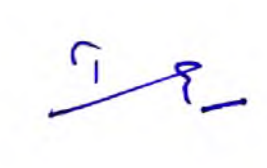
The Agriculture in Vidarbha region which is dominated by small and marginal farmers is facing various challenges such as drought, climate change, globalization of trade and economy, etc. The education, research and extension programmes of the university need to be re-oriented to develop technologies that raise the agricultural income and also create employment opportunities in agriculture and allied enterprises. The strategies planned for achieving the goals set up for 2050 by the Dr. PDKV, Akola are to attract scholars to agricultural education, curriculum improvement, enhancement and strengthening of graduate education, customized learning, non-collegiate education, faculty and employee development, empowerment of outreach programmes and institutional development. The 'Vision 2050' has been conceptualized and prepared with an aim to pursue academic excellence and provide leadership at national and international levels, targeting quality education, research, capacity building, consultancy and innovative outreach to benefit the field of agriculture and allied sciences.

The agricultural education will need to be enriched with more of practical content for enabling the students to address the concerns of stakeholders, primarily the farmers and consumers. We should also plan on non-formal education especially in respect of knowledge and technological empowerment of vast section of work force in rural areas. This will expand the opportunities for off-farm employment and lead to total transformation in rural areas. Agriculture has been contributing significantly towards providing nutrition and livelihood security for millions of families across the country. Therefore convergence of the various disciplines of agriculture and allied sciences is the need of the hour to achieve twin objectives of maximum utilization of available resources and of achieving livelihood security.

The document "Vision 2050" contains the vision and mission of Dr. PDKV, Akola and the strategies to achieve the same. The Vision of Constituent Colleges, Directorate of Research and Directorate of Extension Education are furnished separately. I take this opportunity to place on record my deep sense of gratitude and thanks to the Hon'ble Vice-Chancellor Dr. V. M. Bhale for the valuable guidance and suggestions in the preparation of this document and for conceiving the idea behind preparing such an important document and placing Dr. PDKV well ahead in making such an effort.

The timely help and co-operation, by way of valuable inputs received from the Director of Extension Education, Deans of Faculties of Agriculture, Horticulture and Agricultural Engineering, all Associate Deans, Heads of the Departments and Senior Research Scientists is highly appreciated and acknowledged. The contribution made by all the members of the Vision Document Committee was noteworthy and helped us to give a better shape to the document. Thanks are also due to the Registrar, Comptroller and University Engineer of the university and all those involved directly or indirectly in the process of preparing this Vision 2050.

This document would help the researchers, academicians, planners, and extension educationists for all round development of agriculture and allied sector in Vidarbha region. The contribution made by all the Heads of the departments and Senior Research Scientists to prepare this document and members namely, Dr. V. S. Tekale, Dr. R. N. Katkar, Dr. U. R. Chinchmalatpure, Dr. S. D. Jadhao and Dr. S. U. Kakade to compile and edit the document is highly appreciated.



Place: Akola
Date: October 20, 2018

V. K. Kharche

INDEX

Agricultural Scenario of Maharashtra and Vidarbha

India is a developing country in the world. It accounts for only about 2.4 percent of the world's geographical area and 4 percent of its water resources, but has to support about 17 percent of the world's human population and 15 percent of the livestock. These people live in the villages and majority of villagers are engaged in agriculture sector along with animal husbandry, forestry and fisheries. It is indeed, the econotmic prosperity of our country which mostly depends on prosperity of agriculture sector. Most of the people in developing economies are dependent on agriculture and allied activities. The employment generation and livelihood depend only on agriculture and supporting business.

With the coming in of IPR, knowledge sharing among different nations has shrunk, necessitating technology development by the scientists within the country itself. This puts enormous responsibility on the National Agricultural Education and Research System to develop technologies indigenously. The technology-led agricultural growth can be possible only by strengthening institutions of higher agricultural education. The ICAR is the apex body of the National Agricultural Research and Education System of the country. It provides professional and partial financial support for enhancing the quality, relevance and uniformity of higher agricultural education in the country. In order to ensure uniform structure and effective governance in agricultural universities through regulations, ICAR has developed a Model Act in 1964 which had been revised from time to time. For quality assurance in agricultural education, ICAR established an Accreditation Board in 1996, for a comprehensive process of accreditation of SAUs. ICAR also undertakes periodic revision of course curriculum and academic regulations. There exists vast scope for improving the standards in academics, University's governance, financial health and policies on human resource development. Several new initiatives have to be taken both at the system level as well as at the individual university/institution level in thrust areas like creating an enabling environment for innovation and creativity, developing systems capacity for educational planning and quality assurance, and developing institutional partnership and networks.

Indian agriculture is presently at the cross-roads. During the 10th and 11th Plans, agriculture growth had been about 2.8 per cent which was below the targeted 4 per cent. Since agriculture growth is a driver of economic growth, it is of paramount importance to propel agriculture growth by use of new technology and strategies. Skilled human resource is a key to addressing new challenges. Globally, technology is changing very fast and in view of the IPR and other trade-related issues coming up-front, it is necessary that a new innovative approach is put in place for producing globally competitive skilled human resources. The skilled manpower should not only develop cutting edge technologies but must also bring

about major transformation in agriculture for getting higher economic returns to the farming community with relatively much less investment.

Application of new knowledge in science and technology will become prime infuser of sustainable surge in agricultural production and productivity across diverse agro-ecologies of the country. Additionally, regional inequalities in development coupled with rise in natural resource degradation, climate change, increasing population and opening of global economy have brought affront new daunting challenges. Therefore, these circumstances make it imperative to restructure agricultural education in a manner that it meets the expectations of all stakeholders, employability for students, livelihood security, new knowledge and skills for farmers and economic growth, meeting international obligations, concerns of sustainability and profitability in agriculture for the country.

Various initiatives taken in the recent past have led to substantial improvement in the quality of agricultural education but the situation is still much below the expectations of the stakeholders in many institutions. The pace and quality of technology generation and human capacity building in most of the SAUs have not matched with global change mainly due to lack of a defined vision, inadequate state funding, depleted faculty strength, extensive inbreeding, poor governance, lack of autonomy and environment for nurturing and retaining talent, and dearth of infrastructure for quality education and research. Establishment of new and/or sectoral agricultural universities and colleges without matching resources has compounded the problem. The new challenges faced by Indian Agriculture are formidable and call for development of a new class of human resource equipped with new skills and knowledge to propel agricultural growth.

The present day education policy does not address the issue of social relevance in totality. Issues like poverty, gender inequality, malnutrition, sustainability, regional imbalances and focus in economic equity, agri-business, agriculture marketing, value addition, international trade and other related disciplines are not addressed adequately. Agricultural education will have to come out of its past mould of a rigid framework in order to successfully take over the role of continuing education when the education process is adjusted to the needs of landless, marginal and small holder farmers who are generally illiterate and unskilled.

Along with sustainable development, the education system needs to be harmonized with existing and emerging issues related to World Trade Agreement, free market economies and new agriculture. The new agriculture is poised to become price competitive and its produce acceptable quality-wise, meet stakeholders needs, peer concerns and market vibes. Greater infusion of frontier science subjects, legal aspects and good practices of trade, ethics of IPR and GMO, and modern information and communication techniques will become more

important to promote efficiency, awareness, equity and competitiveness in agriculture. In pursuance of that, development and institutionalization of easily accessible and user friendly knowledge systems to support decision making by various client groups will become necessary. Universities are starved of operational funds, which affect the quality of academics and the research and development.

Maharashtra is the developed state of India. However, agriculture sector in Maharashtra is also surviving in crisis since new economic reforms, rather than intensity of crisis is more in agriculture sector of Maharashtra than all other developed states of the nation. A change in the agricultural policy according to new economic reforms, low level of irrigation, large number of uneconomic operational holdings, uncertain rainfall, seasonal nature of farming, absence of employment opportunities other than agriculture labour in rural areas, declining public expenditure on agriculture sector particularly for irrigation and other infrastructure development have adversely affected agriculture sector in Maharashtra.

Vidarbha region in Maharashtra comprises 11 districts viz., Yavatmal, Akola, Amravati, Wardha, Buldhana, Washim, Nagpur, Chandrapur, Bhandara, Gadchiroli and Gondia. This region is receiving good amount of rainfall but the conservation of water is limited and as such irrigated area is less than 12 per cent. This region has due to various reasons, remained backward agriculturally as well as industrially. Livelihood of around 65 per cent rural population of this region is dependent on agriculture and allied activities. However, agriculture in this region is comparatively less productive than the State and National averages. Cotton is the most important cash crop of western Vidarbha region. Eight out of eleven districts of Vidarbha are primarily cotton growing. Cotton farming is the backbone of the farmers of Yavatmal, Akola, Amravati, Wardha, Buldhana and Washim districts in western Vidarbha. However, with scanty rains and very limited irrigation facilities at disposal, cotton farmers are often exposed to higher risks that many times result in loss of income.

The second largest crop grown in Vidarbha region is Soybean which is predominant in kharif season. In eastern vidarbha region, paddy is the most dominant crop. It is generally grown with pigeon pea and this is the most remunerative cropping system followed by the farmers. However the productivity of soybean has been declining in the past few years. This necessitates crop diversification in the area. The area under sorghum which was drastically reduced due to introduction of soybean again can be increased in order to get yield as well as fodder for animals. Green gram, black gram and groundnut are also grown during kharif. Chick pea is the most predominant crop grown in rabi. Citrus is the main fruit crop grown among the horticultural crops and Nagpur is known as orange city.

There is an emerging challenge to develop comprehensive teaching-research or research-teaching university. We are already facing the challenges of making our economic development more rapid, competitive, sustainable, resilient and more knowledge based. For this the University needs a new agricultural policy backed by good science and best practices. There is a need for developing internationally accepted levels of quality of trained agricultural professionals. Requirement is also there, for training all agricultural graduates to acquire high levels of skills with adequate knowledge base. Using modern IT tools in the educational process and equipping all graduates with competence in using them for information search and exchange, system modeling and optimization and software development for agricultural production, storage and marketing activities is also needed. For developing a holistic approach to sustainable development, including awareness of sustainable resource management practices are essential.

Dr. PDKV at a Glance

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola was established on 20th October, 1969 with its head-quarter at Akola. This Agricultural University was named after the illustrious son of Vidarbha Dr. Panjabrao (alias Bhausaheb) Deshmukh, who was the Minister for Agriculture, Govt. of India. The jurisdiction of this University is spread over the eleven districts of Vidarbha. According to the University Act 1983 (of the Government of Maharashtra), the University is entrusted with the responsibility of agricultural education, research and extension education alongwith breeder and foundation seed programme.

The University has main campus at Akola. The instructional programmes at main campus are spread over in five Colleges namely, College of Agriculture, College of Agril. Engineering & Technology, College of Forestry, College of Horticulture and Post Graduate Institute. At this campus 4 degree programmes namely B. Sc. (Hons) Agri. B. Sc. (Hons) Horti., B. Sc. (Forestry) and B.Tech. (Ag.Engg.), three Master's Degree Programmes viz. M.Sc. (Agri.), M.Sc. (Horti.) and M.Tech. (Agri.Engg.) and Doctoral Degree Programmes in the faculties of Agriculture, Horticulture and Agril. Engineering are offered. Recently Government of Maharashtra sanctioned College of Food Technology at Yavatmal as per the ICAR norms.

The University has sub-campus at Nagpur, Gadchiroli and Yavatmal with constituent Colleges, namely College of Agriculture, Nagpur which offers B. Sc. (Hons) Agri. and M.Sc. (Agri.) degree programmes, Agricultural Business Management, Nagpur for MBA (Agri.) College of Agriculture, Gadchiroli which offers B. Sc. (Hons) Agri. degree programmes and Vasantrao Naik College of Agril. Biotechnology, Yavatmal is offering B. Sc. (Agri. Bio Tech) degree programme. The Nagpur Campus is accomplished with attractive garden surrounded by its natural beauty and a well established Zoo which attract the general public and visitors to the city. Anunique attachment of Zoo and Botanical Garden to the College of Agriculture increase the the value of education, provide cultural entertainment to civil public in the heart of city. College has heritage importance of 110 years and old structure in the honour of Queen Victoria. A separate Botanical Garden is being maintained on 22 hectares with a green house for the benefit of research workers. In addition, there are two affiliated grant-in-aid colleges namely Shri. Shivaji College of Agriculture, Amravati and Anand Niketan College of Agriculture, Warora, Dist. Chandrapur and 26 private non-grant-in-aid colleges under the umbrella of this University.

A Central Research Station is situated at the main Campus which caters the need of research projects undertaken by Crop Scientists of the principal crops of the region viz. Cotton, Sorghum, Oilseeds and Pulses. Presently, the University

research programme is being conducted through 19 various research stations spread over the three different agro-climatic zones of Vidarbha region, 17 departments comprising various disciplines in agriculture, horticulture and agricultural engineering and technology as well as allied subjects, 26 All India Coordinated Research Projects and 31 State plan and non-plan schemes. Besides, the research programmes under different research projects sponsored by various agencies like, eight RKVY and 20 other Ad-hoc research projects are also implemented in the University.

A total of 1376 technologies, 169 progressive crop varieties and 23 farm implements are to the credit of the University.

Mission, Mandate and Goals

Mission Statement

The mission of the Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola is strongly committed in absorbing newer paradigms and using them to develop outstanding human resource, generate the need based innovative technologies and their dissemination so as to serve the farming community of the State and the Country.

Mandate

- To provide education in agriculture, allied sciences and humanities by integrating and co-ordinating teaching in different faculties and examine the performance of students, confer degrees, diplomas, certificates and other academic distinctions.
- To provide research base to improve the productivity of agri-horticulture, livestock, fisheries and agri-allied activities in Vidarbha region through adaptive, basic and need based applied research for attaining economic self-sufficiency.
- To develop appropriate plans for conservation of natural resources and their sustainable use.
- To undertake and guide extension education programmes for transfer of technology, extend services for training, conduct demonstrations and develop appropriate communication network.
- To standardize technologies for crop production, protection, harvesting, marketing, post harvest utilization and also for live-stock, fisheries and allied agro communities for uplift the standard of living of farmers, farm workers and women of Vidarbha, in general and rural women in particular.
- To provide the necessary production support of nucleus, breeders and foundation seed of important crops of the region and also generate revenue through large farms for sustainable growth of the University.

Goals and Objectives

Goals

The University provides better facilities for education in agriculture and allied fields. The University is guided by the concept laid down in the Panjabrao Krishi Vidyapeeth Act. The act states that the agriculture includes the basic and applied science (including technology). The goals of the University have three folds.

1. To train persons in different faculties and equip them for dissemination of knowledge in agriculture and allied sciences.
2. To carry out research for improving agricultural productivity in the influenced area.
3. To educate farmers through various extension programmes e.g. TV, Radio, Field demonstrations, Rallies, Exhibitions, Helpline, Kisan Call Centre for inducing them to adopt advanced practices.

Objectives

The objectives of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola as specified in the University Act are:

1. Providing education in Agriculture and allied sciences, integrating and coordinating teaching between faculties to award the respective degree.
2. Furthering the advancement of learning and research in agriculture and allied sciences.
3. Undertaking and guiding extension education programme including establishment of Krishi Vigyan Kendras and organizing district level farmers' rallies for the improvement and upliftment of the standard of agriculture and agriculturists in the state.
4. To co-ordinate agricultural education, research and extension education activities.
5. To produce Breeders and Foundation seeds as per the targets given by State and Central Government for various crop varieties.
6. To develop early maturing, high yielding hybrids and varieties of different major crops grown in the region.
7. To develop packages of practices for high monetary returns of different major crops of the region.
8. Development of technologies/processes/equipments for the regional problems in the field of agricultural engineering.
9. Such other purposes which the State Government may specify in this behalf.

Milestones in Development of Education, Research and Extension Education

Table 2.1: Milestones in Development of Education

S.N.	Colleges	Estd.
1	College of Agriculture, Nagpur	1906
2	College of Agriculture, Akola	1955
3	Shri. Shivaji College of Agriculture, Amravati (Affiliated)	1959
4	Anand Niketan College of Agriculture, Warora, Dist. Chandrapur (Affiliated)	1965
5	Establishment of Internal Evaluation Trimester System for degree Courses	1968
6	Establishment of Dr. Panjabrao Deshmukh Krishi Vidyapeeth	1969
7	Establishment of Post Graduate Institute with starting of Master's Degree Programme in Agri. & Vet. faculties at Akola	1969
8	Establishment of College of Agril. Engg. & Technology, Akola	1970
9	Switching over from trimester to semester system	1972
10	Establishment of Faculty of Agricultural Engineering	1982
11	Establishment of Horticultural Degree programme	1984
12	Started of Ph.D. Programme by course work in 4 subjects of Agriculture and 3 subjects of Veterinary	1984
13	Started M. Tech. (Agril. Engg.) Programme by course work in 4 subjects of Agricultural Engineering	1984
14	Establishment of Forestry Degree Programme	1985
15	Started Common Examination of UG through MCAER	1990
16	Lower Agricultural Education in Private sector (2 years)	1990
17	Establishment of Dairy Technology College at Pusad *	1992
18	Started M.V. Sc. In three subjects at Nagpur *	1994
19	Establishment of Computer Centre with the assistance from ICAR Under ARIS used by students	1996
20	College of Horticulture, Akola	2001
21	College of Forestry, Akola	2001
22	Started M. Tech. (Agril. Engg.) Programme by course work in one subject of Agricultural Engineering	2002
23	Started M.B.A.programme at Nagpur (non-aided)	2009
24	College of Agriculture, Sonapur (Gadchiroli)	2009
25	Vasantrao Naik College of Agril. Biotechnology, Yavatmal	2013
26	Agriculture Technology School (3years) in Private sector	2013
27	Started Common Entrance Test (CET) for Ph.D. admission in agricultural and allied subjects.	2016
28	Started CET for UG admission in agriculture and allied subjects	2018
29	Establishment of Horticulture Faculty	2018

Note: * Transferred to MAFSU.

Table 2.2: Milestones in Development of Research

S.N.	Particulars	Estd.
1	AICRP on Cotton Improvement, Akola	1969
2	Acquisition of Central Farms	1969-71
3	Establishment of Dry-Land Agricultural Research Project	1970
4	Development of Central Research Station with Lift Irrigation on Morna River	1974-77
5	AICRP on Oilseeds Improvement, Sunflower, Akola	1972
6	AICRP on Post Harvest Technology, Akola	1972
7	Breeder Seed Production Unit, Wani Rambhapur (BSP)	1972
8	Establishment of Crop Research Units	1972
9	AICRP on Fruits, Akola	1974
10	Establishment of AICRP on Sorghum	1975
11	Establishment of AICRP on Fruit Improvement Project	1975
12	Creating crop research units at CRS	1975
13	Establishment of Medicinal & Aromatic Plant Research Unit	1976
14	AICRP on Sorghum Improvement, Akola	1979
15	AICRP on Rice Improvement, Sakoli	1979
16	Establishment of Seed Technology Research Unit	1979
17	Large Farm Development under National Seed Project	1979
18	Establishment of Directorate of Research	1981
19	Implementation of T & V Scheme	1981
20	Initiation of Large Farm Development Programme under NSP at Central Demonstration Farm, Wani-Rambhapur	1981
21	Establishment of Zonal Research Stations and improvement of Research capabilities through World Bank funding	1981
22	Establishment of Commercial Fruit Nursery	1982
23	AICRP on Integrated Farming System Research, Akola & Experiments on Cultivators Field, Amravati	1983
24	Strengthening of ICAR project in Agricultural Engineering	1983
25	Establishment of Aquaculture Research Unit	1983
26	Introduction of NARP Programmes	1984
27	Collaborative Research with BARC, Mumbai	1984
28	Started Model Watershed Development Programme	1985
29	Establishment of Agro Forestry Research Unit at Nagpur	1986
30	AICRP on Agro Forestry, Nagpur	1986
31	Establishment of Agroecology & Environment Centre	1987
32	AICRP on Oilseeds Improvement, Linseed, Nagpur	1987
33	AICRP on Oilseeds Improvement, Sesame, Nagpur	1987

34	AICRP on Renewable Energy Sources, Akola	1990
35	AICRP on Long Term Fertilizer Experiments, Akola	1995
36	AICRP on Agro-meteorology, Akola	1995
37	Started National Watershed Development Programme for rainfed areas	1995
38	Establishment of Drought Prone area Project on Watershed Development	1995
39	Started Institutional Village Linkage Programme under Technology Assessment and refinement	1995
40	AICRP on Micro & Secondary Nutrients & Pollutant Elements, Akola	1996
41	Establishment of Computer Centre under ARIS Project	1996
42	Establishment of Network Programme on Embryo Transfer Technology in Animal Production	1996
43	Implementation of Developmental Programmes aided by Vidarbha Statutory Development Board	1996
44	AICRP on Farm Implements & Machinery, Akola	1997
45	Started AICRP Research Scheme in Agril. Engineering	1997
46	Establishment of Regional Research Centre of Central Institute of Fresh Water Aquaculture	1997
47	Started Akola Cotton Demonstration Project based on Israel Technology	1997
48	AICRP on Medicinal & Aromatic plants, Akola	1997
49	Establishment of Botanical Garden at Nagpur	1997
50	Establishment of RRS Yavatmal & Sindewahi	1998
51	Establishment of Local Area Network (LAN)	1999
52	Started National Agricultural Technology Project	1999
53	Started AICRP on Soybean	2000
54	AICRP on Pulses Improvement (MULLARP),Akola	2000
55	AICRP on Pulses Improvement (Pigeonpea), Akola	2000
56	Started AICRP on Safflower	2001
57	Establishment of IPR Cell	2001
58	AICRP on Oilseeds Improvement, Safflower, Akola	2001
59	Sustainable rural livelihood security in backward district of Maharashtra-Linseed Intervention (ICAR-NAIP)	2007
60	Crop Pest Surveillance and Advisory Project (CROPSAP)	2008
61	AICRP on Oilseeds Improvement, Soybean, Amravati	2009
62	AICRP on Oilseeds Improvement, Rapeseed & Mustard, Nagpur	2009

63	Towards Genetic Improvement of Fax for Oil and Agronomic Traits (Canada/DBT)	2009
64	A value chain on Linseed : Seed Production, Processing and value addition for Profitability (ICAR-NAIP)	2009
65	Establishing and Networking of Agril. Market Intelligence Centre in India (ICAR-NAIP)	2009
66	Niche Area of Excellence on Rainwater Management in Rainfed Agriculture	2011
67	Establishment of Farm Machinery Testing and Training Centre	2012
68	Bio-fortification in selected crops (Sorghum) Consortia Research Platform Project	2014
69	AICRP on Weed Management, Akola	2015
70	AICRP on Chick Pea, Akola	2015
71	Establishment of Biotechnology Centre	2015
72	Establishment of Centre of Organic Agricultural Research and Training (COART)	2015
73	Development of Micronutrient dense Sorghum in Asia and India (Harvest Plus Project)	2016
74	Creation of Seed Hub for Increasing Indigenous Production of Pulses in India	2016
75	University has signed the MoUs with 11 International, 24 National and 44 StateUniversities/Organizations/Agencies	Upto 2017-18
76	Released Rabi Sorghum Hybrid at National level CSH-39 R (High Yielding and rich in Zinc and Iron)	2017
77	Capacity building and Skill development in Renewable Energy (NAHEP-ICAR)	2018

Table 2.3: Milestones in Development of Extension Education

S.N.	Particulars	Estd.
1	Establishment of Krishi Vigyan Kendra Selsura, Wardha	1979
2	Establishment of Directorate of Extension Education and NAEP	1981
3	Shivarpheri system on Foundation Day of the University	1982
4	Agricultural Technology Information Centre (ATIC)	2001
5	Establishment of KrishiVigyan Kendra Sakoli, Bhandara	2002
6	Dr. Panjabrao Deshmukh Smruti Kendra	2003
7	Establishment of KrishiVigyan Kendra Hiwara, Gondia	2004
8	Establishment of Krishi Vigyan Kendra Sindewahi, Chandrapur	2004
9	Establishment of KrishiVigyan KendraYavatmal	2004
10	Establishment of KrishiVigyan Kendra Sonapur, Gadchiroli	2004
11	Kisan Call Centre	2004
12	Hope Generation Programme	2006
13	Krishi Vidyan Manch	2007
14	Krishi Doot Trainings	2007
15	Kirtankar Mela	2008
16	Pre-Monsoon Krishi Mela	2008
17	Krishi Dindi	2009
18	Shetkari Sadan	2009
19	Establishment of KrishiVigyan Kendra Buldhana	2010
20	Corporate Social Responsibility Project (CCI)	2011
21	Training and Capacity Building for dissemination of IPM technologies in Cotton, Soybean and Red gram in Six district of Vidarbha (NRTT)	2011
22	Adoption of villagte for validating and demonstrating of IPM technology in Cotton, Soybean and Red gram in Akola district (NRTT)	2011
23	Transfer of Integrated Crop Management Technology developed by PDKV	2011
24	Farm Women Mela	2011
25	Innovative Farmers Meet	2011
26	Advance Mobile Diagnostic Van funded by ICAR, New Delhi	2011
27	Toll Free Help Line Service	2012
28	Transfer of Integrated Crop Management Technology developed by PDKV	2015
29	Mobile App on TOT for Stakeholders	2017
30	Adoption of Redwa Village	2018

Authorization and Governance

The competent administrative hierarchy is as depicted in the flow chart. This hierarchy is further strengthened by Maharashtra Council of Agricultural Education and Research (MCAER), Pune; coordinating the activities of the four Agricultural Universities in the State; and also by Maharashtra Agricultural Universities Examination Board, conducting the common semester end examinations in the State. The Executive Council, the Academic Council, the Faculties of Agriculture, Agricultural Engineering, Post Graduate Studies and Lower Agricultural Education with their Boards of Studies and University Departments, established as per the statute, the officers of the University including the University Engineer and the University Librarian help the Vice-Chancellor in fulfillment of the cause for which the University has been established in 1969.

From the year 2006 Entrance Examination for PG Courses has been introduced, which is co-ordinated at state level by Maharashtra Council of Agricultural Education and Research.

Administrative Setup of the University

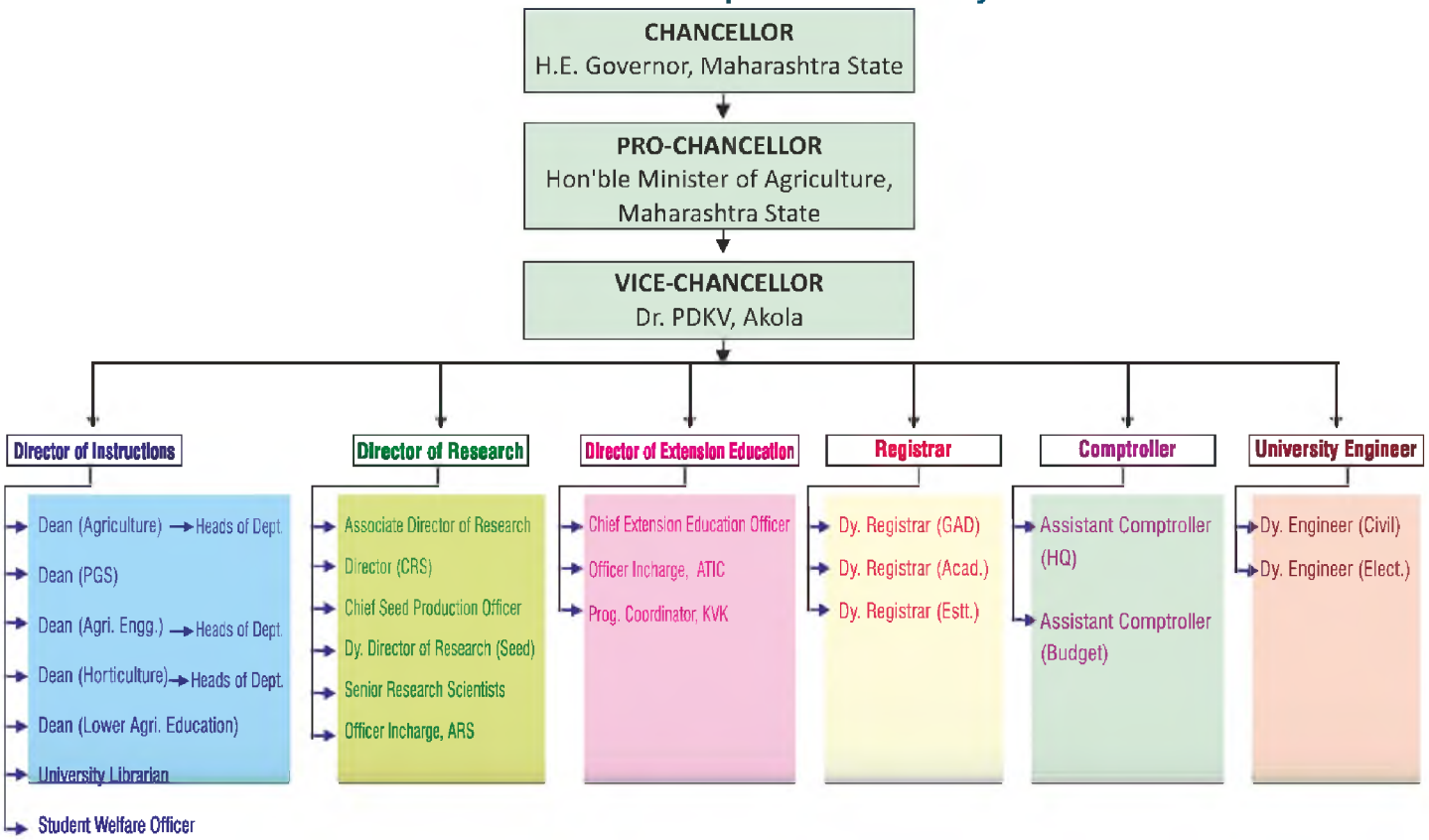


Fig 1 Flow Chart of Dr. PDKV Governance

Education

Academic programmes

The university offers various undergraduate and post graduate programmes in its faculties. Admission to Under Graduate programme is based on XII Std. passed in 10 + 2 pattern and common entrance test. Admission of candidates to Masters Degree programme is based on merit performance in common entrance tests and admission to Doctoral programme is based on Masters Degree in concerned subject and CET.

Undergraduate and postgraduate programmes

The seven undergraduate programmes offered are,

B.Sc. (Hons) Agriculture

B.Sc. (Hons) Horticulture

B.Sc. (Hons) Forestry

B.Sc. (Hons) Agril.Biotechnology

B.Sc. (Hons) Agri Business Management

B.Tech. Agricultural Engineering and Technology

B.Tech. Food Science & Technology

The duration of all these degree programmes is four years. The year of commencement of various undergraduate and postgraduate degree programmes is indicated in Table 1 and 2.

Table 3.1: Undergraduate degree programmes offered by Dr. PDKV at Different Campuses

S.N.	Name of Colleges	Degree	Estd.
A	**Constitute Colleges**		
1.	College of Agriculture, Nagpur	B. Sc. (Hons) Agri.	1906
2.	College of Agriculture, Akola	B. Sc. (Hons) Agri.	1955
3.	College of Agricultural Engineering & Technology, Akola	B.Tech. (Agril.Engg.)	1970
4.	Post Graduate Institute, Akola	M. Sc, M. Tech. & Ph.D.	1970
5.	College of Horticulture, Akola	B. Sc. (Hons)Hort.	2001
6.	College of Forestry, Akola	B. Sc. (Hons) For.	2001
7.	College of Agriculture, Sonapur (Gadchiroli)	B. Sc. (Hons) Agri.	2009

8.	School of Master of Business Management, Nagpur (Un-aided)	M.B.M.	2009
9.	Late Vasantrao Naik College of Agricultural Biotechnology, Yavatmal	B.Sc. (Hons) Agril. Biotech.	2013
B	**Affiliated Colleges (Aided)**		
1.	Shri Shivaji College of Agriculture, Amravati	B. Sc. (Hons) Agri.	1959
2.	Anand Niketan College of Agriculture, Warora, Distt. Chandrapur	B. Sc. (Hons) Agri.	1965
C	**Private Non grant colleges (Non-Aided)**		
1	Vivekanad College of Agriculture, Hiwara, Tq. Mehkar, Distt. Buldana	B. Sc. (Hons) Agri.	2003
2	Swa.Veer G.I. College of Agriculture, Jalgaon Jamod, Distt. Buldana	B. Sc. (Hons) Agri.	2003
3	Ramkrushna Bajaj College of Agriculture, Pipri Wardha	B. Sc. (Hons) Agri.	2003
4	Marotrao Wadafale College of Agriculture, Yavatmal Distt. Yavatmal	B. Sc. (Hons) Agri.	2003
5	College of Agriculture, Darwha, Distt. Yavatmal	B. Sc. (Hons) Agri.	2003
6	Shri. Shivaji College of Horticulture, Amravati	B. Sc. (Hons) Horti.	2003
7	Shri, Shivaji College of Bio-Technology, Amravati	B.Sc.(Hons) Agril. Bio Tech.	2004
8	Sau. Vasudhatai Deshmukh College of Food Technology, Amravati, Distt. Amravati	B.Tech. (Food Sc.)	2004
9	Swa. Veer G.I College of Agril. Engineering & Technology, Jalgaon Jamod Dist. Buldhana	B.Tech. (Agril.Engg)	2006
10	Vivekanand College of Agriculture Business Management, Hiwara, Tq. Mehkar, Distt. Buldana	B.Sc. (Hons) (ABM)	2007
11	Swa. R.G. Deshmukh Agriculture College, Tiwasa Distt. Amravati	B. Sc. (Hons) Agri.	2008
12	Dr. Rajendra Gode Agriculture College, Buldana Distt. Buldana	B. Sc. (Hons) Agri.	2008
13	Shri Samarth Agriculture College, Deolgaon Raja, Distt. Buldana	B. Sc. (Hons) Agri.	2008
14	Shri. Sant Shankar Maharaj Agriculture College, PimpalKhuta, Tq. Dhamangao Rly, Distt. Amravati	B. Sc. (Hons) Agri.	2008

15	Sau.Vasudatai Deshmukh College of Agriculture, Bodana, Tq. & Distt. Amravati	B. Sc. (Hons) Agri.	2009
16	Manoharbhai Patel College of Agriculture, Hiratola Tq. Goregaon Distt. Gondia	B. Sc. (Hons) Agri.	2009
17	Swa. Veer G.I. College of Horticulture, Jalgaon Jamod Distt. Buldhana	B. Sc. (Hons) Horti.	2009
18	College of Agriculture, Umarkhed, Distt. Yavtmal	B. Sc. (Hons) Agri.	2010
19	Sevakbhau Waghaye College of Agriculture, Kesalwada, Ta-Lakhani, Distt. Bhandara	B. Sc. (Hons) Agri.	2010
20	Smt. Sumitrabai Andhare College of Agriculture, Shirla Andhare, Tq. Patur, Distt. Akola	B. Sc. (Hons) Agri.	2010
21	Suvide Foundation College of Agriculture, Risod (Karda), Distt. Washim	B. Sc. (Hons) Agri.	2011
22	Kewalramji Harde Agriculture College, Chamorshi, Distt. Gadchiroli	B. Sc. (Hons) Agri.	2015
23	College of Agriculture, Konghara, Tq. Pandharkawda, Distt.Yavatmal	B. Sc. (Hons) Agri.	2015
24	College of Agriculture, Amkheda, Tq. Malegaon, Distt. Washim	B. Sc. (Hons) Agri.	2015
25	College of Agri-Business Management, Sadak Arjuni, Dist. Gondia	B.Sc.(Hons) BBA	2015
26	P. R. Pote College of Agriculture, Kathora, Amravati	B. Sc. (Hons) Agri.	2017

The Master's degree programmes are offered in 17 disciplines and Doctor's degree programmes are offered in 10 disciplines in faculty of Agriculture and Agricultural Engineering.

Table 3.2: Post graduate degree programmes offered by the university at different campuses

Name of the College and Campus	Degree offered in	Estd.
A. Master's degree programme		
Post Graduate Institute, Akola	Agronomy Agricultural Botany • Genetics & Plant Breeding • Plant Physiology • Seed Technology Agricultural Economics Extension Education Animal Husbandry & Dairy Science • Animal Husbandry • Dairy Science Agricultural Entomology Plant Pathology Soil Science and Agricultural Chemistry Land Resource Management Agricultural Biotechnology Horticulture • Vegetable Science • Fruit Science • Floriculture & Landscaping	1970
	Forestry • Silviculture & Agro-Forestry • Forest Biology & Tree Improvement • Natural Resource Management • Forest Product &Utilization Agronomy Agricultural Botany • Genetics & Plant Breeding • Plant Physiology Agricultural Economics Extension Education	

College of Agriculture Nagpur	Animal Husbandry & Dairy Science • Animal Husbandry • Dairy Science Agricultural Entomology Horticulture • Vegetable Science • Fruit Science • Floriculture and Landscaping Plant Pathology Soil Science and Agricultural Chemistry Agri Business Management (Non-aided)	1970 (From 1935 by research)
Shri. Shivaji College of Agriculture , Amravati (Affiliated)	Agricultural Economics Extension Education	1984
College of Agricultural Engineering & Technology, Akola	Agricultural Process Engineering Farm Power and Machinery Irrigation and Drainage Engineering Soil and Water Conservation Engineering Renewable Energy Sources Farm Structures	1984
B. **Doctoral degree Programme**		
Post Graduate Institute, Akola	Agronomy Agricultural Botany • Plant Physiology • Genetics & Plant Breeding Agricultural Economics Extension Education Animal Husbandry & Dairy Science • Animal Husbandry • Dairy Science Agricultural Entomology Plant Pathology Soil Science and Agricultural Chemistry Agriculture Biotechnology Horticulture • Fruit Science • Vegetable Science • Floriculture & Landscaping	1984

	Agricultural Engineering • Irrigation and Drainage Engineering • Soil and Water Conservation Engg. • Process and Food Engineering • Farm Power and Machinery Renewable Energy Sources	

Table 3.3: Degree wise and college wise intake capacity

S.N.	Degree Course	Name of College	Intake Capacity
1	B. Sc. (Hons) Agri.	College of Agriculture, Akola	112
2		College of Agriculture, Nagpur	172
3		College of Agriculture, Sonapur, Dist. Gadchiroli	64
4	B.Sc. (Hons) Horti.	College of Horticulture, Akola	36
5	B.Tech (Agril.Engg)	College of Agri. Engineering and Technology, Akola	55
6	B.Sc. (Hons) (Forestry)	College of Forestry, Akola	32
7	B.Sc. (Hons) Agril. Bio-Tech, Yavatmal	Vasantrao Naik College of Agril. Bio-Tech. Yavatmal	40
		Total	**511**

Table 3.4: Postgraduate coursewise and college wise intake capacity

S.N.	Degree Course	Intake Capacity
A	**Post Graduate Institute, Akola**	
1	M.Sc. (Agriculture)	166
2	M.Sc.(Horticulture)	28
3	M.Sc. (Forestry)	14
4	M.Sc.(Bio-Technology)	12
5	M.Tech. (Agril. Engg.)	30
	Total (A)	**250**
B	**College of Agriculture, Nagpur**	
1	M.Sc. (Agriculture)	103
2	M.Sc.(Horticulture)	09
3	M.B.M (Agri.) (Business Management)	30
	Total (B)	**142**
	Total (A) + (B)	**392**

Table 3.5. Doctor of Philosophy

S.N.	Degree Course	Intake Capacity
Post Graduate Institute, Akola		
1	Agriculture	37
2	Agricultural Bio-Technology	03
3	Agricultural Engineering	10
	Total	**50**

Adoption of ICAR model curricula

The University is concerned about the quality of students it produces. Regular and effective monitoring of the academic programmes is done to ensure quality education. Utmost care is taken to revise the curricula for the inclusion of new knowledge and skills and exclusion of obsolete courses. Academic norms suggested for course duration, syllabus, credit load, regulation, etc., are revised from time to time as per the guidelines of ICAR, New Delhi. From the academic year 2017-18, the University has implemented the undergraduate course curriculum as recommended by the Fifth Deans Committee of the ICAR. Syllabus of Post Graduate Programme has been revised considering the state/local requirement and implemented from the academic year 2009-10 as per the recommendations of National Core Group appointed by ICAR, New Delhi. Dr. PDKV, Akola has awarded degrees to 32,729 undergraduate & 8,855 post graduates and 638 doctorates in the various faculties.

UG Courses

As per the Fourth Dean (D.I.) Committee the new programme had been implemented from 2007-2008 for old students. Recently, University has implemented new degree course curricula from the academic year 2017-2018 as recommended by the V Deans Committee.

PG Courses

As per the recommendations of Accreditation Board Secretariat, ICAR, New Delhi, the curricula and syllabi for Master's Degree Programme have been revised with 10 to 15 per cent modification in ICAR syllabus. The revised programme is being implemented from the academic year 2009-10.

Interdisciplinary approach in teaching

The University has seven constituent colleges, three in Agriculture, one each in Horticulture, Forestry, Agricultural Engineering and Agriculture Biotechnology. One School of Business Management (Non-aided) in Agriculture Business Management (2009) is at Nagpur. Interdisciplinary approach in teaching has been adopted. The faculty of agriculture is the largest and the oldest in Dr.PDKV. The academic staff of agriculture discipline takes care of imparting teaching of agriculture related courses to other disciplines like Horticulture, Forestry and Agril Engineering. The basic research facilities available at Biotechnology Centre and Tissue Culture project are being utilized by the various colleges. The computer centre caters to the need of computer education of the university.

UG programme

There is an inter-disciplinary approach in teaching undergraduate courses. When students undergo RAWE programme in their VII semester for old students and READY for new admitted students, a team of specialists Agronomist, Soil Specialist, Pathologist, Entomologist, Horticulturist and Economist remains collectively in touch with the students. They meet once in a month and have discussion by guiding them and solving their problems in the particular subject or field. Thus, there is a collective and integrated interdisciplinary approach in teaching.

PG programme

There is an inter- disciplinary approach for PG mainly in two ways:

i) In selecting major and minor courses, students are asked to select related courses.
ii) Formulation of Advisory Committee - To guide a PG student, an advisory committee consisting, a minimum of 3 members used to formulate. The committee members are from different disciplines. These members meet frequently to share their experiences and guide the PG student.

Basis for initiation and closing of educational institutions programmes and departments

Keeping in view the requirements of the University and for successfully meeting the challenges emerged from time to time, proposals for initiating or dropping course(s) or establishing or closing of department(s) /unit/college are thoroughly

discussed by the concerned faculty and the Academic Council, which is the final authority for such matters, before taking final decision on such issues. The proposals for starting of educational institutions, programmes, centres, etc, received from different organizations are scrutinized and discussed in the Academic Council of the University in accordance with the rules and regulation set by the University/State Government. The proposals, which meet the requirements, are recommended to the Executive Council of the University. The Executive Council recommends such proposals to the Maharashtra Council of Agril. Education and Research, Pune, for approval.

Dr. Panjbarao Deshmukh Krishi Vidyapeeth, Akola gives due consideration to any progamme communicated by the MCAER, Pune. It is discussed in the Executive Council meeting, which decides to start or close any educational institute, college, programme, centre, department, etc. The institutions/colleges which are not running as per the rules and regulations set by the University/State Government are recommended for their closure by the Academic Council to the Executive Council of the University. The Executive Council recommends such cases for approval of the MCAER.

Non degree granting programmes

As per Agricultural University Act of the Maharashtra State the responsibility of Lower Agricultural Education in Vidarbha region is assigned to Dr. Panjabrao Deshmukh Krishi Vidyapeeth.

Agricultural schools

After Secondary School Certificate (10th Std.) examination, students are offered a diploma course in Agriculture through well developed Agricultural Schools. There are 8 constituent Agricultural Schools and one is affiliated with capacity of 60 students' intake per year in each school. In addition, there are two Rural Educational Institutes and every year 40 students get the admission in each institute. The curriculum comprises of the courses in soil management, tillage, manures and fertilizers, crop production, weed control, water management, animal science, dairy science, horticulture, co-operation and marketing, agricultural economics, agricultural extension, rural sociology, different land improvement Acts and allied subjects related to agricultural development. The medium of instruction is Marathi. These schools are located at Akola, Buldhana, Yavatmal, Nagpur, Wardha, Chandrapur, Gondia and Amravati (Dharni). Rural Educational Institutes are located at Amravati and Wardha. Considering the increasing demand for Agricultural diploma holders in private and public sectors, the Government of Maharashtra has sanctioned to run 49 semi English private Agricultural Technology Schools since 2013 for three years duration with 60 students intake

capacity affiliated to Dr.PDKV, Akola. The same course was offered for two year as diploma (2 years) in Agriculture School. The online admission process is in operation for the two year Diploma in Agriculture and three year Diploma in Agriculture Technology. The medium of instruction for Diploma in Agriculture Technology is Semi-English.

Gardener (Mali) training course

Gardener (Mali) training programme is offered for one year duration. Every year admission is given to 50 students each in 2 Mali Training Centres located at Akola and Nagpur. In addition to higher agricultural education, approximately 30,024 skilled and proficient agricultural diploma and certificate holders have been produced and put to the service of Vidarbha. The eligibility of admission for the Diploma course in Agriculture and Agriculture Technology is 10th standard pass. Minimum eligibility for the admission to Mali Training Course is minimum 8th standard pass. For the Mali Training, applications are invited and based on merit admission is done. The medium of instruction to Mali Training course is in Marathi medium.

Technology support

In the University, computer centre as a central facility under Agricultural Research Information System (ARIS) scheme of ICAR has been established during 1996 to provide the latest technology support to the colleges and University offices in the main campus. ARIS Cell has a class room equipped with the interactive digital teaching board and a separate computer for each student for online learning with access to e-learning course material-learning portal is also started at University level and operational training has been imparted to the faculty staff to prepare the course material and upload the same. Separate computer laboratory facility is available for post graduate and doctorate students.

Internet connectivity is established under National Mission of Education through Information and Communication Technology (NMEICT) with 1Gbps link under National Knowledge Network scheme of HRD, Ministry. ARIS cell is Hosting and maintaining the university website (URL:-www.pdkv.ac.in). Similarly, a E-mail server is established under domain 'pdkv.ac.in' and provided the institutional emails '@pdkv.ac.in' to the University Offices and research staff members on open source based platform. The Internet connectivity is extended through optical fiber cable, CAT6 cables and Wi-Fi units at all hostels, guest houses, offices, colleges of university main campus.As a security measures, to protect the online application data, data-centre database and online access material, a high-end CISCO firewall is installed by the ARIS cell and provided the controlled Internet access through user-id and password to all the university officers, academic staff, research scientists,

undergraduate, post graduate and doctorate students on PC, laptop and Smartphone.

University has also started the computerization of educational, financial and administrative system work by undertaking the Integrated University Management System (IUMS) project. This project is running on BOOT model for 5 years, by following role based approach. Under this project, each student and staff has been provided unique login-id.

College of Agriculture, Akola

College of Agriculture, Akola is established on 2nd August 1955. The college was under the administrative control of the Department of Agriculture, Maharashtra State Pune and was initially affiliated to the Nagpur University. Later on the affiliation as well as administrative control shifted to Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 1969. This college was established to provide quality education in the areas of agriculture, to develop overall personality of the students during their graduation and to provide competent agricultural graduates to the society.

Achievements

The College has produced 5174 graduates of Agriculture up to 2017-18. Presently 615 students are on roll of I to IV year of degree programme, out of which about 50 per cent are female students. The college has fixed quota for students from out-side Maharashtra. On an average, 85 per cent students of the admission capacity, get their degree every year. Every year, the 55 per cent students receive financial aids from Central Govt., ICAR, New Delhi, State Govt., University Merit Scholarships, and NTS scholarships. The Course curriculum for the entire B. Sc. Degree is framed as per 5th Dean Committee of ICAR and comprised of 183 credit load including 143 credits for subjects from various sections (I to VI semester), 20 credits for RAWE (Rural Agriculture Work Experience) (VII semester) and 20 credits for Experiential learning (VIII semester). The college has a computer laboratory having 22 computers for learning and regularly used by the students. For the experiments and on-farm instructions, the Agronomy, Horticulture farm, Central Research Station of the University is available as and when required. The college has produced 1024 NCC cadets, more than 2500 NSS volunteers, and all the students had undergone the rigorous RAWE training. Nearly 387 students have undergone

the Experiential Learning Programme (ELP) during last four years. The students are allowed to have educational exposure from different places of Maharashtra, South India and North India through educational tours every year. The well equipped Gymnasium and sport complex with adequate facilities is available for the students. The students have represented the college at University and National level sports competitions on many occasions. The huge and updated Central Library facility is available for students and staff in the University Campus.

Vision

Long Term:

- To sustain agriculture production in the next millennium HRD in different critical areas
- To meet the quality of trained manpower heads to be strengthen through short training and experiential learning modules.
- The main focus of education for capability is always to create job rather than to search for job.
- To develop personality of the students during their graduation in agriculture and allied sectors.

Short Term:

- To create awareness among the students for soil health management for sustainable production of agriculture.
- To create awareness among the students about low cost technology including organic agriculture for quality food.
- To develop entrepreneurship and create awareness thought ELP in post harvest technologies of agriculture and allied sectors.
- To create awareness about soil fertility, food security, nutritional and water security, crop protection, seed production, agriculture economics, per drop more crop, soil and water conservation, mechanization, dissemination of technologies, etc

Focus

- Sustainable production technologies for agriculture, horticulture crops and cropping pattern, allied sectors like soil fertility, seed production, crop protection, poultry, dairy, farm engineering, Agril .economics, extension education etc.
- Hands on training regarding post harvest technologies like bio-pesticides & bio-productions, organic farming, soil health & soil testing, horticultural products.
- Safety use of pesticides to protect environment and soil health.
- To impart instructional programme at under graduate level in Agricultural Economics and Statistics.
- To conduct bench mark surveys and assess the impact of technologies on farm economy and socio economic status of farmers.

- Overall development of the students through personality development and entrepreneurship training and visits to Institutions, Industries and farms, etc.
- Focused guidance to students for qualifying Junior Research Fellowship.
- Use of appropriate tool for dissemination of the technology or information
- Practical Mathematics in agriculture sector needs to taught to the students as deficiency course.
- Soil and Water Conservation Engineering, Farm Machinery and Power, Renewable Energy and Green Technology and Protected Cultivation and Secondary Agriculture.

Perspective Plan of College

- Preparation of Theory notes/practical manuals/ICT application in curricula delivery
- Power point presentations and videos of various courses, as per new syllabus of UG course curriculum approved by V Dean Committee
- Establishment of new laboratory for Experiential Learning Module
- Preparation and submission of externally funded projects for research through Experiential Learning Modules
- Entrepreneurship and skill development through short trainings & industrial attachment under organic farming, soil health, horticulture and Dairy post harvest technologies, crop protection, seed production, etc.
- Modernization and development of laboratory as per new course curricula.
- Institutional aspects of agricultural development
- Economic evaluation of prospective technologies and impact assessment.
- Natural resource use planning in agriculture.
- Eco-Systems analysis and studies on agricultural development in agro-climatic/ agro economic zones.
- Impact of research including cost-benefit analysis and research prioritization in the University.
- Economic evaluation of Government programmes related agriculture development.
- Application of non-linear models in agriculture.
- Development of methodologies for identification of backward regions.
- Sustainable agricultural production system

College of Agriculture, Nagpur

College of Agriculture, Nagpur is pioneering institution of agricultural education and research in Central India. It is one of the first five Agriculture Colleges established by the erstwhile British Rulers in 1906. This College had been dedicated for education, research and extension activities since last century and witnessed the several reforms in these activities. The College had offered diploma course in agriculture during 1906 to 1915 and Bachelor of Science (Agriculture) from 1957-58. The College of Agriculture, Nagpur became part of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola established in 1969. The regular post graduate courses of M.Sc. (Agri.) degree were started in 1958. Every year about 172 undergraduate and 112 post graduate students passed out. Several technologies for the benefit of farmers have been released for Vidarbha region and extension wing of this college is striving to popularize these technologies to farmer's doorsteps.

Achievements

A large number of graduates and postgraduates from College of Agriculture, Nagpur have occupied senior positions in different departments such as agriculture, horticulture, ICAR institutions, forest, civil services, banking services, pesticides, fertilizers and seed industries etc. Some of the alumni of this university also reached to the rank of Vice-Chancellor, Dean and Directors.

During 2004-05 to 2017-18, 2473 students at UG level and 1250 students at PG level sought admission in College of Agriculture, Nagpur. During the period, 1979 students at UG level and 1168 students at PG level have successfully completed their degrees.

Vision

The major vision of this institution is to reorient education, research and extension activities to meet the challenges of sustainable agriculture and food security of the State and to transform agricultural graduates from the present status of job seekers to job providers. It also envisages to inculcate creative leadership in students to equip them to take up newer challenges in the next decades.

Focus

College of Agriculture, Nagpur will focus on the following key areas in teaching, research and extension education activities to realize the vision.

Academic Excellence

The science and technical education through the empowerment of human resources brings direct impact on development of nation. Educational programmes need modification by starting distant education courses by harnessing tools of information technology, non-degree training programmes based on market preferences and job oriented courses on self financing mode. Under graduate and post graduate curricula will have a shift in priority with more thrust on following aspects.

Agronomy	• Facilitating, strengthening and streamlining education system to meet future challenges.
	• Increasing the strength of students going out with UG and PG against existing strength
	• Making educational system professional for integrating agriculture education in such a way that it will provide self employment as well as entrepreneurship development.
	• Improvement in the quality of higher education by enhancing capacity building of human resource or through talent management for overcoming new and complex challenges
	• Development of futuristic human resource capable of using latest cutting edge science and technology.
Agril. Botany	• Post graduate class and laboratory will be equipped with the latest equipments and technological advancement viz., Internet connectivity to enable distant learning programme.
	• The faculty will facilitate and equip the post graduate students of the section to secure fellowship and pave way for their placement in reputed private/public organizations.
	• Emphasis will be given for practical/ field level teaching rather than classroom teaching
	• Students of UG and PG will be exposed to field visits and commercial demonstration farms.
	• Keeping pace with global standards this section would strengthen undergraduate and post graduate education in genetics, cytogenetics, plant breeding, biotechnology, plant physiology and seed technology laying greater focus on science and processes and through experiential learning and problem solving approach.
Entomology	• Separate museum for Insect artificial exhibits with AV aids
	• Updating the students for initiating enterprise in pest management and commercial entomology i. e. sericulture, lac culture, apiculture and bioagent production.

	• Establishing and strengthening laboratories of Insect taxonomy, Ecology, Insect physiology, Biosystematics, Toxicological Residues, Insect morphology, Economic entomology, Host plant resistance, Insect biotechnology, Nematology etc.
	• Necessity of exposure to UG and PG students for field visits and commercial demonstration farms
	• Requirement of Experiential learning course on mass multiplication of Insect Parasites and Predators, Entomopathogenic nematodes, NPV etc.,
Plant Pathology	• To educate students in Plant Pathology and carry out graduate and post graduate programme leading to M.Sc. (Ag) and Ph. D. (Ag) to meet the trained manpower.
Horticulture	• To encourage the UG and PG students for developing entrepreneurship in floriculture, landscape and architecture.
	• To act as the knowledge hub and management of scientific and technical information in horticulture.
Soil Science and Agricultural Chemistry	• To equip UG and PG laboratory with latest instruments and equipments
	• To give an opportunity to ten to fifteen undergraduate & post graduate students on merit basis for minimum two month abroad training on "world new advances of soil science"
Animal Husbandry Dairy Science	• To collaborate research of PG student with MAFSU, Nagpur.
	• To revise PG education to incorporate new knowledge/information or reoriented to meet the emerging challenges through strengthening the competitiveness introduction of new specialized course and reorienting of teaching methodology.
Agril. Engineering	• Introduction of need based advance courses in agricultural engineering at least to the 10 per cent to the total syllabus of B.Sc. Agriculture.
Agril. Economics	• Need to start PG programme in three sub-subjects of Agril. Economics i.e. Agril. Production Economics, Agril. Finance and Agril. Marketing to provide specialized economics to the country.
	• Enhancing the quality teaching through significant improvement in the education and policy research.
	• Initiation of Ph.D. programme in the discipline of Agricultural Economics.

	• Development of entrepreneurship model in experiential learning programme.
	• Faculty to encourage PG students for participation in National/ International conference
Agril. Extension	• Ph.D(Agri.) in Extension Education to be started at Extension Education Division
	• Development of Virtual learning classroom (ICT).
	• Involvement of students in University Extension Programmes will be increased
	• To orient Agril. education to encourage entrepreneurship
	• To start certificate course in Agriculture Journalism
	• Establishment of agricultural education media centres for providing instructional modules for distance education.
	• Development of innovative techniques for transfer of technologies

College of Forestry, Akola

The College of Forestry has the distinction of being the first in starting B.Sc. Forestry degree programme in Maharashtra state. To cater the need of future research based forestry development and demand of specialized technical personnel of this region, four year forestry degree programme has been started in this University from 1985-86 with the assistance of Indian Council of Agricultural Research (ICAR), New Delhi. Independent College of Forestry was established at Dr.PDKV, Akola on 26thJanuary, 2001. Initially the intake capacity of B.Sc. Forestry was 20 students per year, which increased to 32. Presently the College has five departments and total strength of faculty is twelve. The staff of the College is engaged in teaching, research and extension activities. The students are taken to nearby forests areas, national parks and sanctuaries for imparting effective practical training. In addition to these facilities like wood product workshop, mist chamber, green house, charcoal making unit, press board unit etc. are availed to the students for hands on training and experiential learning.

The postgraduate programme has been initiated in the year 2008-09 with an intake capacity of 7 (Seven) students, the intake capacity were increased to 14 students in the year 2010-11. To make the M.Sc. degrees more professional and salable, the specialized courses like Ecotourism, Agroforestry, Plantation Technology, Medicinal and Aromatic, Wood Science and technology, Forest Genetic Resources etc. as suggested by ICAR New Delhi have been offered.

Achievements

The College has produced 538 graduates of Forestry up to 2017-18. Presently 125 students are on roll of I to IV year of degree programme. The Course curriculum for the entire B. Sc. degree is framed as per Fifth Dean Committee of ICAR and comprised of 181 credit load including 143 credits for subjects from various sections (I to VI semester), 20 credits for Experiential learning (VIII semester) and 20 credits for FOWE (Forest Work Experience) (VII semester).

The college has produced 225 NCC cadets, more than 425 NSS volunteers, and all the students had undergone the rigorous FOWE training. The students are allowed to have educational exposure from different places of Maharashtra, South India and North India through educational tours every year. The well equipped Gymnasium and sport complex with adequate facilities is available for the students. The students have represented the college at University and National level sports on many occasions. The huge and updated Central Library facility is available for students and staff in the University Campus.

Vision and Focus

To create an ambient atmosphere and institution of excellence to impart quality higher education in Forestry; to institute better forestry research and outreach programmes so as to improve the livelihoodsand welfare of the farmers, consumers and other stake holders through growth and sustainability inclusiveof social development.

Mission

The prime mission of the College is to develop human resource in the field of Forestry, to conduct research for development of new techniques for sustainable management of natural and managed ecosystems of forestry and agro-forestry and to disseminate research findings to the farming community of the region.

Goal and Strategies

To transform the Forestry education into a demand-driven efficient system, to provide academicservices and intellectual skill and high quality technical base in forestry education, research and extension, to promote centers of excellence, and to provide skilled, analytical and globally competitive human resources to meet the local and national needs for sustainable development of forestry and other allied disciplines.

The strategy of college is to focus on synergizing inter-disciplinary education and research pertinent to the Local need and help building innovative extension systems for sustainable management of natural resources andoverall improvement of farmers livelihood. State Agricultural Universities in India started to provide the much needed forestry education and research by establishing Forestry colleges under their umbrella. Within that overall objective, the mandate of the College of

Forestry, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola has been defined as developing human resources for the stewardship and sustainable use of forests resources. In particular, academic and research Programmes in conservation and sustainable use of natural resources, social forestry, agroforestry, silviculture, and minor forest product are being focused at the college.

College of Agricultural Engineering & Technology, Akola

College of Agricultural Engineering and Technology was established on 3rd October 1970 at Akola. The college is now one of the premier institutes in the state for imparting education in Agril. Engineering and plays an important role in human resources development in the field of Agril. Engineering. College of Agricultural Engineering and Technology is imparting education at under graduate level and the departments are also assisting in post graduate and doctorate degree levels in agricultural engineering. B.Tech. (Agril. Engg.) degree course comprises 8 semesters with credit load of 183 including 25 credits for In-plant Training during 8th semester. In addition to these four non countable credits are also to be completed.

Achievements

The College has produced 1610 graduates of B.Tech (Agril. Engg.) and 316 post graduates of M. Tech (Agri. Engg.) up to 2017-18. Presently 225 students are on roll of I to IV year of degree programme.The college has produced 355 NCC cadets, more than 785 NSS volunteers. The students are allowed to have educational exposure from different places of Maharashtra, South India and North India through educational tours every year. The well equipped Gymnasium and sport complex with adequate facilities is available for the students. The students have represented the college at University & National level sports on many occasions.

College of Horticulture, Akola

Being a state of horticulture, the B.Sc. (Horticulture) four years degree programme has been implemented by the Maharashtra state Government from July 1984 with 20 intake capacities (16 male + 4 female) up to 2001. This degree programme was launched under the establishment of College of Agriculture, Akola with one Professor (Hort.), two post of Associate Professor (Hort.) and six Assistant Professor (three from Horticulture and three from allied discipline). Later on 25th January, 2001, the full fledged independent College of Horticulture has been started by filling the additional posts through redeployment. Now, this college is functioning independently with the intake capacity of 36 students plus 15 per cent ICAR nominated students. The degree programme offered by this college is B. Sc. (Hons) Horticulture.

Achievements

The College has produced 776 graduates of B.Sc (Hort.) up to 2017-18. Presently students are on roll of I to IV year of degree programme, The Course curriculum for the entire B. Sc. Degree is framed as per 5th Dean Committee of ICAR and comprised of 183 credit load including 143 credits for subjects from various sections (I to VI semester), 25 credits for Experiential learning (VIII semester) and 20 credits for HAWE (Horticulture Work Experience) (VII semester).

The college has produced 322 NCC cadets, more than 625 NSS volunteers, and all the students had undergone the rigorous HAWE training. The students are allowed to have educational exposure from different places of Maharashtra, South India and North India through educational tours every year. The well equipped Gymnasium and sport complex with adequate facilities is available for the students. The students have represented the college at University and National level sports on many occasions. The huge and updated Central Library facility is available for students and staff in the University Campus.

College of Agriculture, Sonapur (Gadchiroli)

Gadchiroli district is categorized as tribal and under developed district. Most of the land nearly 75.96 per cent is covered with forest and hills, 38.3 per cent population of this district is tribal and having 60.1 per cent literacy rate (Census, 2011). This district is economically backward. Considering the lack of facilities and economic, social and educational upliftment of tribal people, the Government of Maharashtra vide its resolution of Agriculture Animal Husbandry, Dairy Development and Fisheries Department; Mantralaya, Mumbai No. PDKV 1007/PK-167/7-A dated 4th December, 2008 has accorded sanction for the establishment of College of Agriculture at Sonapur, Gadchiroli from the Academic Year 2009-10 with the objective to diffuse the Agricultural Education amongst the people of Gadchiroli and adjacent districts in general and tribal people in particular. Agriculture College, Gadchiroli is pioneering institution of agricultural education and research in Eastern Vidarbha Zone. The degree programme offered by this college is B. Sc. (Hons) Agriculture.

Achievements

The College has produced 212 graduates of B.Sc (Agri.) up to 2017-18. Presently 301 students are on roll of I to IV year of degree programme. The Course curriculum for the entire B. Sc. degree is framed as per 5th Dean Committee of ICAR and comprised of 183 credit load including 143 credits for subjects from various

sections (I to VI semester), 25 credits for Experiential learning (VIII semester) and 20 credits for RAWE (Rural Agriculture Work Experience) (VII semester) and 20 credits for Experiential learning (VIII semester). The college has a well established computer laboratory and educational library in the college campus. All the students had undergone the rigorous RAWE training programme. The students are allowed to have educational exposure from different places of Maharashtra, South India and North India through educational tours every year. The well equipped Gymnasium and sport complex with adequate facilities is available for the students. The students have represented the college at University and National level sports on many occasions.

Vasantrao Naik College of Agricultural Biotechnology, Yavatmal

Vasantrao Naik College of Agricultural Biotechnology, Yavatmalwas established as a constituent college of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola on 15th August, 2013. It is situated on west side of the city on Waghapur road with a view to impart educational programme in the disciplines of Agricultural Biotechnology leading to the degree of B.Sc. (Agril.Biotech.) with the intake capacity of 40 students. But as per Vth Dean's Committee recommendations B.Sc. (Agril. Biotech.) stopped and now from this year 2017-18 new degree B. Tech (Agril. Biotech.) started with the intake capacity of 40 students. This is the first Government Agricultural Biotechnology College in Vidarbha region and second in Maharashtra State. The aimto establish this college is to develop advance educational facilities for the remote area like Yavatmal, which is severely affected by drought like conditions. Another aim in establishing this college is to generate agricultural experts in the discipline of biotechnology and also cater the need of future research based development and demand of specified technical personnel of this region.

The admissions to B.Sc. (Hons) Agri. in the discipline of Agricultural Biotechnology are centralized under MCAER, Pune whereas 10 per cent students are admitted from ICAR and the admissions are done on merit basis. Entrance examination MHT-CET will now be compulsory for the admission to agricultural courses from the academic year 2018-19. Semester system of education is followed with internal and external evaluation component. The staff of this college is engaged in teaching, research and extension activities. Modern laboratory facilities like Biotechnology/Tissue Culture, Molecular Biology, Animal Biotechnology and Bioinformatics are developed for improving effective practical training for the students. College has huge administrative building with boys and girls hostel

facility. It also has well established completely digitalized class room, CCTV surveillance, Wi-Fi campus, gymnasium as well as study forum for students and well equipped library with 1580 books.

Achievements:

- College has huge administrative building with advance facilities which was inaugurated on 20th December, 2017 by the auspicious hands of Hon'ble Governor of Maharashtra, Shri. Ch. Vidyasagar Rao. College also has a well maintained guest house and amenities building.
- Well established and furnished Boys and girls hostel facilities with R.O. drinking water, reading room and Wi-Fi facilities.
- Four well equipped laboratories for conducting the practicals of UG students.
- This college has ranked first in the semester end examination of first term of academic year 2015-16 among all the granted and non-granted colleges affiliated to the University.
- The first batch of 32 graduates of this college passed out in 2016-17.
- Students got admission to the higher studies in reputed institutes/colleges and some students have become entrepreneurs in agricultural sector and providing raw materials for agriculture as well as giving training to farmers to improve the productivity of crops.
- Adopted a tribal village Marthad for sustainable development under 'Swachcha Bharat Abhiyan'.
- Since establishment of college various programmes as per the schedule of NSS were organized regularly. One special camp was also organized at adopted village Marthad.

Vision

The college is focusing on establishment of PG and Ph.D. programmes in the discipline of B.Tech. Biotechnology upto 2030. The 2050 focus will be on research relevant to the state and to help building innovative extension system for sustainable management of agriculture resources, availability of good tissue culture planting material for horticultural development, animal as well as food technology and overall improvement of rural livelihood. In particular academic and research programme in the field of Agriculture and allied sectors related to Agricultural Biotechnology.

Focus

- Establishment of PG section in Agricultural Biotechnology at Yavatmal.
- Provide technically qualified, hardworking and devoted manpower for the development & management of sustainable agriculture to enhance income and improved quality of life of the farmer in Vidarbha region.
- Provide scientific and practical advice related to advance biotechnology to

thevarious end users.

- Endowing the quality education to produce globally competitive graduates in agricultural biotechnology sectors.
- To create an ambient atmosphere and intellectual skill in the area of agricultural biotechnology.
- To recruit the human resource in various government sectors, organizations, co-operative sectors, private establishments like gene banking, tissue culture, food technology, molecular biology, biochemistry and administrative services, non-governmental organizations, private R&D units, agro-services centers, etc.
- To develop biofortified varieties with all essential nutrients to overcome the problem of malnutrition as well as develop salt and drought tolerant variety to overcome salinity and water scarcity problem.
- Development of methods and technology to overcome the problem of water scarcity and pollution.
- Isolation and identification of micro-organisms for preparation of biopesticides and mass raring of biocontrol agents from crop ecosystem to minimize the use of poisonous chemical in agriculture.

School of Agri-Business Management, Nagpur

The development of the agribusiness sector in the region can create employment and income generating activities, which can bring stability in agriculture and rural life as whole. The changing nature of agriculture from mainly means of livelihood to the business requires manpower specialized in agri-business management. There is considerable demand for agri-business professionals and expected to increase in near future. Professionalization of various managerial facts of agri-business like production, operations, personnel, marketing and finance require the induction of appropriate trained agri-business professionals in managing the day to day affairs of this business. Looking to the requirement of trained manpower in Agri-business Management, the School of Agri-Business Management is established in year 2009. A post-graduate degree programme is started at School of the Agri-Business Management, Nagpur under the jurisdiction of this Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola awarding the degree of Master in Business Administration (Agriculture). The school offers two year post graduation programme viz; Master in Business Administration (Agriculture) and the intake capacity is 30.

Achievements

The College has produced 161 graduates of MBM up to 2017-18. Presently 54 students are on roll of I to II year of degree programme. The digital classroom is well equipped with the Computer, Projector and screen facility. The teaching is

done with power-point presentation, games and through posters.As the part of the curriculum, the MBA (Agri.) students has to attend the In-plant summer training in Industrial unit for the period of two months during fourth semester. During this period, they learn practical knowledge of the marketing, market research, operations management and research, project management, financial analysis, IT management, personnel management (HRM) etc. Many students are working in agricultural and allied sectors in specialized areas. Approximately the 60 per cent students of last 8 batches are employed in banks, agribusiness sector and self employed.

Post Graduate Institute, Akola

Post Graduate Institute, Akola was established in 1970 with a view to impart educational programme in various discipline of Agriculture leading to the degree of M.Sc. (Agri), however, Ph.D. and M.Tech. degree programmes were started in 1984 and 1985, respectively. It was also started to develop quality education at Post Graduate level, training and generate agricultural experts and also to cater the need of future research based development and demand of specialized technical personnel of this region. The admission to Post Graduate i.e. M.Sc.(Agri.) and M.Tech are centralized at MCAER, Pune through a Common Entrance Test (CET) conducted by Maharashtra Agricultural Universities Examination Board, Pune and the admission are done on merit basis and the admission for Ph.D. degree programme are centralized through a common procedure developed by MCAER, Pune on merit and CET basis. Semester system of education is followed with internal evaluation component.

Presently, the post graduate Institute has provided the facility for education in respect of nine disciplines in Agricultural Sciences and five disciplines in Agricultural Engineering and Technology at the main campus of Akola. The post Graduate degree programmein Agril. Biotechnology under the disciplines of M.Sc.(Agril. Botany) was started during 2007-2008 and PhD in 2009-2010. The degree programme offered by PGI are M.Sc.(Agri.), M.Tech. (Agril.Engg.) and Ph.D.

Accomplishments

The PGI has produced 7525 postgraduates in M. Sc. (Agri./Biotech/Hort/ Forestry), 316 post graduates in M. Tech (Agri. Engg.) and 627 doctorates in various disciplines up to 2017-18. Presently, 440 students are on roll for postgraduate of M. Sc. (Agri./Biotech/Hort./ Forestry), 60post graduates in M. Tech (Agri. Engg.) and 120doctorates in various disciplines of all years of each degree programme.

Goals and Strategies: Education

1. Capacity Building Human and financial resource (Steps towards Entrepreneurships development)

Rainfed agriculture has played an important role in India to move from the severe food crises of the sixties to aggravate food surplus today but needs quality food with healthy environment of soil, animal and human. One of the major challenges facing rainfed agriculture in India today is its sustainable development through conserving and enhancing the inherent capacity of its land and other natural resources to sustain it. To develop human resources well equipped with arrangement of training programme for students on conservation agriculture, organic farming and IFS module, seed production and technology, soil health, Biotechnology, Horticulture, Agri. Engineering, Water technology in climate change scenario is the need of the hours.

Livestock sector is best alternative for sustainable rural development. To develop human resources, awareness of recommended management practices, region specific breeds conservation, clean and quality milk production, value added milk products, processing and marketing of various milk and milk products, are essential through organizing capacity building programmes for students, farmers, unemployed rural youths and women's. Emphasis is also needed for farming system, crop diversification, risk and sustainability, economics of resource management, agro input marketing and price behaviour of agro input–output. The students should be exposed to the entrepreneurship development training programme with a handsome coverage of related topics successfully.

2. Dissemination of Improved Technology

Through RAWE, NSS and experiential learning students are disseminating agril.technologies to the farmers. Vocational programmes for rural youth can be organized on photography, videography, agriculture journalism, establishment of Kiosk for transfer of technology etc.

3. ICT application in curricula delivery

e-agriculture is innovative communicative technology for information of latest development in agriculture to students. The education of agriculture through various tools available in the market for efficient and effective way of teaching to students. ICT Based applications with demonstrations, PPT, films, videos and all possible recent applications will beefficiently and effectively used for teaching to students. Use of Computer, Laptop, IT tools, LCD, Digital boards, and subject CDs and Multimedia module, Videoconferencing for the expert lecture, e-Extension module will be used.

4. Feedback of stakeholders

Meeting with parents, students and agro industry management is necessary for feedback of our teaching and how helpful to student in their future career development.

5. Development of Faculty profile

Teachers will be sent to attend various seminars, symposium and summer/winter schools of agriculture and allied subjects where they get innovative ideas for overall development of the institute and upgradation of knowledge which they can emphasize in the teaching.

6. Modernization and atomization of class rooms and laboratories (considering curricula changes)

e-classrooms, modernization of laboratories and atomization of irrigation in the fields, development of demonstration units and atomization of livestock farm/unit will be modified as per the syllabi requirements.

Development of interactive lab for the students, availability of different A/V aid for hands on training to the students, Digital mimeographs for teaching the subjects like PRA and RRA are the essentials.

7. Industrial attachment for skill development

During RAWE students are allowed to attach to various seed industry, processing industry, manures and fertilizers industry for their practical knowledge and to choose career.

8. Attachment with various AICRP existing in the University

Students visit to AICRP like Dryland Agriculture and Watershed (AECC) and AICRP on IFS and other AICRP on crops, Dairy Unit, Livestock farms for better understanding the crops and cropping system and their research developments.

9. Short term training programmes for skill development

Short term training programme on composting methods, green manuring, dairy industry, processing industry, soil and water testing, manures and fertilizers industry, Poultry production and organic farming, land scaping and gardening, micro irrigation system design and management etc will be organized for students and society need base sectors. The short term training programmes in Communication skill, speaking skill, behavioral science, management and professional ethics are needed to be organized for the students during the study. Short term training programmes on organic livestock production, clean milk production, milk and milk products processing, sheep and goat production are also necessary.

10. Development of student's amenities /extra co-curriculum activities

- Conduct the students field visits for up gradation of their knowledge.
- Development of video clips related to particular course/ experiential learning modules for effective teaching.
- The various sport and cultural activities are organized for the students. Gymkhanas for the students, Sport facilities along with coach are needed.

Sports and Physical Education

Activities of games, sports and cultural events are run by the college since its inception, as an integral part of education. However, from the academic year 2017-18 a new course of physical education (GEN-111 of 0+1 credit) has been started and included in B.Sc. (Agri., Hort. and Forestry) degree programme with the inception of new syllabus at national level.

11. Establishment of basic science faculty

Establishment of basic sciences is required along with additional staff for better understanding the science of agriculture. It will facilitate the education in the new subject of basic science and also will develop the strong support in research and education.

12. Campus interviews and alumni Associations

Alumni Associations are more important for campus interview of students. Few alumni have their own industry or institute which will be effectively utilized for inspiration, motivation and guidance to the students.

13. Social attachment

NSS camp, RAWE programme and training programmes will be conducted for direct approaching the farmers and get acquainted with rural life, farming business, social activities and other knowledge.

The following strategies would be adopted to accomplish the vision and the goals of the Dr. PDKV Akola and to enhance efficiency and effectiveness of education.

SN	Goal	Strategies	Performance measures
1	Imparting globally competitive Post-Graduate education for capacity building	• Improvising teaching/ learning processes and methods for UG and PG education • Rigorous evaluation andup gradation of course curricula, faculty competence • Capacity enhancement	Development of international level infrastructure for education, research, hostel amenities etc., through project collaboration and public-private partnerships
2	Enhancing the content and quality of educational programmes	• State-of-the-art advanced centres for higher learning in agriculture • Effective integration of ICT, GIS, RS technologies different courses • Designing short-, medium- and long-term entrepreneurial training programmes on different farming technologies. • National Centre on Innovative Learning and Teaching in agricultural sciences	• Establishment of virtual centre of excellence in teaching and learning to reach the unreached • Developing strong linkages between traditional and agricultural universities and agro-industries for creation of 'Technology Parks' etc. • Development of a modern library and information centre with international standards • Development of International Centre on Innovative Learning and Teaching in

			agricultural sciences.
3	Upgradation of knowledge and skills of faculty	Modernize education system (Infrastructure, faculty, generation of new aids and modules in teaching	Qualified and trained man power will be generated in agriculture and allied sectors.
4	Creation of adequate facilities and quality human resources to address emerging challenges	• Increased experiential learning, with greater focus on science and processes. • Capacity building through i) trainings on recent developments and ii) visits to various laboratories and centres of advanced studies in different parts of the country and abroad. • Establishment of well equipped laboratories (marker assisted breeding labs, field laboratory, gain and seed quality analysis lab, cytology, physiology and tissue culture laboratories, nano technology) • Strengthening of PG class rooms and labs with latest equipments and technological advancement (Internet connectivity to enable distant learning programme) • Facilitating the PG students to secure fellowships and also pave way for their placement in reputed private and public organization and Universities abroad. • Effective co-ordination of undertaking collaborative	• Upgradation of faculty resulting in better quality teaching and research • Improved education and research

		research programme with various national institutes like CICR, NRCS etc.	
5	To educate students using innovative methods	• Promote more student engaged approach. • Emphasize, promote, and encourage experiential learning opportunities outside of the classroom. • Expand international exchange and educational opportunities • Promote graduate student participation in active teaching and extension/outreach activities. • Innovative teaching methods through power point, audio visual aids and video conferencing with expert	Use of innovative tools and techniques and emphasizing experiential learning
6	Updation of knowledge and skills of students and academic staff	• Establishment of well furnished state of art class rooms with audio visual aids and exhibits. • Development of new laboratories viz Biocontrol, Sericulture, Apiculture, HaNPV,Biosystematics, Toxicological residues, Nematological laboratory etc • Initiate experiential learnings courses on mass multiplication of Insect Parasites and Predators, Entomo-pathogenic nematodes, NPV, Sericulture and Apiculture • Necessity of exposure to UG and PG students for field	Creation of modern laboratories and emphasizing trainings and demonstrations.

		visits and commercial demonstration farms • To depute academic staff for participation in refresher training course, conference, symposium, seminars etc at national and international level.	
7	Post graduate education and research	• Revised PG education to incorporate new knowledge/information or reoriented to meet the emerging challenges through strengthening the competitiveness introduction of new specialized course and reorienting teaching methodology. • Research in major thrust area i.e. animal nutrition, health, animal production and milk processing	• Meeting the new challenges in education • Envisaged reinforcement of care of livestock and quality research is expected to have direct decisive impact on livestock productivity & food security for the human being.
8	Improvement in UG and PG education	• Upgradation of knowledge and skill of faculty • Abroad training of PG students • Creation of adequate facilities and modern soil and water testing laboratories	Meeting the new challenges in education
9	To meet the need of Agril. Engineering Education in the region as there is no institute of Agril. Engineering	Establishment of Agricultural Engineering College at Nagpur	Meeting the need of agril. mechanization

10	In view of MIHAN project in this region there is acute need to cater the requirement regarding post harvest processes	Establishment of Research institute of Post Harvest Technology at Nagpur	Development of linkages
11	To strengthen syllabus of B. Sc. (Hons) Agri. course to produce more competitive students	Present syllabus is not covering the basic aspects required for B.Sc. Hons.(Agri.) and essential to strengthen the syllabus	Emphasizing basic aspect
12	To popularize microirrigation and fertigation for all crops	Trainings on fertigation technology	Organization of short courses
13	Improvement in UG /PG teaching	• Quality UG/PG teaching with growing demand for economic input in agricultural R and D and technology related aspects and provide evidence- based policy advice related to production, marketing, distribution, macro management, trade and other aspects of Agril. Economy. • Develop policy think tank and a credible source of information on agricultural issues, strengthening to take up the expanding PG research agenda and to meet	Measures for quality improvement

		the rising expectations from it. ICAR has been quick to recognise this to make it "Regional Centre of Excellence". • Actively nurturing PG research partnership with National and International institutions. • Develop the data bases of research of PG thesis	
14	Updating of faculty	Organize capacity building seminars/workshops/training to enhance the skill of Agricultural Economists and social scientists to keep abreast with advances in Agricultural Economics.	Measures for capacity building
15	Strengthening PG Education	• Bottom up approach shall be adopted in the practical courses. • Emphasis on more accesses of PG students towards rural area.	Strong co-ordination with the extension agencies working at field level.

Research

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola has a major mandate to undertake research to cater the needs of agriculture sector in Vidarbha region of Maharashtra State. The University also participates in important activities of agricultural research organized through state policies as well as those under national programmes. It has also developed an excellent interaction with the national and international institutes.

The primary goal of the research in the university is to develop, innovate and test the technology for augmenting agricultural production and productivity consistent with the socio-economic and cultural needs of the region, compatible with the state objectives. Sustainability and profitability are major issues being handled to make the new technologies more remunerative as well as more eco-friendly to the target population. Thus, the objectives of research are:

- To organize basic and fundamental research to augment agriculture
- Develop crop production technologies for Vidarbha region
- Utilize available resources in more efficient manner, with considerations towards sustainability
- To resolve the problems faced by the farmers and extension workers in adoption of the technologies

The research in the University is mainly of applied nature, which will be beneficial to the farming community and the citizens of the region. However, some fundamental issues are also taken for research, which will have indirect implications on the farm sector. The research programme in the university can be broadly classified into following major areas based on the activities.

Basic or Fundamental Research:

These are mainly aimed at to study physical, chemical and biological resource base available in the system and their relationship in the process of agricultural production and its quality. Such research is basically needed to generate the information, knowledge and database. It is undertaken both by faculty as well as

students of postgraduate departments in the University. Few such projects are sponsored and funded by external agencies.

Applied Research:

These activities are aimed to resolve the problems of immediate importance, faced by the extension workers and farmers. It is also aimed to monitor the feed back problems to make the technology recommended by the University more useful to the farming community.

Need Based Short Term Ad-Hoc Research:

They are taken up to tackle the situations emerging on the adoption of the technology. These are tackled in a short period of one to three years and are usually adhoc in nature. Several such projects are funded by ICAR, NATP, BARC, Mumbai, Govt. of India and Development Departments of Government of Maharashtra.

Operational Research:

These activities are taken on farmer's fields and are primarily aimed at studying the impact of innovations by the scientists on farmer's field or with actual users. It develops good interaction between the scientists and the end-users of the technology. It helps to develop site-specific modifications and refinements wherever necessary. Moreover, they provide good feedback to plan future research to resolve the problems.

Agro-ecology of the region

The region in the jurisdiction of the university has been divided into four Zones on the basis of precipitation, number of rainy days, soil group, physiography and cropping system. The zone receiving 700-950 mm precipitation predominantly hasVertisols, Inceptisols and Entisols. The assured Kharif Crop Zone consisting of the districts namely, Buldana, Akola, Amravati and part of Washim district, while the districts Yavatmal and Wardha and part of Nagpur are characterised by its precipitation in the range of 950-1250 mm. in 52-62 rainy days having Vertisol and Inceptisols soils constituted the Moderate Rainfall Zone. The districts namely, Bhandara, Gondia, Chandrapur and Gadchiroli have been categorised as the High Rainfall (1250-1700 mm.) zone. The hilly tracts of Amravati district receiving

rainfall in the range of 950-1700 mm have been categorised as Moderate to High Rainfall Zone. The Vidarbha region is endowed with rich forests. The region has an area of 27.5 lakh hectares under forest which accounts for 52 per cent of the total forest area of the State and 28 per cent of the geographical area of the Vidarbha region. The University jurisdiction covers three agroclimatic zones viz; Eastern Vidarbha Zone, Central Vidarbha Zone and Western Vidarbha Zone.

Cropping Pattern

Agriculture in Vidarbha is characterised by rainfed farming with 90 per cent of the cultivated area dependent on monsoon. Food grains account for about 54 per cent of the gross cropped area. Cotton and Soybean are major crops of the region. The intercropping of pigeonpea with cotton is most predominant along with soybean-pigeon pea, cotton –green gram, black gram. The area under sorghum has been declined in the past decades. Maize has been introduced and the area under maize is increasing. During rabi the most predominant crop grown is chickpea and wheat, linseed, mustard, safflower and other crops grown. The crop diversification is essential in the region to discourage the monocropping. Rice is the major crop in eastern Vidarbha region and the productivity is limited by the vagaries of nature like scanty and uneven distribution of rains with prolonged dry spells. The harvesting of rainwater by farm ponds is the important intervention to combat the drought situation. Nagpur mandarin is the predominant fruit crop grown in the district of Nagpur, Amaravati, Wardha and Yeotmal. The high density planting of orange recommended by the University has been found beneficial to overcome the phytophthora problem and farmers are adopting the technology. The region has vast scope for plantation of dry land horticultural crops like Jamun, Aonla and custard apple. Monocropping of cotton and soybean has resulted into emergence of problem like soil health decline, pest and disease outbreak and low yields. This necessitates interventions like crop diversification and the crops like maize, turmeric, ginger, safflower, ajwain, linseed have the potential. The rabi sorghum also is a most potential crop suitable in the region which can provide fodder to support dairy enterprise. There is also vast scope in Eastern Vidarbha region for growing second crop during rabi after drill rice.

Constraints in Maharashtra's Agriculture in General

- Low productivity in major crops.
- High cost of production and lack of remunerative prices for the produce
- High variation in productivity status of crops in different ecologies.
- Acute labour shortage and high wages of labourers
- Exorbitant cost of agricultural inputs affecting the production cost.
- Intensive agriculture leading to depletion of soil organic matter
- Pest and disease attack affecting yield levels significantly

Constraints in Vidarbha's Agriculture in Particular

- Uneven and unpredictable rainfall
- Consistent dry spell and long moisture stress
- Improper cultivational practices leading to degradation of micro flora of soil
- Declining soil health and crop productivity
- Widening gap in nutrient demand and supply
- Very less availability of organic as a source of nutrients
- Outbreaks of insect pest and diseases in major crops
- Lack of storage facility to harvested grains and horticultural crops particularly perishable fruits
- Negligible cold storage facility
- Improper marketing and infrastructure facility
- Inadequate infrastructure of polyhouse, net house for high value crops
- Shrinking surface water storages limiting water productivity
- Very less irrigation facility
- Lack of facility of dairy development, sheeps/goats and dairy network
- Very low income of farming community
- Reduced availability of farm labours
- Improper delivering of farm implements at door steps of farmers

The Research Network of the University

- All India Coordinated Research Projects : 26
- Agriculture Research Stations : 16
- Crop Research Units : 17
- Zonal Research Stations : 02
- Regional Research Stations : 01
- Central Research Stations : 01
- Central Demonstration Farm : 01

Table 4.1: All India Coordinated Research Projects (26)

S.N.	Project	Estd.
1	AICRP on Cotton Improvement	1969
2	AICRP on Dry land Agriculture	1970
3	AICRP on Oilseeds Improvement, Sunflower	1972
4	AICRP on Post Harvest Technology	1972
5	Breeder Seed Production Unit, Wani Rambhapur (BSP)	1972
6	AICRP on Fruits	1974
7	AICRP on Rice Improvement, Sakoli	1979
8	Seed Technology Research Unit	1979
9	AICRP on Sorghum Improvement	1979
10	AICRP on Integrated Farming System Research	1983
11	AICRP on Agro Forestry, Nagpur	1986
12	AICRP on Oilseeds Improvement, Linseed, Nagpur	1987
13	AICRP on Oilseeds Improvement, Sesame, Nagpur	1987
14	AICRP on Renewable Energy Sources	1990
15	AICRP on Agro-meteorology, Akola	1995
16	AICRP on Long Term Fertilizer Experiments	1996
17	AICRP on Micro & Secondary Nutrients & Pollutant Elements	1996
18	AICRP on Medicinal and Aromatic plants	1997
19	AICRP on Farm Implements & Machinery	1997
20	AICRP on Pulses Improvement (MULLARP)	2000
21	AICRP on Pulses Improvement (Pigeonpea)	2000
22	AICRP on Oilseeds Improvement, Safflower	2001
23	AICRP on Oilseeds Improvement, Soybean, Amravati	2009
24	AICRP on Oilseeds Improvement, Rapeseed and Mustard, Nagpur	2009
25	AICRP on Weed Management	2015
26	AICRP on Chick Pea	2015

Table 4.2: Agricultural Research Stations (16)

S.N.	Name Agricultural Research Stations	Estd.
1	Agriculture Research Station, Sindewahi	1911
2	Agriculture Research Station, Washim	1919
3	Agriculture Research Station, Yavatmal	1920
4	Agriculture Research Station, Achalpur	1927
5	Agriculture Research Station, Buldana	1928
6	Regional Research Station, Amravati	1953
7	Agriculture Research Station, Sonapur	1965
8	Regional Fruit Research Station, Katol	1965
9	Agriculture Research Station, Tharsa	1965
10	Agriculture Research Station, Navegaon Bandh	1966
11	Agriculture Research Station, Sakoli	1969
12	Agriculture Research Station, Kutki	1969
13	Betelwine Res. Station, Ramtek	1973
14	Agriculture Research Station, Ekarjuna	1974
15	Agriculture Research Station, Amgaon	1979
16	Betelwine Research Station, Divthana	1979

Achievements

Various research units in the university have contributed largely in bringing out improved varieties of different important crops, need based farm implements and several technologies useful to farmers. Till now a total of 169 crop varieties, 23 farm implements and 1376 technologies have been released by the university. The salient achievements have been given below.

- Developed the world's first cytoplasmic male sterility (CMS) based cotton hybrid PKV Hy-3.
- Created variability in cotton by using wild germplasm and heterosis breeding.
- Released cotton hybrid PKV Hy-2, hirsutum varieties AKH-081, PKV Rajat & arboretum varieties AKA-7 & AKA-8.
- Released scented and small seeded paddy varieties PKV Khamang, PKV Makrand and Sakoli-7.

- Released paddy early varieties Sakoli-6 and Sindevahi-1, mid late varieties PKV-Kisan, Sindewahi-75, PKV Ganesh, Sindewahi-4, PKV HMT, Sakoli-9, PDKV Akshad, Sindewahi-2001 late varieties and Sindewahi-5, Sakoli-8 and PDKV Tilak.
- Developed and released sorghum hybrids CSH-14, SPH-1635 and CSH-35, impoved sorghum varieties SPV-669, PDKV Kalyani and PKV Kranti (rabi season) and Sorghum parching variety PDKV Kartiki, Wani sorghum PKV Ashvini and sweet sorghum AKSSV-22.

- Developed and released Wheat varieties for dryland area Sharad and PDKV Washim, for irrigated timely sowing Purna and Vimal and irrigated condition late sowing PDKV Sardar AKAW – 4627 and AKW- 381.
- Released Bajra variety PKV Raj (BBH-3)
- Released Chickpea Varieties JAKI 9218, PDKV Kanchan, PKV Harita and bold seeded varieties PKV Kabuli-2 and PKV Kabuli-4.

- Released Greengram varieties PKV Green Gold, PKV Mung- 8802 and PKV AKM-4
- Released pigeon pea variety PKV Tara resistant to wilt disease and AKT-8811.
- Released Blackgram varieties TAU-1 having countrywide demand and TAU-2, PDKV Black Gold.

- Released Soybean variety PDKV Yellow Gold (AMS-1001)
- Developed groundnut variety TAG-24 in collaboration with BARC suitable for all seasons and released bold seeded groundnut variety AK-303 and PDKVG-335

- Developed sunflower varieties PKVSF-9 and TAS-82 and hybrid PDKVSH-27 and PDKVSH-952
- Developed and released safflower varieties PKV Pink and AKS-207.
- High yielding linseed varieties NL-97 and PKV NL-260 released.
- Developed and released sesame varieties Kharif AKT-64, Semi rabi N-8 and Summer AKT-101 and Summer PKV NT-11
- Released mandarin varieties Nagpur seedless and PDKV Santra-5
- Released Sweet orange variety Katol Gold.
- Released Acid lime varieties PDKV Lime, PDKV Chakradhar, PDKV Bahar and PDKV Trupti.

- Released Chilli varieties Jayanti (Red Chilli) and PDKV Hirkani (Green Chilli)
- Released white onion variety Akola Safed for rabi season.
- Released Turmeric variety PDKV Waigaon
- Released Brinjal varieties Aruna and AKLB-9
- Released Limabean variety AKLB-2
- Released Okra variety PDKV Pragati
- Developed Mini Dal Mill for cottage industries having National demand.
- Developed PDKV self propelled pneumatic planter for precision sowing.
- Developed PDKV self propelled BBF planter cum inter row cultivator and small tractor operated inter row cultivator

- Developed PKV-Bullock drawn cotton planter.
- Developed PKV citrus harvester.
- Developed PKV BBF planter cum inter row cultivator.
- Developed PDKV Tractor drawn Slasher for in-situ incorporation of crop residues.
- Developed integrated PKV mini dal mill.
- Released PDKV Green gram Wet dehuller

- Released PDKV Turmeric harvester
- Released PDKV hand operated custard apple deseedling machine
- Developed technology of preparation of turmeric powder after harvesting within 24 hrs.
- Successful in controlling citrus blackfly syndrome in Nagpur mandarin.
- Production of HaNPV and trichocards on commercial basis.
- Developed and recommended the IPM modules for cotton and pigeonpea.
- Recommended plant protection schedule for Chilli leaf curl disease which is accepted nationally.

- Development of suitable intercropping/ sequence cropping systems for rainfed as well as irrigated conditions.
- In-situ conservation of soil and rainwater by using vegetative contour key lines and continuous contour trenches (CCT).
- Development of PKV model for In-situ soil and water conservation.
- Establishment of Nagarjun Medicinal Plants Garden and conserved about 400 medicinal plants species.
- Alternative uses of mouldy sorghum for production of liquid glucose, high purity alcohol, starch, etc.
- Released GPS-GIS based Micro and Secondary nutrients status maps for Maharashtra state.
- Started Centre for Organic Agriculture Research & Training for Vidarbha region.
- Recommended PDKV compost method and protocol for preparation of Phosphocompost from crop residues.
- Recommended technologies for amelioration of sodic-saline soils in Purna valley.
- Phosphate fertilizer economy by using alternate sources like phosphocompost, press mud cake etc.
- Recommended various technologies for enhancing nutrient use efficiency and soil health improvement.

Sorghum crop varieties of Dr. PDKV are popular among farmers. PKV Kranti is cultivated on 18,000 ha area out of 26,000 ha in Vidarbha covering 69.23 per cent area, whereas CSH 14 sorghum variety is cultivated on 5200 ha. Recently released PKV Ashwini (Hurda variety) covers 310 ha area in Vidarbha.

In oilseeds, Ground nut crop variety TAG 24 is most popular among farmers which is cultivated on 39,700 ha area covering 90 per cent whereas recently released AK 303 (bold seeded) occupies 150 ha area and it is now becoming popular among farmers. Safflower variety AKS 207 occupies 1000 ha area and PKV Pink covers nearly 400 ha area. In linseed, University variety PKV NL-260 is cultivated on 24,800 ha area. In sesame crop, PKN-NT-11 is cultivated on 14000 ha area, whereas Mustard crop variety Shatabdi is cultivated on 80 ha area.

In case of cotton, Deshi cotton varieties are popular among farmers for dry land cultivation. Variety AKA 7 is cultivated on 20,000 ha and AKA 8 on 4000 ha area, whereas, American cotton variety AKH 081 is cultivated on 1500 ha area, Deshi cotton Hybrid PKV Suvarna cultivated on 1500 ha area.

Pulse crop varieties are popular among farmers. In Pigeonpea crop, PKV Tara is most popular and is cultivated on 258720 ha area. Green gram variety, PKV Green Gold occupies 900 ha area whereas PKV AKM-4 covers 237 ha area. In black gram, University variety TAU-1 is most popular and covers 360450 ha area. Newly released AKU-15 and PDKV Black gold are cultivated on 6720 and 840 ha area respectively. Whereas chickpea variety JAKI -9218 is very popular among the farmers and occupies 943600 ha area. The bold seeded variety PKV Kabuli-4 occupies 27300 ha area. Recently released PKV Harita and PDKV Kanchan cover 546 and 50 ha area respectively.

Wheat Crop Variety Vimal (AKAW-3722) is cultivated on 16980 ha area, whereas wheat variety AKAW cultivated on 69780 ha area. PDKV Washim covers 8910 ha area. Recently released variety PDKV Sardar is also becoming popular in farmers.

Recently released rice variety PDKV Kisan is cultivated on 12,000 ha whereas Sakoli-9 is also preferred by the cultivators.

In Horticultural crops mandarin University variety Nagpur Seedless covers 40,000 ha area. Newly released PDKV Mandarin 5 occupies 110 ha area whereas recently released acid lime variety PDKV lime is planted on 22000 ha area, PDKV Bahar and PDKV Chakradhar occupies 144 and 60 ha area respectively.

University released implements are popular among farmers, PKV mini dal mill is most popular and till now 1500 units have been sold, similarly other implements like PDKV fruit grader, PDKV cleaner grader and PDKV screw polisher were sold 40, 20 and 28 units respectively.

The University has also taken initiative to establish public-public and public-private partnership from last few years and several MOUs in respect of technology development, seed production, farm implements and machinery have been signed.

Several useful technologies in field of Dry land agriculture, weed management, IFSR model, balanced fertilizer use, soil reclamation, organic farming, medicinal plants, agro forestry, plant protection, fertigation and soil and water conservationhave been released which are largely adopted by the farmers of Vidarbha region in university jurisdiction.

Varieties registered under PPV and FRA

The registration of varieties with the PPV and FRA is continued. So far, 71 proposals have been submitted to the authority and 34 registrations have been granted to various varieties of different crops like wheat (3), Mungbean (3), Cotton (7), Sorghum (4), Paddy (4), Safflower (1), Sunflower (1), Soybean (2), Urdbean (1), Gram (4), Groundnut (3) and Mustard (1). The University is honoured to receive the first prize by PPV and FRA authority, New Delhi for registration of maximum number of crop varieties in the country during 2016-17.

Table 4.3: Crop varieties registered under PPV and FRA

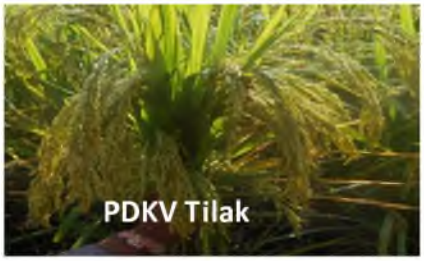
S N	Crop	Variety	Registration No.
1.	Wheat	AKW-1071 (Purna)	166 of 2009
		AKAW-3722	43 of 2014
		AKAW-4627	754 of 2014
2.	Mungbean	TARM-18	49 of 2010
		PKV GREEN GOLD	336 of 2014
		PKV Moong -8802	659 of 2014
3.	Sorghum	AKSSV-22	43 of 2011
		AKSSV-13R (PKV Kranti)	44 of 2011
		PKV Ashwini	120 of 2015
		SPH – 1635	
4.	Cotton	AKA-7	107 of 2012
		AKA-8	45 of 2011
		PKV Hy-4	46 of 2011
		PKV HY-5	78 of 2012
		PKV-DH-1	119 of 2012
		AKH-8828	109 of 2012
		PKV SUVARNA (AKDH-5)	401 of 2014
5.	Rice	PKV-HMT	106 of 2012
		SKL-8 (SKL-11-28-29-55)	142 of 2014
		SYE-2001	111 of 2013
		PKV MAKARAND	97 of 2013
6.	Safflower	AKS-207	30 of 2012
7.	Sunflower	TAS-82	12 of 2012
8.	Soybean	TAMS-38	26 of 2014
		TAMS-98-21	35 of 2014
9.	Udid	AKU-15	338 of 2014
10.	Groundnut	AK-159	64 of 2013
		AK-303	65 of 2013
		AK-265	66 of 2013
11.	Gram	PKV KABULI-2	486 of 2014
		JAKI-9218	337 of 2014
		GULAK-1	339 of 2014
		PKV KABULI -4	
12.	Mustard	ACN-9	243 of 2013
	Total	34 Thirty four)	

Crop Improvement

Cereals

Rice

- Released rice varieties viz., SKL-6, SKL-7, SKL-8, PKV-Ganesh, PDKV KISAN and Sakoli-9, PKV HMT and SYE 2001.
- Pre-release of three rice varieties viz., SKL- 6-1-23, SKL-30-39-24-8-9 and SKL-28-12-26-1-24-18 (Sakoli-10).
- Two Rice varieties viz., PKV HMT,SYE 2001, PKV- SKL 3-11-25-30-36 and SKL-11- 28-29-55 (SKL-8) registered in PPV and FRA, New Delhi.
- Five rice genotypes Registered in NBPGR, New Delhi
- 591 rice germplasm of different traits is maintained and used in rice varietal development programme.
- Released SYE-1 and SKL-6 Early duration varieties suitable for Kharif and Summer season.
- Released PKV Khamang and PKV-Makarand which are scented varieties.
- Released PDKV Tilak variety of rice which is fine grained.



Wheat

Wheat Research unit has Released / Notified total 9 wheat varieties promising for various characters and adoption conditions and Registered 22 Valuable germplasm lines with NBPGR.

- Released wheat variety AKW-381 and AKAW-4627 for irrigated late sown conditions.
- Released wheat variety AKW-1071 (Purna) for irrigated timely sown conditions.
- Released wheat variety Vimal (AKAW-3722) for irrigated timely sown conditions.
- Released wheat variety AKDW-2997-16 (Sharad) for rainfed conditions.

- Released Wheat variety PKV Washim (WSM-1472) rainfed and limited irrigation conditions.
- Released Wheat variety AKW-4210.6 (PDKV Sardar) for Late sowing conditions for state.
- 22 germplasm lines registered with NBPGR, few among these are viz; AKW-65-1 (Drought and heat tolerance), AKW-619, AKW-770 (Short duration and late heat tolerance), AKW-3294, AKAW-2862-1 (Early and late heat tolerance), AKAW-3722 (Early and late heat tolerance), AKDW-2997-16 (Pasta product specific), AKAW-3717 (Drought and heat tolerant), AKDW-3795-3 (Multiple resistant line- black, brown and yellow rust, BWM, FS) and PDKV Sardar (Early and late heat tolerant).

Sorghum

- Released CSH 14 early maturing (100-105 days) kharif hybrid during 1992 for cultivation all over the country. This hybrid is a replacement for CSH-1 and CSH-6.
- CSH 19R rabi sorghum hybrid released for deep soil and rabi irrigated areas.
- Mid late Kharif hybrid CSH 35 released at national level. It matures in 110-115 days.
- In 2017 this Rabi hybrid CSH 39 R released at national level.
- In 1988, this mid-late kharif hybrid SPH 388 released as a supplementary hybrid to CSH-9. It matures in 110-115 days.
- Potential hybrid SPH-840 with medium maturity developed and released.
- In 2012, mid-late kharif hybrid SPH 1635 has been released.
- Straight kharif dual purpose variety CSV 34, SPV 669 and PDKV Kalyani released at national level.
- Single cut fodder sorghum variety Improved Ramkel released in the year 1984.
- PKV Kranti potential rabi dual purpose sorghum variety released at state level.
- Sweet sorghum variety AKSSV-22 released at state level.
- PKV Ashwini and PDKV Kartiki for green hurda (Kharif hurda) released

Pulses

- Released Medium early, high yielding AKT - 8811 and high yielding, resistant to wilt PKV TARA pigeonpea variety.
- Developed and released green gram varieties; TARM – 2, PKVM – 8802, PKV Green gold and PKV AKM – 4.
- Developed and released black gram varieties; TAU – 1, PKV Udid (AKU - 15), PDKV Black gold.

- Released chick pea varieties; Gulak 1 (Bold seeded), PKV Kabuli 2 (Extra bold seeded), JAKI-9218, PKV Kabuli 4 (Extreme bold seed), PKV Harita (AKG-9303-12) (Medium bold green seeded), PDKV Kanchan (resistant to wilt).
- Released Lablab variety AKLB-9306.

Oilseeds

- Released soybean varieties; TAMS-38, TAMS-98-21, PDKV yellow gold
- New strain (MYMIV) of Soybean Yellow Mosaic Virus in Vidarbha region of Maharashtra was identified in coordination with BRNS, Trombay.
- Developed genotype viz. AMS 1002, AMS- MB-5-18 and AMS 1003 promoted to AVT-I in AICRP on Soybean channels.
- Breeding line of soybean AMS -59 is identified as potential source of resistance against pest complex.
- Breeding line of soybean AMS-MB-5-19 is identified as potential source of resistance against pest complex.
- Released Linseed variety NL–97 and PKV NL–260 for cultivation under rainfed and irrigated condition.
- Released sesame variety AKT-64 for kharif and AKT-101and PKV NT-11 for summer cultivation.
- Mustard variety ACN-9 (Shatabdi) released for cultivation in Vidarbha region.

Cash Crops

Cotton

Increase in seed cotton yield could be achieved through development of high yielding varieties and hybrids. Hybrids with high yield potential have been released in American cotton exploiting heterosis to the maximum extent from Dr. PDKV, Akola.

- F 1 hybrids PKV Hy. 2, PKV Hy.4 and PKV Hy.5 are most notable among them released for Vidarbha region and central India.
- In Deshi cotton PKVDH-1 and PKV Suvarna (PKVDH-5) are released high yielding hybrid for Vidarbha region from this university.
- Improved high yielding varieties of Deshi cotton like AKA-4, AKA-5 , AKA-8401, AKA-7, AKA-8, AKA-2005-3 (recently released in 2014) and American cotton varieties like DHY-286, AKH-081, PKV Rajat, AKH-8828 and AKH-9916 (recently released in 2014) were contributed to increased yield in rainfed cotton belt of Vidarbha as well as central India.
- Released six varieties and two hybrid of *G. arboreum* while five varieties and four hybrids of *G. hirsutum*.
- Released Arboreum cotton varieties viz; AKA-4, AKA-5, AKA-8401, AKA-7 and AKA-8.
- Released Arboreum cotton hybrid viz; PKV DH-1 and PKV Suvarna.
- Released Hirsutum cotton varieties viz; DHY-286, AKH-081, PKV- Rajat and AKH-8828.
- Released Hirsutum cotton hybrids viz; PKV Hy-2, PKV Hy-3, PKV Hy-4 and PKV Hy-5.
- PKV Hy-4 is the first commercial hybrid in the world, based on cytoplasmic male sterility released for cultivation in 1993.
- In cotton, developed *G. harknessii* is the only source for cytoplasmic male sterility.
- Successfully developed an alternate source of cytoplasmic male sterility in tetraploid cotton by using a wild species, *G.aridum*.

- Using a wild species G. anomalum a new source of genetic male sterility was developed and utilized for the development of hybrid PKV DH-1 released in 2002 and AKDH-5 released in 2006.
- Utilized wild species *G. aridum, G. raimondii, G. thurberi and G. anomalum* are for the introgression of various economic characters and genetic markers from wild species to cultivated species.
- University has signed MOU with MSSCL, Akola for conversion of PKV Hy.-2 in BG-II version. Through this project, PKV Hy.-2 BG-II has been developed which has been approved by Department of Agriculture and Cooperation, New Delhi during 2017.
- The hybrid PDKV JKAL-116 BG-II has been developed through collaboration with JK Agri Genetics Pvt. Ltd., Hyderabad and it is approved by GEAC for its commercialization for central zone during 2016-17.

Improvement in fibre quality:

- Significant achievement have been made in fibre quality especially fibre length and spinning capacity.
- Long staple Deshi cotton variety AKA-8401 released in 1989 having 26-27 mm staple length, 40s spinability count, 38% ginning outturn.
- While American cotton hybrid PKV Hy-4 released in 1996 having 30.2 mm staple length, 50s spinability count & PKV Hy-5 with 60 scounts released in 2002.
- AKH-8828, a hirsutum variety highest in ginning outturn, 41 – 42 % with good fibre quality released in 2005 for general cultivation in Vidarbha region.

Improvement in adoptability:

- PKV Hy.2 released in 1981 is having wider adoptability and tolerant to sucking pests and still it is under cultivation since last 24 years.
- The variety AKH-081 is extra early and having drought escape mechanism suitable for shallow to medium soil.
- PKV Rajat released in 1994 is popularly grown in saline tract of Vidarbha since it is tolerant to saline soil conditions.

Insect resistance

- The varieties resistant to sucking pests were released by Dr. PDKV, Akola are DHY-286, PKV Hy.-2, AKH-081, PKV Rajat, AKH-8828 and AKH-9916.

Earliness

- The maturity duration has been reduced to 160–170 days in PKV Hy.5.
- In Deshi cotton, the early variety AKA-7 takes 140–150 days to mature as against 210 days in late varieties with comparatively less incidence of pink bollworm.

Sugarcane

- Sugarcane variety CO-7714 is recommended specially for central Vidarbha Region.

Following varieties of field crops have been released.

For fodder grass: NG-13. NG-22, NG-5, NG-73, NG 107, NG-308 and NG-287, For Cotton: B-147 and B-1007, For Sorghum 22-5-16 (CMS line), for Pigeonpea EB-3 and EB-38 and for Maize PKV M Shatak- High yielder than Manjari composite and Panchaganga. Soybean cv. JS 80-21 tolerant to water logging of four days has been recommended.

Horticultural Crops

Fruits

- Developed & released acid lime varieties Chakradhar (seed less, thornless) and PDKV Trupti (for pickles).
- Developed and released Nagpur mandarin varieties, PDKV Nagpur Santra and Nagpur seedless.
- Developed and released sweet orange variety Katol Gold.
- The Aonla varieties, Krishna and Chaikaya having less fibre content are recommended for the preparation of best quality candy.
- The Aonla variety Neelam (NA-7), Chakiyya and NA-10 are recommended for Vidarbha region.

Vegetables

- Early duration turmeric genotype GDT-06-02 with high curcumin content and rhizome yield is recommended.
- Developed and released onion variety Akola Safed.
- Released brinjal genotype AKLB-9 high yielding green fruited with tolerance to fruit & shoot borer.
- Released lima bean genotype AKLB-2 with higher yield of dry seed for vegetable purpose.
- Released sponge gourd genotype PDSG-31 with small size, golden colour fruits.
- Fenugreek variety CO-2 is recommended for earliness more fresh green leaf yield and economic returns.
- Released Okra variety PDKV Pragati (AKOV 107).

- Released Chilli variety Hirkani (AKC 406) and coriander variety Pant Haritma

Flowers

- Released chrysanthemum variety AK-CHR-MUT-05-02 and Bijali supers (NAC 07).
- Released gladiolus variety Akola Roshani (AK-GL-04-06-A).
- Released Gaillardia variety PDKV Roshani.

Crop Production Technologies

Cereals

Rice

- For effective control of weed and getting higher yield in case of direct seeded rice, pre-emergence application of Butaclore, Stomp-30 and Benziocarb is recommended.

Sorghum

- Sowing of kharif sorghum on four row BBF at 45 cm by tractor is recommended for getting maximum yield, net return and improved moisture conservation.

Pulses

- Early sowing in 26thMW (last week of June) with basal application of 20 kg N and 40 kg P_2O_5 /ha recommended for higher grain yield of green gram.
- The seed treatment with Rhizobium and PSB (25 g/kg seed) with basal application of 25 kg N + 50 kg P_2O_5 /ha for green gram and black gram is recommended.
- For obtaining higher yield of rabi green gram sowing should be done between 25th October to 25thNovember.
- Rabi green gram should be sown with 45x10 cm or 30x15 cm spacing.
- TAP-7 green gram variety should be sown at spacing of 45 cm X 10 cm or 30 X 15cm.
- For getting high yield from irrigated Rajma MUR-15, sowing should be done in first fortnight of November.
- The optimum sowing time for rabi blackgram is 25th October to 9th November.
- For obtaining higher grain yield of black gram should be sown in the last week of October at 30x10 cm spacing.
- In medium deep black soil, for higher grain yield of greengram and blackgram, application of potassium @ 20 kg ha^{-1} along with recommended dose of 20 kg N and 40 kg P_2O_5 ha^{-1} is recommended.
- In medium deep black soils, for higher grain yield of rainfed chickpea potassium @ 40 kg ha^{-1} along with nitrogen @ 20 kg ha^{-1} and phosphorus @ 40 kg ha^{-1} is recommended.
- In pigeonpea one irrigation at bud formation and another at pod formation stage resulted in 54 per cent rise in productivity.
- Pigeonpea should be planted on ridges and furrows for maximum yield or opening furrows 30 days after sowing is recommended for efficient water conservation.
- Chickpea should be irrigated at pre-flowering and another at early pod initiation stage raise the yield level substantially by 52 per cent.
- Chickpea should be inoculated with Rhizobium culture along with basal application of 25 kg and 50 kg P_2O_5 /ha for higher productivity.

- For early planting of kabuli chickpea variety ICCV-2 up to 20 October, closer spacing of 30x10 cm can be advantageous.
- For getting maximum yield of pigeonpea, blackgram and chickpea it is essential to keep the crop weed free up to 75, 45 and 45 DAS, respectively with pre-emergence application of pendimethalin.
- For late sowing till last week of December of kabuli chickpea variety ICCV-2 the basal application of fertilizer dose of 25 kg N +50 kg P_2O_5/ha with irrigations at the flowering & pod formation stages are recommended for higher production.
- Under rainfed condition for desi chickpea, for higher grain yield soaking of seed for 4 hrs in water is recommended.
- For normal sowing in last week of October, French bean varieties PDR-14, HUR-15 are recommended, while under late sowing during November, cv. HUR-137 should be selected.
- The spacing of 45x10 cm is recommended for Rajmah cv VL-63 and HUR-137 with the seed rate of 90 kg/ha, while closer spacing of 30x10 cm is recommended for variety PDR-14 with the seed rate of 120-135 kg/ha.
- Application of two irrigations one at branching and at bud or pod formation of Field pea recorded maximum yield with basal fertilizer application @ 30:60 kg N: P_2O_5 ha^{-1} is recommended.
- For higher productivity of lentil basal application of 25 kg N + 50 kg $P_2O_5ha^{-1}$ recommended for higher grain yield.
- For higher production of lablab bean sowing should be done in last week of October along with basal dose of 25 kg N + 60 kg $P_2O_5ha^{-1}$.
- Horse gram variety D 40-1, field pea should be sown by the end of July with 4.40 lakh/ha population with 22.5x10 cm spacing.
- For August sowing field pea variety Selection-37 should be used with 45x10 cm spacing.

Oilseeds

Soybean

- It is recommended that the early maturing soybean genotypes (75 to 85 days) should be sown at 30 x 9 cm. or 30 x 6 cm. Whereas genotypes required 95 days

for maturity should be sown at 30 x 12 cm along with 40kg N + 80 kg P2O5 /ha for optimizing the yield of soybean.

- Cotton + Soybean intercropping an early maturing soybean variety (75 days) should be used.
- Foliar application of 2% urea at 50 and 70 DAS along with RDF is recommended to soybean for getting highest yields of soybean.
- In rainfed condition three tier intercropping system Soybean + Sorghum + Pigeon pea (6:2:1) or (9:2:1) row spacing is recommended.
- Seed inoculation of bio-fertilizers (Rhizobium + PSB, 20g each/ kg seed) + 50% RDF/ha is recommended for the intercropping system of Pigeon pea + Soybean (1:2) for higher returns.
- An integrated weed management in intercropping of Pigeon pea + soybean (1:2) indicated the highest Pigeon pea equivalent yield in Pendimethalin @ PE 0.75 ai kg/ha + one hand weeding at 40 DAS.
- In Soybean for getting higher productivity, monetary returns and better moisture conservation, opening of furrow after every three rows at about 30 days is recommended.
- Application of straw mulch 5 t/ha with anti-transparent KNO_3 @ 1% or $MgCO_3$ @ 5% or Glycerol @ 5% 15 days after flowering is recommended for water stress tolerance in soybean.
- In soybean, seed treatment of Rhizobium and Phosphate solubilizing bacteria (PSB) @ 25g/kg seed each and ammonium molybdate @ 4g/kg seed along with 15 kg N and 16 kg P_2O_5 per ha at the time of sowing is recommended.

Sunflower

- Sunflower should be sown in 1st week of July, first fortnight of October and last week of January to 1st week of February during *kharif*, *rabi* and *summer* seasons respectively for obtaining higher yields.
- Intercropping of groundnut and sunflower in 6:2 and sunflower and red gram in 3:3 row proportions is found remunerative.

- Sunflower - sunflower rotation should be avoided as it increases pest and disease complex. Spacing at 45 x 22.5 cm for variety Morden and 45 x 30 cm for hybrid variety should be followed in sunflower for higher yields.
- A dose of 40:40:0 kg NPK/ha for Morden and 60:60:0 kg NPK/ha for remaining varieties/hybrids of sunflower should be applied for optimum yields.
- Irrigations at seedling, bud, flowering and grain filling stages during rabi found beneficial for higher yields in sunflower.
- Seed soaking treatments with 10 ppm IAA and 10 ppm NAA for 6 hrs followed by drying under shed gives higher yield of sunflower.
- Application of 30:30:0 kg N,P_2O_5 and K_2O/ha at sowing along with three foliar sprays at 30, 40 and 50 days after sowing with DAP @ 5 g + Urea @ 15 g in one litre of water increases the sunflower yield.
- For getting higher seed yield in sunflower, application of FYM @ 5 t along with 40:60:40:25 NPKS kg/ha and seed soaking treatment is recommended.
- Application of RDF along with FYM @ 5 t ha^{-1} and spraying of 0.2% Borax at flowering initiation stage only on capitulum gave higher yield of sunflower hybrid PKVSH-27 in seed production programme.
- Sunflower stalk cutting with application of cellulatic microorganism culture along with dung slurry treatment application to the soil, 10 days before sowing of gram during *rabi*, has not observed any adverse effect on crop and increases organic carbon in the soil.
- For seed production of hybrid sunflower PKVSH-27 male female lines should be sown at the same day and application of 80 kg nitrogen, 120 kg Phosphorus and 60 kg Potash is recommended for getting higher yield.
- In sunflower hybrid seed production female and male lines should be sown in 3:1 row proportion with supplemented hand pollination increases 52% seed yield.
- Hand pollination practices in morning hours increases seed setting of sunflower.

- Sunflower crop requires 9-10 irrigations during summer at an interval of 10-12 days in Feb., 8-10 days in March, 6-8 days in April and 4-6 days in May depending upon soil type.
- Application of fertilizer and thinning are most important amongst improved package of practices in Sunflower.

Safflower

- Sowing of safflower at 45 x 20 cm to 30 cm is recommended for higher yields in safflower.
- For higher yield of irrigated safflower application of 40:40: 00 kg N, $P_2O_5$and K_2O ha^{-1} is recommended.
- Three to five irrigations should be given to safflower in medium to lighter type of soils for higher yields.
- For higher yields, safflower should be irrigated twice (at 35 and 55 DAS).
- Intercropping of safflower with gram or linseed in 6:3 or 3:3 row proportion (30 cm) and two rows of safflower paired (30/60 cm) plus one row of gram or linseed is profitable.
- Seed treatment with PSB @ 200 g/10 kg seed is recommended to compensate 25% recommended dose of P_2O_5.
- For getting higher seed yield and monetary return seed of safflower should be treated with Azotobactor and Azospirilum 20 g/kg seed along with 12.5 kg N/ha are recommended.
- Application of cycocel @ 500 ppm either at flower initiation or at 50% flowering under moisture stress conditions recommended for higher grain yield.
- Application of 30 kg S/ha through single super phosphate to increase seed yield and returns of safflower under rainfed conditions.
- Sowing of safflower during 1st week of October or as late as 1st week of November is recommended. Also, two irrigations, first during vegetative stage (30 DAS) and second at grain development stage (80 DAS) is recommended

Groundnut

- Early sowing (10th to 15th June) of kharif groundnut with one or two irrigations is found beneficial than normal sowing (25th to 30th June) on the onset of the monsoon.
- Spacing at 30 cm to 45 cm between rows and 10 cm to 15 cm between plants according to variety should be followed for higher yield.
- Basal application of 25:50:0 kg NPK/ha is optimum for higher groundnut yields.
- Application of 300 – 500 kg gypsum/ha at 50% flowering increases the yield in groundnut.
- Rhizobium seed treatment in groundnut increases the yield by 7%.
- Application of 10 kg zinc sulphate along with recommended dose of fertilizers at sowing time increases groundnut yield.
- Last week of January to 1st week at February is optimum time of sowing summer groundnut, last week September to 1st week at October is optimum time of sowing of rabi groundnut.
- Pre-monsoon sowing of groundnut with one or two irrigation increases seed yield.
- Application of Borax @ 5 kg/ha along with recommended dose of fertilizer and two foliar sprays of Borax (0.1%) at 35 & 50 DAS increases the yield of groundnut.
- Two foliar sprays of NAA @ 10mg/lit of water should be sprayed at 30 and 45 days after sowing for higher groundnut yields.
- Sowing of groundnut)TAG 24 (at 30 X 10cm is recommended for higher yield.
- Four row method of BBF cultivation increases groundnut yield than that of flat bed (normal) method.
- For higher yield of Kharif groundnut, protective irrigation at an interval of 12 to 15 days and 12-15 days to during dry spell found effective.
- For higher yield of summer groundnut, should be irrigated 15 to 17 times depending upon soil type.

- After complete emergence of groundnut, irrigation should be with hold in seedling stage upto 15 to 25 days depending upon soil type for higher yield.
- Sprinkler irrigation found better for higher yield of summer ground nut.
- Application of vermicompost @ 1.25 t/ha + Neem cake @ 500 kg/ha or FYM @ 5 t/ha + Neem cake @ 500 kg/ha with seed inoculation of biofertilizers (Rhizobium + PSB @ 250 g each/10 kg of seed) is recommended for organically grown groundnut.

Linseed, sesame and mustard

- Powdery mildew resistant plants have been isolated in M4 generation through the BRNS project.
- Two irrigations at 45 and 65 DAS recommended for maximum Linseed yield (variety PKV-NL 260) over no irrigation and one irrigation.
- Developed suitable module of INM in soybean. Linseed prevalent double cropping system.
- Developed suitable module of phosphorus management in soybean, linseed prevalent double cropping system.
- Recommended technology of sowing dates, fertilizer application and foliar application of nutrients on sesame.
- Addition of 20 kg $ZnSO_4$ + 25 kg $FeSO_4$ is recommended for obtaining higher seed yield of sesame and foliar application of 2 per cent DAP at flowering + Pod formation stages in addition to RDF.
- In soybean-linseed double cropping sequence, application of 75per cent recommended dose of fertilizer to both crops and bio fertilizer treatment to both the crop is recommended.
- Growing of linseed variety PKV NL-260 as sole crop or as intercrop in Chickpea + Linseed (4:2) intercropping system is recommended for higher productivity.
- Second week of October is recommended as optimum time of sowing for mustard.

- Foliar spray of thiourea at 50 per cent flowering + 50 per cent siliqua filling stage effectively mitigates the terminal drought stress and significantly increased the seed yield (over three years).
- For effective weed control, more yield and economic return in mustard, 2 weeding and 2 hoeing at 20 and 40 DAS or pre-emergence application of herbicide Oxadiargyl (80 WP) @ 90. g a.i. ha^{-1} or Pendimethalin (30 EC) @ 1.0 kg a.i. ha^{-1} is recommended.

Cash Crops

Sugarcane

- For effective control of *Sachharum spontanium* (Kans) spraying of Glyphosate 0.8% + 2% Urea on leaf of weed is recommended and one deep ploughing and three times harrowing. Should be done after each 15 days.

Horticultural Crops

Fruits

- Forbetter establishment of pomegranate, hardwood cutting treatment with IBA 2500 ppm found useful.
- Mango viz, Neelum, Pairi, Amrapalli, Rajapuri and Nagin are recommended for their cultivation in Vidarbha region.
- After grafting, Sapota, Custard apple and Mango graft should be kept under 70% green shade net house for better performance and establishment.
- The aonla syrup prepared by adding 25 per cent aonla pulp blended with 10 per cent lime juice and stored at cold storage.
- The aonla candy prepared form variety Krishna is recommended for its maximum nutritional qualities and consumer acceptance.
- For Nagpur mandarin, application of 100% RDF + VAM 500g + PSB 100g + *Azospirillum* 100g + *Trichoderma* 100g is recommended.
- Irrigation at 80% evaporeplishment for all the six stages of Nagpur Mandarin and acid lime is recommended.
- For high density guava orchard, planting at 3 x 1.5 m spacing (2222 plants/ha) is recommended.

- For banana, the nutrient dose of 75% RD, 1.5 kg Vermicompost, Azotobactor @ 50g, PSB @ 50g per plant is recommended.
- For commercial propagation of guava through softwood grafting, rootstock NGR-04, Sardar, NGR-5 are recommended.
- The application of 75%Vermicompost (on N-equivalent basis of RDF- i.e. 80 kg/ plant/ year) + *Trichoderma harzanium* (30-40 ml/plant) + Azadirachtin (1% at 3-4 ml/liter as spray)+ *Pseudomonas fluorescens* (30-40 ml/plant) is recommended for yield and quality of Nagpur mandarin.
- For Nagpur mandarin, drip irrigation at 90 % ER with nutrition application at 80 % RDF (960: 320: 320g NPK/ plant) is recommended.
- For best quality fruits of Nagpur mandarin, application of potassium @ 800 g per plant per year through Muriate of potash is recommended.
- The soft wood grafting in the month of December is recommended for maximum success in jackfruit.
- In Nagpur mandarin, pruning during third week of December at 10ft height is recommended for obtaining higher and better quality yield.
- Rangpur lime is recommended as rootstock for Nagpur santra.
- High density planting at 6m x 3m on raised bed (Indo Israel Citrus Production Technology) is recommended for obtaining better growth, yield and quality fruits of Nagpur Mandarin.
- For higher fruit yield in banana variety basarai, spraying of KH_2PO_4 @1500 ppm + urea @ 1% on fruit bunch after 55 days of flower initiation is recommended.
- Technologies developed for *Phytophthora* control in sweet orange, Rejuvenation of declining citrus orchards, Chemical control of gummosis in Nagpur santra, Rejuvenation of old guava orchard, Single furrow irrigation to check the Phytophthora infestation in citrus.
- The spraying of GA3 25 ppm and urea 1% on Rangpur lime seedlings after transplanting recommended for obtaining the seedling of better vegetative growth and more percentage of seedlings of buddable size.

- Seventy per cent agro-net is recommended for covering the bud grafts of Nagpur mandarin budded on Jamberi/Rangpur lime rootstock.
- Pruning at 3.0 cm thick shoot from tip in first fortnight of May is recommended in twenty years old guava trees for obtaining the highest fruit yield.
- The spraying of KNO_3 @ 0.5% in first fortnight of October is recommended in Vidarbha for growing mango and obtaining early flower initiation and regular flowering with the highest yield.
- The spraying of GA_3 10 ppm or Thiourea 0.1 % four times at monthly interval starting from 45 days after transplanting of Jamberi rootstock seedlings found effective for vigorous growth of rootstock and scion of Nagpur mandarin.
- Nagpur mandarin fruits of Mrig as well as Ambia bahar should be treated with 6% waxol alone or in combination with 0.1% Carbendazim to store for 20 days and 30 days at room temperature respectively for minimum fruit weight loss and good palatability.
- The spraying ethrel 200 ppm on Nagpur mandarin trees at pea stage is recommended for thinning to increase the fruit size for local market.
- The spraying 400 ppm NAA or 500 ppm ethrel on trees of Nagpur mandarin at pea stage is recommended for thinning to harvest export quality fruits.
- Nagpur mandarin fruits of Ambia bahar should be dipped in Sesamum oil 2% with spreader 0.2% for one minute to store 45 days in cold storage at 6^0C temperature for minimum fruit weight loss and to maintain TSS/Acidity ratio.
- To increase the germination of jambhiri seed, soaking of seed in GA_3 (10 ppm) solution for 24 hours before sowing be done.
- A spraying of glycel 41 % SL. @ 1.00 % + 2.00 % urea (10 ml glycel + 20 g urea per litre of water) was recommended at 25 days after germination of weeds in rainy season for effective weed control in Nagpur mandarin.
- In order to save 41.29 per cent water and for getting higher yield with better quality of Nagpur mandarin fruits, irrigation by micro sprinkler or drip is recommended.

- Fertilizer dose of 700 g Nitrogen, 450 g P_2O_5 and 450 g K_2O along with 50 kg Farm Yard Manure per tree was found suitable for ten to twelve years old santra trees on medium deep black soils.
- For obtaining higher yield and better quality fruits of organic Nagpur mandarin in both bahar, an application of 50kg FYM along with 10 kg neemcake per tree is recommended.
- In zinc and iron deficient soils, for obtaining higher yield of sweet orange and improvement in fruit quality, soil application of Zn-EDTA@50g/tree and Fe-EDTA@100g/ tree or one foliar spray of Zn-EDTA@0.5% and Fe-EDTA@1.0% one month after fruit set along with recommended dose should be applied.

Vegetables

- Intercropping of ajwain + cabbage (1:2) or fennel + cabbage (1:2) is recommended for getting maximum economic returns and LER.
- For control weeds in garlic an application of oxyfluorfen @ 0.100 kg a.i. /ha as per emergence followed by the fenoxaprop-pethyl @0.100 kg a.i. has at 30 DAS is recommended.
- To obtain good quality garlic bulb application of sulphur @ 30 kg/ha through bentonite S along with RDF is recommended.
- To obtain good quality onion bulb and better storage application of Azatobactor + 75 kg N +50 kg P_2O_5 + 50 kg K_2O is recommended.

Flowers

- It is recommended to grow gerbera in polyhouse for higher production of quality flowers.
- For getting maximum flowers and higher monetary return per plant under partially controlled polyhouse the gerbera varieties Cabana and Sunway are recommended.


Protected Cultivation Module

- For getting maximum flowers from mogra, the varieties Khoya and Sel.1 are recommended.

- Arjun can be grown on shallow waste land under rainfed conditions for tassar cultivation.
- Application of 50g N, 20g P_2O5 and 20g K_2O per sq. m out of which full dose of P_2O5 & K_2O before planting of gladiolus corms along with $1/3^{rd}$ dose of Nitrogen. The remaining 2/3 dose of Nitrogen, $1/3^{rd}$ at each time to the crop at two leaf and four leaf stage is recommended.
- Transplanting of annual chrysanthemum seedlings of Bijali local from 5^{th} to 15^{th} October is recommended for maximum flower yield.
- For higher flower yield of chrysanthemum cv Zipri & PKV Sel-1 is recommended.
- Transplanting of Aster seedlings on 1^{st} October is recommended for higher flower yield.
- For obtaining maximum yield of gallardia, application of 100: 50: 50 kg N, P and K per ha is recommended.
- For obtaining maximum yield of marigold, application of 200: 50: 50 kg N, P and K per ha is recommended.
- The spraying of 100 ppm GA_3 is recommended for getting higher yield of chrysanthemum.
- Foliar application of cycoeal 500 ppm at fifteen days before and after pruning of Mogra bushes is recommended for obtaining higher bud yield in mogra.
- For obtaining higher flower stalk yield in golden rod application of 100: 100: 50 kg N, P and K per ha is recommended
- For obtaining higher flower yield of gallardia, foliar application of cycocel @ 200 ppm at 30^{th} and 45^{th} days after transplanting is recommended.
- Phule Ganesh variety of gladiolus is recommended for its quality flower stalk, more number of the florets and higher stalk.
- The spacing of 30 x 25 cm is recommended for planting to get quality flowers spike, more number of corms and net monetary returns of gladiolus.

Medicinal and Aromatic plants

- The application of 20 ton FYM along with NPK@ 100:50:50 kg per ha.(N in three split) is recommended to *Piper longum*.
- The plant spacing of 60 X 30 cm with application of 2.5 ton vermicompost per hectare is recommended to Aloevera.
- For obtaining higher yield of Kawach beej-onion crop sequence application of 5 t FYM to Kawach beej in Kharif and 100 per cent RDF (100:50 kg NP) per hectare to onion in Rabi season is recommended.
- Kalmegh + Pigeon pea intercropping at 3:1 row proportions recommended for obtaining higher yield.
- Intercropping of Safed musali with pigeon pea at 3:1 row proportion is recommended for obtaining higher yield.

Seed Spices

- Forobtaining the higher yield of ajwain sowing during 10th November with wider spacing (45 x 45 cm) is recommended.
- For obtaining the higher seed yield of cumin and fennel sowing during 31st October, the ridges and furrow method is recommended.

Agroforestry

- Developed useful agroforestry technologies in four priority research areas, five technical models and processes.
- Developed Teak (*Tectona grandise*), Bamboo (*Dendrocalmus strictus*) and Ailanthus (*A. excelsa*), based agroforestry systems for dryland farming in the region.
- Developed suitable agro practices for the production of quality planting material of teak, bamboo etc.
- Designed and developed Eco friendly Bamboo Tree guard for the protection of plants.
- For the vegetative propagation of bamboo, two node culm cutting should be treated with 2500 ppm IBA solution.
- On waste lands eucalyptus may be planted to make the land productive to help in improving the environment.

- In evaluation of bamboo germplasm, *Bamboo vulgaris* was found superior over other (No. 13) bamboo species.
- In evaluation of Eucalyptus germplasm, clone ITC 413 was superior over other (10) clone under study.
- Identified Teak (*Tectona grandise*), Shivan (*Gmelina arborea*), Sisso (*Dalbergia sissoo*), Bakan (*Melia azardiract*) for timber, Bamboo (*D. Strictus, D. stocksii,B. vulgarise, B. arundenacia*), and Ailanthus (*Ailanthus excelsa*), Melia (*Melia dibia*),(*Casuria equsetifolia*) for wood based industries and Albezia (*A. odoratissima*) for fodder and fuel as potential tree species for agroforestry intervention in the region. Germplasm of these species have been collected, evaluated and conserved on the experimental farm of this centre.

Plant Protection

Entomology

Cereals

- For effective management of shoot fly in sorghum, seed treatment with imidacloprid 70 WS @ 10 ml/kg seed or imadacloprid 48 FS @ 12 ml/kg seed followed by Quinolphos 25 % EC spray @ 20 ml/10 lit. water, 15 days after sowing is recommended.

Pulses

Pigeonpea

- For the management of pod borer complex of pigeonpea, first spraying of Azadirachtin 10000 ppm @ 10 ml per 10 liter of water at 50 per cent flowering phase, and at 15 days interval the second spraying of Emamectin Benzoate 5 SG @ 3.0 g per 10 liter of water and third spraying of Deltamethrin 1 EC + Triazophos 35 EC a ready mix formulation @ 25 ml per 10 liter of water is recommended.
- For the management of pod borer complex of pigeonpea, ETL based spraying of Rynaxypyr 20 SC @ 2.5 ml or Flubendiamide 20 WDG @ 5.0 g in 10 liter water is recommended.

- For the management of pigeonpea pod fly, application of Thiacloprid 21.7 SC @ 4.0 ml or Acephate 75 SP @ 20.0 g in 10 liter water at grain filling and 15 days after first application is recommended.

Chickpea

- For the management of gram pod borer on chickpea, the first spraying of Deltamethrin 1 EC + Triazophos 35 EC ready mix formulation @ 25 ml per 10 litre of water and the second spraying of Emamectin Benzoate 5 SG @ 3 g per 10 litre of water, 15 days after first application is recommended.

Green gram

- For the integrated management in mungbean, seed treatment with Imidacloprid 600 FS @ 5 ml per kg seed, seed treatment with Trichoderma @ 4 g per kg seed, spraying of Azadirachtin 10000 ppm @ 10ml/10 liter water at 30 days after crop emergence and application of Profenphos 50 EC @ 25 ml/10 liter water at 45 days after crop emergence is recommended.

Chickpea

- For the management of gram pod borer on chickpea, ETL based spraying of Rynaxypyr 20 SC @ 2.5 ml or Flubendiamide 20 WDG @ 5.0 g/10 liter water is recommended.
- For the management of *Gonocephalum* beetles on chickpea, seed treatment with Clothianidin 50 WDG @ 2 g/kg seed followed by spraying of Chlorpyriphos 20 EC @ 20 ml/10 liter water 20 days after crop emergence or Application of Phorate Granules 10G @ 10 kg/ha at sowing and spaying of Chlorpyriphos 20 EC @ 20 ml/10 liter water, 20 days after crop emergence is recommended.

Oilseeds

Soybean

- To restrict the excessive vegetative growth and for getting higher monetary returns, application of plant growth retardant like Chlormequat chloride 1000 ppm @ (2ml/L of water) at 40 DAS is recommended for soybean
- In soybean for control of stem fly, soil application of Phorate 10 G @ 10kg/ha at the time of sowing or foliar spraying with Triazophos 40 EC (0.04%); Chlorpyriphos 20EC (0.04%) or Acephate 75SP (0.07%) is recommended.

- For the effective management of leaf defoliators of soybean and higher yield, two sprayings at an interval of 15 days with NSE 5% followed by Quinalphos 0.05% is recommended.
- Effective management of soybean and higher monetary returns sprayings of Chloropyriphos 20EC @ 30ml/ 10lt or Indoxacarb 14.5 SC (0.0135%) @ 9.3ml per 10 lit or Fenvalerate 20EC (0.015%) @ 7.5ml per 10 lit water is recommended.
- For soybean identified potential sources for resistance/tolerance against insect pest complex- AMS-1, AMS 59, AMS 243, AMS-MB-5-18 and AMS-MB-5-19.
- The lines developed *viz.* AMS 243, AMS-MB-5-18 and AMS-MB-5-19 were recommended for utilization in crossing programme as a donor for resistance to Charcoal rot.

Sunflower

- Economic threshold Level for Leaf hopper on Sunflower is 3 nymphs/leaf is optimized.
- For the management of leaf hopper spraying of Dimethoate 0.03% (10ml) or Methyl Demeton 0.03% (12 ml) or Monocrotophos 0.05% (14ml) or Formathion 0.03% (12ml) or Fenthion 0.05% (10ml)in 10 lit of water or Dusting of Malathion 5% or Methyl parathion 2% or Carbaryl 5% or phosalone 4% dust @ 20 kg/ha is recommended.
- For management of Helicoverpa and Spodoptera spraying of Phosalone 35 EC (14 ml) in 10 litres of water or dusting of Carbaryl (10% dust) @ 20 kg/ha is recommended.
- For the management of mealy bug on sunflower spraying of dichlorvos 76% WSC @ 20 ml or methomyl 40 SP @ 10 g + 20 g soap powder in 10 liter of water is recommended.
- For management of whitefly and thrips on sunflower treatment with imidaclorprid 70 WS @ 5 g/kg seed or two spraying of Azadirachtin 1500 ppm @ 20 ml / 10 lit. of water at 15 and 30 days after emergence is recommended.

Safflower

- Early sowing (25th September to 10thOctober) of safflower is recommended to control aphid.
- It is recommended to adopt plant protection measures against safflower aphid when economic threshold level of aphid colonies on 30% plants is reached.
- For management of safflower aphids spraying of Fenthion 50 EC (10ml) or Quinolphos 25 EC (20ml) or Thiometon 25 EC (12ml), or Dimethoate 30 EC (10ml), or Acephate 75% WSP 4g or Malathion 50 EC (20ml) or Carbaryl 50% WSP 20g in 10 lit of water or dusting of Quinalphos 1.5 % dust or Methyl Parathion 2% dust or Phosalone 4 % dust @ 20kg/ha is recommended.
- For effective management of Gujhia weevil, application of Phorate 10 G @ 10 kg/ha at sowing + foliar spray of chlorphriphos 20 EC @ 25 ml OR Lymbda chalothrin 2.5 EC @ 10 ml/10 ltr of water at 10 days after emergence and need based second spraying at 10 days after first application is recommended.

Groundnut

- Aphids, Jassids and Thrips of groundnut can be controlled by spraying Carbaryl (0.2%), Phosphomidon (0.02%), Quinolphos (0.05%), Malathion (0.1%), Phosalone (0.05%) or Dimethoate (0.03 %).
- For the control of leaf miner, spraying of Cypermethrin 0.01%, Permethrin 0.01%, Decamethrin 0.0025% or Phosphomidon 0.02% are found effective.
- In case of heavy incidence of Leaf folder if control measure is not possible spraying of Cypermethrin 25 EC (4 ml) or Fenvalerate 20EC (5 ml) or Deltamethrin 2.8 EC (10 ml) in 10 litre of water is recommended.

Linseed

- For the effective management of Linseed bud fly two fortnightly sprays of Azadirachtin or Acetamiprid 20 SP or Imidacloprid 17.8 SL starting from bud initiation is recommended.
- For the control of powdery mildew of linseed two sprays of propiconazole (0.1per cent) or difenconazole (0.05per cent) or wettable sulphur (0.25 per cent) or hexaconazole (0.1per cent), two sprayings of any of these fungicides is recommended.

Fruit Crops

- For effective control of citrus psylla, the following insecticides are recommended.

Fenvalerate 0.01 %	or	Permethrin 0.01%	or
Methyldemeton 0.04 %	or	Methamedophos 0.05%	or
Fenthin 0.05 %	or	Formothion 0.04%	or
Vamidothion 0.05 %	or	Quinophos 0.04%	or
Phosalone 0.05%			

- For control of blackfly spraying of insecticide may be undertaken in the first fortnight of April and second fortnight of July and First fortnight of December to cover respective bahars.
- The newly tested insecticides i.e. phosolone 0.025%, Quinalphos 0.025 %, Acephate 0.05% and Mecarban 0.05% were found effective against first instar nymphal stage citrus black fly.
- For the control of early nymphal population of citrus blackfly, Azadirechtin 1500 ppm after fifty percent hatching of eggs and second spray 15 days thereafter is recommended.
- For control of citrus mite spraying of Morocide 0.02% and wettable sulphur 0.5% is recommended.
- For the management of nymphal population of citrus blackfly, two releases of 4 to 6 eggs of Mallada boninensis per shoot during hasta bahar is recommended.
- For the control of citrus leaf eating caterpillar, spary of Fenvalerate 0.01% or Acephate 0.05% or Quinolphos 0.05% or Monocrotophos 0.04% after the incidence of the pest is recommended.
- For control of bark eating caterpillar on citrus, spot spray application of DDVP 0.05% on the affected trees or application of petrol swab in larval holes are recommended during the month of October – November.
- For the management of citrus mites and maintaining quality of citrus fruits, two spraying of Neem Seed Extract 5% or Propogite 0.15% or wettable sulphar 80% w.p.0.25% are recommended at an interval of one month.

- For control of citrus nursery diseases and annual weeds soil solarization for 45 days during September to November, using clear transparent polythene sheet is recommended.
- For control of Jamberi seedlings mortality in secondary nursery, soil solarization for 45 days during May and June with drenching of Metalaxyl MZ 0.2 % during August, December and June and spraying of Metalaxy1 MZ 0.2% during October February and April is recommended.
- Application of Metalaxy1 MZ 50 g /L or Alliete 50 g/L stem pasting at initiation of disease and second after 30 days from initiation of the disease for effective management of gummosis of Nagpur mandarin is recommended.
- Drenching of Ridomil MZ-72 @ 0.2 % during August, December and June coupled with spraying of copper oxychloride @ 0.3 % during October and April after transplanting of Jamberi seedlings was recommended to control the mortality of Jambheri seedlings before and after budding.
- *T. harzianum* + *T. viride* + *P. fluorescence* 100 g each + Bordeaux paste application (1:1:10) and Phosetyl AL spray 0.2 per cent was superior for integrated management of gummosis in Nagpur mandarin.

Pathology

Pulses Pathology

- Seed treatment with boiagent viz., *T. harziznum or T. viride* @ 4g per kg seed was found effective in reduction of wilt/root rot in pigeonpea, chickpea and green gram.
- Seed treatment with captan @ 3 g/kg or chlorothalonial @ 2 g/kg seed or thiophenate methyl @ 2 g/kg seed is recommended against wilt/ root rot of chickpea.
- Spraying of wettable sulphur 0.25 %, penconaole 0.1 5 found effective against powdery mildew of green gram and blackgram and application of Dithane M-45 0.25 % reduced the intensity of Cercospora leaf spot
- Application of three sprays of calixin 0.3 % or karthane 0.1 % or thiovit 0.5% or sulphane 0.25% ot carbendaine 0.1% at an intervals of 10 days found effective for management of powdery mildew of pea

- It is recommended to treat the seed of pigeonpea first with combined product of fungicide Carboxin (37.5%) + Thiram (37.5 %) @ 3 g/kg followed be *T. viride* @ 10 g/ kg of the seed to reduce the wilt incidence & obtaining higher grain yield.

Pulses Microbiology

- Before sowing of pigeon pea application of 25 g AKPR -101 as a bio fertilizer should be applied for enhancing grain yield.
- Before sowing of pigeon pea, combined application of 25 g Rhizobium PKVPR-101 with 20 g PSB-3 as biofertilizer should be applied for enhancing grain yield.
- Before sowing of Chickpea application of 25 g AKCR -1 as a bio fertilizer should be applied for enhancing grain yield.
- Before sowing of greengram, seed treatment of Rhizobium AKMR-12-01 @ 25g/kg seed as a bio- fertilizer should be applied for enhancing grain yield.
- Before sowing of blackgram, seed treatment of Rhizobium WUR-12-1 @ 25g/kg seed as a bio- fertilizer should be applied for enhancing grain yield.

Oilseed Pathology

Sunflower

- Foliar diseases of sunflower caused by Alternaria, Curvularia and Bacterial leaf spot should be controlled by spraying Dithane M-45 (0.25%).
- Fungicidal seed dressing of Brassicol, Captan, Thirum or Bavistin @ 2 to 3 g/kg of sunflower seed was found to improve germination, plant stand and yields by protecting crop from seed and soil borne diseases.
- For controlling sunflower necrosis disease,seed treatment with imidacloprid (5g/kg of seed) before sowing and two spraying with imidacloprid (0.05%) at 30 DAS and 45 DAS is recommended.

Safflower

- For controlling Alternaria Leaf Spot, seed treatment with Thirum or Captan 3g/kg seed is recommended and in field condition spraying with Dithane M-45, 25g in 10 liter of water is recommended.
- For controlling root rot and wilt, seed treatment with thirum or captan @ 3g/kg seed along with Trichoderma 4 g/kg seed is recommended.

Groundnut

- Groundnut Seed should be treated before sowing with Thirum + Bavistin 2:1 or Thirum/Captan 2.5 to 3 g/kg of seed is beneficial to avoid seed & soil borne diseases.
- Rust on groundnut can be controlled by spraying the crop with any one of the fungicides Plantavax or Vitavax (10 g) or Dithane M–45 (25 g) or Kalaxin (7 ml. per 10 litres of water).
- Cercospora leaf spot (Tikka) disease of groundnut can be controlled by spraying wettable sulphur (0.3%) or Dithane M–45 (0.25%) or Bavistin (0.1%) or by dusting 300 mesh Sulphur dust (20 kg/ha) during morning or evening hours.
- For controlling Bud Necrosis disease in groundnut can be effectively controlled by spraying of Carbendazim 0.1% (1 g in 1 lit of water) or Dithane-M 45, 0.2% (2.5 g in 1 lit of water) + Dimethoate 0.03% (1 ml in 1 lit of water) is recommended.

University Departments

Agronomy

- Application of recommended dose of N and K in five splits through fertigation along with basal P for increasing the system productivity of Cotton-Onion sequence and fertigation saves 25 per cent fertilizer as compared to conventional soil application method.
- Adoption of crop residues of Pigeonpea + Sunhemp (GM) (1:2) intercropping under minimum tillage along with RDF for Bt cotton is recommended for higher returns and enhancing soil fertility.
- In organic cotton production system, application of soybean straw 5 tons/ha as an alternative source to FYM for maximizing the yield.
- Under irrigated condition in organic agriculture of soybean - wheat cropping sequence, application of 100% RDN through vermicompost, compost and farmyard manure along with jeevamrut or 100% RDN only through vermicompost for increasing system productivity & improvement in soil health.
- It is recommended to apply irrigation at 0.80 Etc through drip with polymulch to get higher seed cotton yield and higher monetary return in Bt cotton.

- In soybean, the post emergence application of Imazethapyr + Imazamox 70 WG @ 0.070 kg a.i./ha PoE 15 DAS found effective herbicide for controlling the weed flora and higher yield.
- In cotton, pre emergence application of pendimethalin 1.00 kg /ha followed by directed spray of non-selective herbicide glyphosate 2.00 kg/ha 45 after days for recommended sowing is controlling weeds with higher yield & monetary returns.
- In groundnut, the post emergence application of Imazethapyr + Imazamox 0.100 kg/ha POE 20 DAS found effective herbicide for controlling the weed flora and getting higher yield.
- In turmeric, pre emergence application of Pendimethalin 1.0 kg/ha or Metribuzin 0.7 kg/ha or Atrazine 0.75 kg/ha (0-5 DAP) fb straw mulch 10 t/ha (10 DAP) fb one HW (75DAP) found effective for controlling weeds & higher yield.
- While preparing land for soybean crop to use rotavator after ploughing for higher soil moisture retention, improving soil physical properties, obtaining higher crop yield and getting more economic returns.
- Application of 7.5 t/ha FYM along with 50 per cent RDF is recommended for getting maximum yield and monetary returns of soybean.
- Cotton be sprayed with 2per cent DAP or Urea at 45 and 75 DAS is recommended to increase the yield.
- French bean should be manured with 2.5 t FYM ha^{-1} or vermicompost to reduce the recommended fertilizer dose by 50 per cent.
- Soybean grown in ill drained clayey soil, be applied with Fly Ash @ 5 t ha^{-1} or FYM @ 2.5 t ha^{-1} along with 15:35.5:0 kg N P K ha^{-1} to cut down fertilizer dose by 100 per cent.
- For increase in the residual fertility status of soil and for getting higher yield of pre-monsoon cotton, application of 2.5 t FYM + 75:37.5:37.5 kg N P K ha-1 is recommended.
- For getting higher dry pod yield and economic returns from groundnut, it is recommended to use 75per cent recommended dose of phosphate (37.5 kg ha^{-1}).

- In cotton, furrow opening (alternate row or every row) at 45 DAS + addition of 5 t ha^{-1} weed biomass + spray of 2per cent Urea and 2per cent SSP on weed biomass is recommended to get higher yield and net monetary returns.
- For mustard, application of 50 per cent N through FYM or compost prepared from different weeds or Glyricidia and remaining 50per cent N through fertilizer is recommended.
- In soybean at flower initiation stage apply paddy straw mulch @ 2.5 t ha^{-1} to get higher economic returns.
- In Vertisols, for harvesting maximum yield and monetary returns, sowing of safflower during 40th to 44 MW (1st October to 4th November) is suitable.
- For obtaining higher yield of safflower and water use efficiency, two irrigations, first during vegetative to flowering stage and second at grain development stage should be applied.
- For getting more economic returns, sorghum + soybean intercropping system (2:1) with the application of RDF (80:40:40 NPK kg ha^{-1}) is beneficial.
- In semi-rabi pigeonpea, opening of furrow in every row with the application of 100 per cent phosphate (50 kg P_2O_5 ha^{-1}) found beneficial for getting higheryield and economic returns.
- Hoeing at 15 DAS + post-emergence application of Imazethapyr @ 90 g ha-1 at 30 DAS or two hoeing + two hand weeding at 20 and 40 DAS is beneficial for effective weed control and higher grain yield.
- In soybean based sequence cropping system, moisture conservation practice of soil mulch at 30DAS + wheat straw mulch @ 2.5 t ha^{-1}in kharif season followed by growing of linseed crop is recommended for getting more net monetary returns.

Plant Physiology and Seed Technology

- For grading delinted cotton seed, sieve size of 2.8 mm and 3.2 mm are recommended for small seeded varieties and medium to bold seeded varieties, while for grading soybean cultivars sieve of 3.6 mm, for safflower seed 2.2 mm sieve should be used and for grading of paddy varieties sieve of 1.4 mm for fine and 1.6 mm for coarse varieties.

- For wet acid delinting of cotton seed the treatment of 100 ml H2SO4 for 10 minutes is recommended.
- In seed processing plant, for minimizing mechanical damage and maintaining seed quality inclined belt conveyor is recommended in place of bucket conveyor.
- Specific gravity separator is recommended for upgrading marginal seed lots in cotton, soybean and safflower and removing ODV seed in paddy.
- For maintaining the genetic purity in seed production of soybean, an isolation distance of 5m should be adopted.
- For maintaining the seed quality of soybean for 12 months storage polymer coating @ 3 ml/kg seed and flowable thiram @ 2.4 ml/kg of soybean seed before storage should be used.
- Pre-sowing hydro priming treatment to pigeon pea seed treatment for 8 hrs with 1:2 seed: water ratio followed by drying for two days is recommended for expected and uniform field emergence, plant stand establishment and improving seed yield.
- For inducing dormancy upto 35 days in green gram two sprays @ 250 ppm of Malic Hydrazide after sowing is recommended.
- Organic treatment combination of vermicompost (3 t/ha) + rizobium inoculation (5 kg/ha) with trichoderma seed treatment produced significantly higher seed yield and seed quality of groundnut.
- For sweet corn, spacing of 45x20 cm and NPK dose of 150:75:45 N, P2O5 and K20 ha^{-1} and ridge planting resulted in higher seed yield and quality.
- A ridge sowing method and soil application of $ZnSO_4$ @ 30 kg ha^{-1} + recommended DAP along with foliar spray of $ZnSO_4$ @ 0.5 % at 52 & 60 DAS improved the seed quality parameters and yield of soybean.
- Final count of germination has been found suitable to assess the planting value of hybrid cotton where as AAT at 48 hours showed good assessment for storability.
- Polymer coating in combination with fungicide has been found beneficial in improving and maintaining the seed quality for a longer period during storage of soybean.

- Two sprays @250 ppm of malic hydrazide, first at 45 days followed by 60 days after the planting induced dormancy upto 35 days in green gram without adversely affecting the seed yield.
- The pre-sowing invigoration seed treatments of hydration 2 hrs followed by drying at room temperature below 250C and dressing with thiram @ 0.25 % found beneficial for increasing seed yield and seed quality of soybean.
- A sieve of 1.6 mm and 1.4 mm is effective and economical for course and fine varieties of paddy.
- The mechanical damage in the seed from combined harvester at 500 rpm was observed 3.7% with germination 76.3%, physical purity 94.7% and 98% threshing efficiency at 13.2 % moisture content.
- The ODV seeds in paddy seeds can be effectively removed up to acceptable limit by using specific gravity separator.
- A seed treatment of Neem Azal 1000 ppm 1.5 mg/kg or Econeem 3000 ppm@ 5ml/kg was effective in controlling the insect infestation and maintaining seed quality under ambient condition upto 12 months storage for wheat.
- The pigeonpea seed can be safely stored up to twelve months with seed treatment of Emamectin benzoate (proclaim 5SG) @ 2ppm(40.0 mg/kg seed).
- The seed treatment with rice husk ash @ 5 g/kg seed in combination with Diatomacious earth @ 5 g/kg seed was found in best inert dust treatment in protecting sorghum seed from storage insect incidence without reducing seed germination.

Entomology

- IPM Package for rainfed hybrid cotton, Deshi cotton and Chilli was developed and recommended.
- Developed Shetkari and Warkari duster
- Developed IPM Package for rainfed desi and hybrid cotton
- Stem smearing technology was developed for cotton
- For sericulture unit S-3 mulberry cultivar is recommended
- Established Insect Museum with more than 25000 insect specimens including heritage collection (British Era)

- Mass production of biological agents, Trichogramma, Chrysopa and HaNPV for commercial and research purpose is recommended
- Identified *Mylabrisphalorata, M. tricolor* and some whitegrub species viz., *Sophropskarschi, S. sculpticollis, S. fuscens, Leucopholislepidophora, Schizonycharuficollis and Amiridibacocabiae* from different agro-climatic zones of Maharashtra
- Identified white grub species viz., *Holotrichiaserrata, H. fissa, H. reynaudi, H. akolana, H. nagpurensis, H. rufoflava, H. ferrinosa* with molecular characterization and developed pictorial key.
- Recommended on management practices for control of Linseed Bud fly.
- Hundred and ten year old precious insect specimen preserved in good condition in insect museum.

Plant Pathology

- Seed treatment with Thiram (3 g) + carbendozim (1 g) + Trichoderma (4 g) is recommended for the management of root-rot/collar rot of soybean
- Three foliar sprays of Difenconazole are recommended for the management of Thaphrina leaf blotch of turmeric.
- Two foliar sprays of manozeb or propiconazole are recommended for the management of Alternaria leaf blight and white rust of mustard.
- Propiconazole was found effective for controlling die back, fruit rot and powdery mildew of chilli.
- For management of root rot complex in Kapoori variety of vetelvine and for better growth of vine IDM Module is recommended
- Application of Bordeaux paste (1:1:10) on the tree trunk of Nagpur mandarin.
- For obtaining maximum yield of pigeonpea, seed treatment of Rhizobium isolate PKVPR-101 @ 25 g/kg is recommended
- Prediction equation for occurrence of pokkan boeng disease in seasonal (suru) Alternaria leaf spot diseases in sunflower, twig blight in Nagpur mandarin and canker incidence in Acid lime are recommended.

- For the control of powdery mildew of linseed two sprays of Propiconazole (0.1%) or Difenconazole (0.05%) or wettable sulphur (0.25%) or Hexaxonazole (0.1%) is recommended.
- For pigeonpea, seed treatment of dual inoculation of Rhizobium PKVPR-101 and PSB-3 as biofertilizers is recommended for enhancing the yield.
- For chickpea, pre-sowing treatment of Rhizobium isolates, AKCR-1 is recommended.
- For effective management of root rot of soybean seed treatment of Carboxin + Thiram (Combi product) is recommended.
- To restrict post harvest storage diseases of Nagpur mandarins, entire surface of the fruits should be exposed to UV-C of 13.4 Watt Ultra violet output for 10 min at 10 cm distance or dip fruits in sodium hypoclorite solutions and coating fruits with vegetable wax.
- Seed treatment of Rhizobium AKMR-12-10 to green gram and Rhizobium WUR-12-1 to black gram is recommended.
- It is recommended to treat the seed of pigeonpea first with combined product of fungicide Carboxin + Thiram @ 3 g/kg followed by Trichoderma viride @ 10g/kg of seed to reduce the wilt incidence.
- For controlling dahiya disease of cotton dusting of sulphur (300 mesh) and groundnut rust with Plantavax is recommended.
- Developed and recommended decomposting culture for crop residues and provides mass culture of Rhizobium, Azotobacter, PSB, Trichoderma and bio-decomposing culturesto the farmers.

Soil Science and Agricultural Chemistry

- In sorghum- wheat cropping sequence, on the basis of long term fertilizer experimentation on Vertisols, for sustaining soil quality and crop productivity application of RDF along with FYM @ 10 t ha^{-1} is recommended.
- Phosphocompost of good quality can be prepared by decomposing wheat straw with rock phosphate @ 12 per cent (120 kg $tonne^{-1}$) along with PDKV decomposer (1 kg $tonne^{-1}$) for 120 days.

- Application of 50 per cent recommended dose of phosphorus (37.5 kg ha^{-1}) through phosphocompost @ 2 t ha^{-1}alongwith remaining dose through inorganic fertilizers is recommended for getting higher soybean productivity and improving soil quality.
- In Vertisols, for higher cotton productivity and fibre quality, application of two foliar sprays of Sulphate of Potash @ 1.5 % (15 g SOP/L) at flowering and boll development stage is recommended along with RDF.
- In Vertisols under rainfed situations it is recommended to adopt conservation tillage (one harrowing and two weeding) and 50 % N through gliricidia green leaf manuring (3.5 t ha^{-1}) and compensation of RDF through chemical fertilizers (30:27:8 kg NPK ha^{-1})as a alternative to FYM (50 % N) for sustaining productivity of cotton, monetary returns and improvement in soil health.
- Soil application of $ZnSO_4$ @ 20 kg ha^{-1} to soybean, cotton and maize is recommended.
- The integrated application of 2.5 tones Farm Yard Manure + 1.25 tones gypsumper hectare in Tied Broad Bed Furrow after 15-20 days of sowing is recommended for improvement in soil properties, yield and monetary returns of soybean in deep black sodic soils of Purna valley of Vidrabha.
- In salt affected soils of Purna valley in Vidarbha region, growing of dhaincha as a green manuring crop between two rows of cotton (1:1) and in situ burring after 40 DAS is recommended as an alternative to gypsum for improving soil health.
- For improving soil health,productivity and monetary returns in cotton- soybean rotation, it is recommended to apply 25 per cent recommended N through Dhaincha loppings (2 t ha^{-1}) or Neem cake (3 q ha^{-1}) with remaining recommended dose of NPK of cotton (45: 28: 17 kg NPK ha^{-1}) along with RDF of soybean through chemical fertilizers or application of 100 % recommended N of cotton and soybean through FYM (11 t ha^{-1} to cotton and 5 t ha-1 to soybean)and remaining dose of P & K through phosphocompost to cotton (80 kg ha^{-1})and soybean (3.8 t ha^{-1}).

- In sulphur deficient soils, for obtaining higher soil application of 30 kg Sulphur to cotton, soybean, onion, 20 kg sulphur to pigeon pea and 15 kg sulphur to linseed through gypsum or bentonite sulphur is recommended.
- Soil application of potassium (30 kg ha^{-1}) to cotton, soybean and chickpea is recommended along with RDF.
- For obtaining economic and quality manure from FYM and leaf litter waste in shortest period, it is recommended to use PDKV compost method.
- In Vertisol, application of gypsum (1.5 tonne ha^{-1}) once in two years before sowing is recommended for increasing the yield of soybean, moisture use efficiency and improving the physical properties of soil.
- For obtaining higher yield of soybean and improvement in soil fertility in Vertisol, application of phosphogypsum @100 kg/ha with recommended dose of fertilizer is recommended.

Animal Husbandry and Dairy Science

- It is recommended to grow the fodder crop (Stylosanthus hemata) on light soils bunds and grazing yard to provide quality fodder.
- Feeding concentrates soaked in water (1.5 kg water per kg concentrates) for one hour along with roughages in lactating animals increased milk production in cows and buffaloes can be enhanced by 7 to 10 per cent without affecting quality of milk.
- Grooming and washing of milking animals before 3-4 hours of milking, Cleaning of udder and hands of the milker, Washing the milking parlour and utensils, Use of dome shaped or small top milking are recommended.
- Dry root powder of Ashwagandha @ 30 g, two times a day be fed to lactating cows for 30 days to increase daily milk yield.
- Good acceptable quality burfi can be prepared by blending of 15% mung flour with 50% sugar in khoa.
- Maximum profit can be obtained from chocolate milk drink, fruit flavoured milk drink and skimmed milk, dahi prepared in combination with cream, ghee and butter, respectively

- PDKV Berar Burfi prepared from goat milk, Khoa blended with mango pulp and sugar is recommended.
- Blending of 4% ginger juice and 0.4% turmeric powder as a natural flavor and coloring agent produce good quality value added herbal softy cream
- Feeding of 5% dry azolla in the diet of Giriraja poultry birds is recommended for better body weight and maximum economic gain under intensive rearing.
- Blending of 20 % cooked unripe banana pulp with cow milk chakka produced good quality value added banana *shrikhand*.
- *Azolla*tank constructed for Azolla growing, used as feed for goats.
- Glyricidia tree leaves available as top feed for goat feeding.
- Produce greenand dry fodder, jowar as well as maize silage and followed by summer fodder production for cattle feeding.

Social Sciences

Extension Education

- Utility perception Scale for measurement of utility of farm periodicals
- Awareness of Congruence scale
- Credibility scale for measurement of creditability of farm periodicals
- Development of Congruity Index
- Readability scale for measurement of readability of farm periodicals
- Socio-economic Status scale for tribal
- Attitude scale developed for measuring attitude of dry land farmers towards dry land agricultural practices
- Socio-economic status scale for farmers
- Growth index of tribal
- Role Perception of Agricultural Assistants
- Role Performance of Agricultural Assistants
- Attitude of Agricultural Assistants towards One Window Approach of Farm Technology Transfer
- Training Need of Agricultural Assistants
- Job competency of Agricultural Assistants
- Job performance of Agricultural Assistants

- Developed Participation scale and standardized to measure the participation of farmers in terms of Participation Index.
- In Eastern Vidarbha zone to overcome the distress situation of farmers, there is need to provide subsidiary occupations to the farmers and to give remunerative price for their agricultural produce on the basis of cost of cultivation, there is also need of social and agricultural technology counseling and to provide weather information time to time to the farmers.
- To make attitude of rural youth more favourable towards agriculture as an occupation it is recommended that the youth should be involved in skill development programmes and need to include the agriculture subject in course curriculum of primary level schooling.
- In Amravati Division of Vidarbha region 81.80 per cent farmers were found without knowledge of preparation of insecticide solution. It is recommended that the State Agril. Dept., Agril Universities, Krishi Vigyan Kendras and other institute should initiate awareness about this.

Agricultural Economics and Statistics

- Decline in area and yield of Soybean in Nagpur district was mainly due to low remunerative price in the market, attack of insects and pests and changes in climate were the major reasons and to overcome these problems government should provide good remunerative prices to the farmers and awareness about the insect and pest management.
- Maize appears to be one of the important emerging crop in the Buldhana district and it became additional crop in the cropping pattern of the district. Allocate more area invariably under the cultivation of maize crop by providing high yielding varieties and introducing improved technology.
- In Eastern Vidarbha district, lathyrus crop required low input with high B:C ratio in marginal and small size of holding farmers in rainfed cultivation during rabi season as a relay crop. High yielding varieties of lathyrus and suitable improved technology needs to be given for increasing the production of lathyrus.

Agricultural Engineering and Technology

Irrigation and Drainage

- Developed the technologies of riser valve, gated pipe, water filter for micro irrigation, Management of drip system, Micro sprinkler irrigation system for summer groundnut, Portable drip irrigation system, Ready reckoner for deciding optimum lateral length and dripper spacing along the lateral, dripper discharge and field slope in the design of online drip irrigation system in order to increase efficiency of irrigation water.
- Developed PDKV "V"- notch to measure the flow of irrigation water.
- Developed equations for prediction of weekly pan evaporation for Akola and Nagpur region.
- Recommended drip irrigation and fertigation techniques for acid lime and garlic.
- Developed agricultural drainage coefficients for designing drainage system.
- Recommended reference evapotranspiration values for irrigation scheduling.
- Phytorid wetland engineering technology is recommended to treat city sewage and use this treated sewage water for irrigation of crops except vegetables.

Agriculture Process Engineering

- Developed custard apple de-seeding machine.
- Generated employment by installing more than 150 deseeding machines for custard apple pulp.
- Developed automated sprouter for grain.
- Developed microwave puffing machine.
- Developed multigrain puffing machine.
- Developed marking nut cracker.
- Established experiential learning unit on processing of cereals and pulse and generating employment through grain processing.
- Signed the MoU with Industry for manufacturing of developed agricultural processing machinery.
- Developed Orange fruit grader.


PKV Mini Dal Mill

Developed Post Harvest Processing Machineries/Equipments

- Developed PKV Waste fired dryer, PKV mini dal mill, PDKV Cleaner-grader, PDKV Single screw polisher, PDKV Double screw polisher, Developed and modified PKV chilli seed extractor.
- Developed PDKV fruit grader, Onion seed extractor, Roselle calyces detacher, Continuous hot air puffing system, Small capacity animal feed mill using dal mill by product, Developed PDKV Tutty-fruity/Cherry pilot plant, PDKV Hand operated papad cutter, Turmeric slicer, PDKV green pigeonpea pod shelling machine.
- Higher capacity PKV mini dal mill(5 HP), Developed PKV mini dal mill (1HP) for milling of pulse grain, Developed Laboratory working model of PKV mini dal mill, Developed PDKV Integrated Mini dal mill, Developed PDKV green chickpea pod stripping machine, Turmeric washing Machine.

Technologies/Processes/Products Developed

- Evaporatively cooled storage structure
- Developed Indigenous ethosorb technique for banana
- Developed RTC snack products from sorghum
- Developed Process technology for value added products of pumpkin
- Enhancement of post harvest life of kagzi lime
- Value added products from roselle calyces (Ambadi)
- Bakery products from available cereals and millets
- Value added products viz; Kharodya, Chakali, Sev, Papad, Injera,Ghari, have been prepared from from sorghum
- Technology for bio-pesticide from custard apple seeds
- The aqueous extract of custard apple seed powder was prepared for management of pod borer on chickpea.
- Technology for milling of pigeon pea using enzyme pretreatment.
- Total storage losses during storage of onions can be minimized by providing natural ventilation using perforated PVC pipes in onion storage structures after curing by farmers method.

Unconventional Energy Sources & Electrical Engineering

- Developed solar tunnel dryer for drying agricultural produce
- Developed cabinet solar dryer for drying horticultural produce
- Developed cabinet solar dryer with heat storage system for drying agricultural produce
- Developed thermo-efficient biomass cook stove for rural households
- Designed and developed solar still
- Designed and developed biogas scrubber for removal of CO_2 from biogas
- Designed and developed low cost biogas burner
- Designed and developed updraft portable wood stove
- Solar photo voltaic powered sprayer
- Installed vertical and horizontal types of kitchen waste based institutional biogas plant
- Installed modified Janta and Deenbandhu Biogas plant for solid state fermentation at farmer's sites under operational research demonstration
- Installed durable improved chullas under operational research demonstration programme
- Evaluated different gasifiers for their thermal performance
- Evaluated & demonstrated rice husk stove in Eastern Vidarbha of Maharashtra
- Developed Solar-gasifier hybrid system for drying horticultural & medicinal crops
- Evaluated Solar tunnel dryer and portable farm solar dryer at user's sites
- Developed PDKV solar insect trap

Farm Power and Machinery

- PDKV self propelled pneumatic planter For precision sowing and enhancing crop productivity in any crop
- PDKV self propelled inter row cultivator for inter row cultivation after crop establishment in any crop
- Power tool bar operated tiller for tillage in cloddy field, orchard and for making broad based furrows (BBF)

- Tractor operated slasher for slashing of standing crop residues
- PKV Bullock drawn cotton planter for sowing of cotton crop
- PKV citrus harvester for harvesting of citrus fruits
- PKV BBF planter cum inter-row cultivator for preparation of broad bed furrow and sowing
- Small tractor operated inter row cultivator for inter culture operation for the crop spacing of 45 cm. with maintaining the depth of operation
- Manually operated seedling transplanter for planting seedlings.
- PDKV small tractor operated seed ferti drill cum interrow cultivation(FPM) PDKV small tractor (18.5 - 25 hp) operated seed ferti drill cum interrow cultivation is recommended for sowing and intercultural operation
- PDKV small tractor operated crop residue disintegrator PDKV small tractor (18.5 -25 hp) operated crop residue disintegrator is recommended for in-situ crop residues management
- PDKV developed power cutter Dr. PDKV developed power cutter is recommended to use for cutting sugar cane sets and forage.

Soil and Water conservation Engineering

- For higher in-situ soil and moisture conservation, yield, energy and water use efficiency contour cultivation with ridges and furrow after 30 days of sowings recommended for sorghum and cotton.
- In medium to deep black soil for higher in-situ soil, water, nutrients conservation and improving physical properties of the soil (eg. bulk density, soil resistance etc.), crop growth, water and energy use efficiency and yield in soybean and cotton crop, it is recommended to adopt sub- soiling at 90 cm H.I. up to 55 to 60 cm depth with 2 tyne and 1 blade harrow before sowing.
- Sewage water treated by Phytorid wetland Engineering Technology is recommended to use for irrigation to maize and cotton crop.
- For the satisfactory growth of dry land tree species (Karanj, Sitaphal, and Bel) and higher moisture conservation in medium deep soil up to 1.5 to 2.00 per cent

slope the half moon basin 45 cm away from the plant at down stream with 20 cm width and height are recommended up to three years after plantation.

- For the prediction of erosion index for 30 minute duration of rainfall intensity for Akola district the equation is recommended
- It is recommended to use mean weekly reference evapotranspiration for determining water requirement of different crops at Akola and Nagpur districts of Vidarbha.
- In assured rainfall zone of Vidarbha region the life of the CCT's in sown silvipasture system is recommended upto 10 years.
- For higher economical returns the double cropping system of Green gram–Chickpea and Soybean–Chickpea along with contour and across slope cultivation with protective irrigation by sprinkler irrigation from farm pond is recommended for the saline tract of purna river valley.
- In sub-mountain region of Maharashtra for determination of water storage capacity of bunding in agricultural watershed the computerised based system is recommended.

Dry Land Agriculture

In dry land areas, to obtain higher yields of crops the following technologies are recommended.

- Risk minimizing intercropping system for Vidarbha region
- Nutrient management through greengram intercropping in cotton
- Nutrient management through green leaf manuring in cotton and soybean
- In-situ moisture conservation through toposequence based cropping
- Vegetative barriers for reducing runoff and soil loss and increasing crop productivity
- Use of harvested rain water in farm ponds for protective irrigation during dry spell to enhance crop and water productivity
- Water stress management in standing crops under contingency situation
- Real time contingent plans for meeting weather aberrations for the region
- Alternate land use planning.

Integrated Farming System Research

- In medium black soil under irrigation and adequate input conditions sorghum-wheat-green gram crop sequences found best in respect of grain productivity and monetary returns.
- In sorghum-wheat crop sequence under irrigation for higher productivity, 30 kg P_2O_5 ha^{-1} to both the crops should be supplied through Ammonium Polyphosphate.
- Cotton-summer groundnut crop sequence has been recommended for getting higher monetary returns under irrigated and adequate input conditions.
- Amongst the several cropping systems tried, chilli (green)-groundnut cropping sequence is recommended under irrigated condition.
- Application of 50% higher NPK than the recommended dose along with 15 t FYM/ha to sorghum and recommended plant population should be maintained for maximum yield under continuous cropping of Sorghum-Wheat.
- Under situation of irrigation water availability up to the month of March, sorghum-wheat and sorghum-chickpea crop sequences, soybean-wheat and sorghum-sunflower crop sequences are also recommended.
- For sustainable productivity of cotton-summer groundnut cropping system, application of recommended dose of phosphorus was advisable to summer groundnut only.
- Considering monetary return, productivity and sustainability, it is recommended to grow sorghum – chickpea in the first year and maize- wheat or soybean – wheat or soybean – sunflower in the second year with recommended package of practices.
- For more productivity, monetary benefits, economy in water use and improvement in soil fertility, the sorghum-chickpea or soybean-chickpea sequences should be adopted with recommended irrigations.
- Considering productivity, monetary return, water use economy and improvement in soil fertility, it is recommended to adopt soybean-rabi sorghum sequence with two to three irrigations at primordia initiation (30-35 DAS), flowering (70-75 DAS) and/or grain filling (85-95 DAS) stages to sorghum.

- In Maize – Chickpea cropping system, it is recommended to apply 3/4th recommended NPK through fertilizer, 1/4th recommended N through leucaena lopping (46.15 q/ha) + azotobacter application to maize and ½ recommended N and P dose to succeeding chickpea for higher productivity, monetary return and soil fertility build up.
- On the basis of 15 years pooled results, it is recommended to apply half dose of N either through FYM, wheat straw or leucaena lopping to sorghum and 100% NPK to wheat crop through inorganic fertilizer for reducing expenses on inorganic fertilizer, to improve soil fertility and productivity.

- For getting higher yield, monetary returns and to maintain fertility status of soil, adoption of broad bed furrow (BBF) method with soybean-chickpea crop sequence is recommended.
- On the basis of long term experiments of 30 years, in sorghum – wheat crop sequence, for obtaining higher yields and monetary returns with improving and sustaining soil health, application of 75% RDF (90:45:45 kg N, P2O5, K2O ha^{-1}) through chemical fertilizers along with 25% N through FYM or leucana lopping or wheat straw to kharif sorghum and 75 % RDF (90:45:45 kg N, P2O5, K2O ha^{-1}) through chemical fertilizers to wheat is recommended.
- It is recommended to adopt 1.00 ha integrated farming system model under irrigated condition for small and marginal farmers of Western Vidarbha region of Maharashtra. The IFS model includes the components of various crops and cropping system (0.70 ha) + Fruits and vegetables (0.25 ha) + Goatary + Backyard poultry + Rabbit + Organic kitchen garden + Compost (0.05 ha) + useful plantation on field boundaries. IFS model consists of following enterprises.

Agro Ecology and Environment Centre

- For the satisfactory establishment of dry land MPTS on CCT's in non-arable lands it is recommended to provide per plant 5 liters of water once in a week at least for first two years through earthen pots with grass mulching.

- For the establishment of quality pasture in light and shallow soil the sown system of pasture development soils the sown system of pasture development is recommended.
- For the restoration of shallow soil and waste lands in terms of better in-situ soil and moisture conservation it is recommended to establish the sown silvipasture.
- In shallow and medium soil for the better production of perennial Anjan Grass (*Cenchrus cilliaris*) the contour ridges and furrows planting system is recommended under dry land condition.
- For the satisfactory establishment of MPTS (e.g. Karanj, Ritha, Bihada, Jamun, Kawath, and Sisoo) under rainfed in waste land it is recommended to provide the land treatment for continuous contour trenches.
- To enhance the growth of Anjan plantation (*Hardwickia binata*) in wasteland, the continuous contour trenches along the trees and opening of contour furrow between the two CCTs is recommended.
- For the satisfactory establishment of silvipasture system (Ramkati, Ber, Neem with stylo, scabra and Anjan grasses) in waste land the land treatment of intermitant contour trenches (CCTs) is recommended.
- In shallow and medium soil, planting of buffer lines of Anjan grass on the contour bunds (with CCT's) is recommended to enhance the fodder yield and seed under rainfed conditions.
- For harnessing maximum runoff for higher recharge it is recommended to construct the CNB in series in such a fashion that the full supply level (FSL) of the downside CNB is at least equal to or less than bottom level of upper CNB.
- In shallow soils under agro-horticulture systems the efficient life of the CCT's observed upto eight years.
- In the saline tract of Purna river valley it is recommended to adopt across the slope or contour tillage in the catchment and to provide Brushwood inlet spillway to the farm ponds.
- In medium deep soil, across the slope cultivation upto 30 cm depth is recommended for maximum in-situ water conservation.

- Due to compaction the hard pan formed in the medium to deep black soils of Vidarbha for the improvement in physical properties of soil and higher production and benefits of Soybean and Cotton crop, it is recommended to adopt sub-soiling at 90cm horizontal interval up to 55 to 60 cm depth with 2 tyne and 1 blade harrow before sowing.

Challenges

The biggest challenge for Indian agriculture is the ever growing population. This coupled with the ever reducing area of cultivable land is making this problem more serious. Thus agriculture sector will have to respond to the increasing and changing needs of the growing population. At the same time, multiple challenges affect agricultural productivity including climate change; land degradation, availability and fragmentation; water and energy crises; and biodiversity loss. India is already in low agriculture productivity category coupled with low water availability. Since the scope for expanding the cropped area is limited, the only way to reach desired level of production has to be through productivity improvement. Thus, early and efficient detection and prophylaxis and treatment of diseases and pests will have to be given greater emphasis in future.

Varietal Improvement

- **Breaking yield barriers**

In most of the crops yield plateau has been already achieved, hence milestone achievement is not obtained in recently released varieties. It can be possible to enhance rate of exploitation and utilization of available germplasm resources including wild accessions by recent advance breeding technology like molecular breeding and marker technology for breaking yield barriers.

- **Improvement in nutritional quality and value addition of agriculture produce**

Nutritional quality of food grain crops is declined. Molecular breeding, development of transgenic technology and biofortification help to boost nutritional quality without losing yield. It is also suitable for value addition, post harvest management and promotion of products in world market to earning foreign exchange.

- **Crop improvement under controlled conditions**

To evolve suitable crop varieties/hybrids for cultivation under controlled conditions e.g. Hydroponics system, Greenhouse, Shade net house.

- **Forage and tree species improvement for high biomass**

To develop genotypes of forage crops and tree species for high biomass with improved fodder and wood quality within short duration and less space.

- **Climatic resilience**

Strengthening research in view of new niche areas due to climatic change and development of cultivars which stand under short duration & are climate resilient.

- **Shortening of breeding cycle/process duration**

Advance molecular breeding tools and controlled prove its efficiency to shorten breeding cycle/process and increase number of generations to curtail period of cultivars development.

- **Conservation of genetic resources:**

Development and evaluation of trait specific genetic resource under different climatic condition and its conservations. Further utilization in breeding program and also establishment and maintenance of a gene sanctuary with identified useful genes and promoters for use in plant breeding programs.

- **New emerging pest and diseases**

Development of suitable tolerant/ resistant cultivars to control/ management of emerging pests and diseases within short time.

- **Development of cultivar for organic farming**

Strengthening research to develop new crop varieties more responsive for organic farming, it will be helpful to enhance profitability of organic farming.

- **Development of suitable cultivar for cropping system**

Strengthening research to develop new crop varieties suited for different cropping system e.g. Intercropping, sequence cropping, relay cropping, HDPS, agro forestry, multistoried, vertical farming etc.

- **Development of cultivar suitable for mechanized farming**

Strengthening research to develop new crop varieties suitable for mechanized farming.

Rice

- Rice quality: Development of super fine grain rice varieties of early , mid late and late duration for premium price in market.
- Development of nutritional rice/Biofortification of rice varieties. Collection, evaluation and maintenance of rice germplasm and use in varietal development
- Development of high yielding rice varieties. Hybrid rice development
- Biotic and abiotic stresses: Development of fine grain rice varieties for gall midge and hopper resistance.
- Development of rice varieties for high yield, abiotic & biotic stress tolerance and quality. Development of Rice technology for integrated pest, disease and nutrient management.
- Development of climate resilent rice varieties.
- Development of drought, flood and enhanced temperature tolerant rice varieties.
- Development of rice varieties and management practices for drilled rice.
- Low productivity of Paddy, Pigeon pea, Dhaincha and Sunhemp
- High cost of cultivation
- Mechanization of farming
- Controlling of perennial weeds in rice farming system

Wheat

- Increasing Population and consequently the demand of wheat grains.
- Climate change, increase of temperature and depletion of water sources availability.
- Unsustainable use of natural resources.
- Biotic and Abiotic stresses and management.
- Development of product specific varieties.
- Ways of increase productivity and value addition.
- Cropping systems and Agronomical practices.
- Prevailing high temperature
- Lack of congenial climate
- Exhaustive crop

Sorghum

- The reduced maturity duration of the high yielding varieties led to its high vulnerability to grain mold damage during kharif.
- Consequent non expansion in demand for use as food, failure in creating diversified area for grain as feed or industrial raw material and value addition to kharif sorghum impair restriction on production and profitability to the farmers.
- Unlike the case of kharif sorghum, biological and environmental limitations posed difficult hurdles in rabi sorghum productivity.
- Limitations in the maneuverability of the rabi adapted genetic variability to the grain yield heterosis, high yielding of non rabi adapted variability to the biotic stresses are causing hurdles in the progress of rabi sorghum productivity.
- Lack of thrust on forage sorghum
- With scanty and erratic rainfall and with shallow low water retentive soils (unfavorable soil conditions) preventing advanced sowing and also leading to terminal moisture stress to the crop are passing the task of the yield improvement by agronomic manipulations equally difficult.
- Under this present food situation which is relatively secure for the time being addressing the issue of "hidden hunger" caused by imbalanced nutrition is emerging as a important issue.
- Thus, to emphasize breeding for the micronutrients, vitamin A and other essential amino acids are essentials.
- How to develop sorghum as a multipurpose cash crop such as that for the production of the ethanol and other value additions is also challenging.

Pulses

- Exploitation of germplasm resources and wild accessions in pulses for breaking yield barriers.
- Transgenic technology to boost pulses production.
- Development of high protein content varieties of pulses.
- Expansion of pulses in new niches like chickpea in rice fallows and summer mugbean cultivation wherever irrigation is available.

- Development of efficient water management strategies and popularization of micro-irrigation techniques for enhancing pulse productivity.
- Development of chickpea varieties suitable for mechanical harvesting.
- Linking farmers with profitable markets.
- Promotion of export of pulses like kabuli chickpea.
- Development of climate resilient varieties of pulse crop.
- Aggressive technology demonstration in farmers' fields.
- Seed treatment campaign through Mobile Seed Treatment Machines to facilitate seed treatment at the door-steps of the farmers.
- Isolation and maintenance of efficient strains of biofertilizers. (Rhiobium, PSB etc.) for longer period.
- Minimization of chemical fertilizers by using effective biofertiliers.
- Enrichments of soil fertility with application of PGPR for various nutrients.
- Biofertiliers and nutritional requirements of kharif and rabi crops should reach to the door step of farmers for easy and quick utilization.

Soybean

- Removing of anti-nutritional factors (ANFs) including soybean agglutinin, soybean protease inhibitors, soybean allergenic proteins, etc., that may result in poor food utilization and decreased growth performance.
- Breeding for biotic stress disease resistance like yellow vein mosaic virus.
- Development of new quantitative trait loci to diseases such as Charcoal rot disease.
- Breeding for increased abiotic stress tolerance in soybean is long-term and difficult due, in part, to the multigenic nature of improved tolerance.
- Identifying major abiotic stress resistance genes and QTLs.
- Incorporation of new alleles for tolerance to drought, flooding and alkaline soil conditions in soybean
- Improvement in functionality of soybean protein and oil for greater utility in food, feed and industrial markets. Improvement health benefits, greater heat and oxidative stability for improved use in frying, bio-fuels and lubricants.

- Increase the genetic diversity in wild soybeans by using modern tools as use in Arabidopsis, which could improve today's yield, composition, stress resistance and more.
- In future we could use CRISPR interference technique has enormous potential application, including altering germline & modifying the genes of food crops.
- Development of herbicide tolerant soybean.

Oilseeds

Sunflower

- Indiscriminate cropping in marginal soils without proper crop rotation.
- Inadequate and imbalanced fertilization of major, secondary and micronutrients.
- Non adoptability of recommended time of sowing.
- Poor moisture conservation practices, Non adoption of moisture conservation practices like ridges and furrows, use of hydrogel.
- Non availability of at least two protective irrigations during Rabi & summer season.
- Low productivity of high oleic hybrids.
- Absence of thinning to remove excess plant population.
- Poor seed setting due to continuous rains & cloudy weather during kharif season.
- Pollen desiccation due to high temperature at pollination stage during summer.
- As it is a highly cross pollinated crop requires special efforts to be taken like Hand pollination, spraying of boron during flowering stage and keeping of honey bees.
- Narrow label claim insecticides, no label claim on safer insecticides like bio pesticides, botanical and newer eco-friendly group of pesticides.
- No spraying technique after 50 % flowering to control head borer.
- Non adoption seed treatment to avoid diseases like Necrosis, Alternaria, rust and downy mildew

Safflower

- Indiscriminate cropping in marginal soils without proper crop rotation
- Seed availability of high yielding varieties and hybrids

- Most of the area is under rainfed condition leading to acute moisture stress
- It is grown either as mixed or intercrop with other rabi crops leading to poor crop management
- Aphid control and management
- Absence of thinning to remove excess plant population
- Inadequate irrigation facility to provide one life saving irrigation
- Inadequate and imbalanced fertilizer application
- Water logging due to heavy rains in September / October in many areas
- Late sowing after harvest of kharif crop leading to aphid problems
- Inadequate soil moisture conservation practices
- Lack of marketing facility of safflower
- Spiny nature of the crop discouraging the farmer for adoption

Groundnut

- Grown largely under rain-fed conditions (kharif) with low inputs and hence production highly dependent on quantum and pattern of rainfall
- Non-availability of short-duration (90 days) high-yielding varieties for specific low rainfall areas
- High seed multiplication ratio (1:8) results non-availability of quality seeds of new varieties and slows down their spread
- Difficult to develop hybrid due to cleistogamy
- Low seed replacement rate due to a low seed multiplication ratio (1:8) and high seed rate (120 – 150 kg seed pods/ha) and high volume seed crop (seed alone costs about 35% of the cost of cultivations)
- Rapid loss of seed viability in rabi-summer produce rendering the seeds unfit for sowing in the next rabi summer
- Highly susceptible to aflatoxin contamination
- Narrow genetic base in released cultivars and cultivated germplasm
- Lack of infrastructure for post-harvest processing and village or community level storage
- Lack of incentive for producing high quality groundnuts (free from aflatoxin)
- Lack of enthusiasm for adopting high-cost technologies

Cash Crops

Cotton

- Genetic erosion and narrowing of genetic diversity in cultivated varieties/hybrids
- Non-availability of public sector GM cotton varieties mainly Bt cotton
- Indian cotton productivity levels are 30-50% below world average of the leading countries
- Insect Resistance development to Bt cotton and insecticides
- Spurious inputs such as GM seeds and pesticides
- Ever increasing cost of inputs such as seeds, fertilizers and pesticides and non-commensurate market price of cotton is lowering down profitability over time.
- Despite the introduction of Bt cotton, which was expected to reduce the need for insecticide use, the expenditure on insecticides on cotton increasing constantly
- Effective pest control is challenge
- Labour shortages and enhanced wages
- Erratic monsoon, droughts and extreme temperatures limiting the productivity
- Effect of Climate change on cotton production

Sugarcane

- Decreasing Sugarcane productivity
- High input cost
- Continuous drought in the region
- Menace by Wild animals
- Development of drought tolerant variety of Sugarcane for the region

Horticulture

- Inadequate genetic resources, their enhancement and utilization
- Less utilization of resources and production system management including micro-organisms for high profitability
- Enhancing the efficiency of protected cultivation through new cultivars and technology
- Precision farming for efficient utilization of resources
- Development of organic production systems for horticultural crops

- Mechanization for enhancing the efficiency of human capital
- Post harvest management, value addition and marketing
- Exploiting the underutilized fruits and vegetable crops
- Low productivity of fruits and vegetables as compared to other states of India.
- Lack of multiple stress resistant/tolerant varieties and climate resilient technologies.
- Inadequate availability of planting material of improved varieties.
- Inadequate varieties & eco-friendly agro-techniques for export, processing, organic, riverbed, protected cultivation & improving total factor productivity.
- Low input use efficiency.
- Depletion and conservation of natural resources.
- Inadequate infrastructure for storage, transportation, marketing, postharvest processing, value addition and export.
- Regional disparity in technological empowerment of farming community.
- Poor quality of the produce including food safety issues like pesticide residues, microbial contamination, heavy metals, colouring agents etc.
- Emergence of new pest & diseases and new strains/races/biotypes.
- Development of resistance in pests.
- Low level of investment in R & D.
- Low productivity of fruits and vegetables
- Assessment the performance of germplasm of citrus and other fruit crops for vegetative growth, yield and quality of fruits.
- Standardization of agro-technique viz., nutrition, irrigation, regulation of Mrig bahar, weed control, nursery management etc. for increasing the productivity in citrus and other fruit crops.
- Standardization the plant protection schedule for citrus.
- Research on pre and post harvest management of fruits of citrus.
- Impart training to cultivators and extension personnel of Agricultural Department of improved agro-techniques of citrus.
- Supply healthy and genuine planting material of citrus and other fruit crops to the cultivators of the region.

University Departments

Agronomy

- Need for developing a holistic approach to sustainable development, including awareness of sustainable resource management practices.
- Production technologies for organic farming, intelligent marketing of truthfully labelled produce to fetch better price.
- Cost-effective and eco-friendly plant health management.
- Increasing rural labour wages and shortage of labour
- Depleting water resources
- Degradation of natural resources like deteriorating soil health soil organic
- Moncropping and lack of use of organics
- Weed management
- Food security and nutritional quality
- carbon, multiple deficiency of micronutrients
- Reducing crop responses to inputs
- Harvest and post-harvest losses
- Malnutrition among the population
- Climate change and its effect
- Imbalanced fertilizer use
- Decreasing cultivable land, farm holding and family size
- Technology adoption gaps
- Changing food consumption pattern
- Low rate of farm residue recycling
- Multiplicity of farming systems
- Reliable prices and assured market
- Value addition of all product produced from IFS
- Post-harvest processing of farm produce

Seed Technology

- Climate resilient seed production technology
- Basic research on genomics of seed quality traits, seed health and seed ageing.

- Basic research relevant to pollination, seed development and maturation studies for better seed recovery
- Standardization of seed production technology in major crop species for enhancing the viability and profitability.
- Development of seed testing kit
- Identification of alternate area for seed production in off-season
- Strategic involvement of private seed sector for symbiotic partnership.
- Integration of Information and communication technologies for online database management system for effective coordination.
- Transfer of optimum seed production technology to farmers.
- Strengthening of seed village programme to promote the need based technology for the farmers through launching different extension activities.
- Development of diagnostic tools for different seed borne diseases.
- Creation of referral laboratories for seed quality testing

Biotechnology

- There is high level of private participation in biotech research worldwide. The Indian biotechnology research also has to bridge the gap with advanced level of work going on in developed countries through adequate funding especially to public institutions. Therefore, we have to equip ourselves better both on skilled manpower and research areas to address region-specific issues and drive the biotech research programmes in the right direction.
- In the view of increasing job opportunities in private companies this centre will focus to educate PG students well trained in sophisticated technologies useful to seed industries.
- In Agricultural Biotechnology field the main challenge is in the research area to develop the technology as well as varieties resistant to draught/ abiotic stress for Vidarbha region.
- The acceptance of biotech processes and products like GM crops by the government regulation, so there is a need for careful analysis of implications and acceptability risk of any GM organism, at the conceptual stage.

Entomology

- Synthesis and harmonization of robust and adaptable, bio-intensive, location and cropping system specific IPM technologies including novel molecules and nano-technological inputs with Global-GAP & India-GAP standards/protocols
- Development of decision support systems based on advanced sensor linked and IT-based platforms for monitoring crop parameters, enabling decision criteria induction mechanisms
- Overall ecologically sound IPM/GAP practices to encourage inter-departmental/inter-ministerial linkages and project based collaborations for ultimate convergence and involvement of all stakeholders for the successful implementation of area wise IPM in the region.
- Use of newer technologies particularly advanced biotechnological, biochemical and microbial interventions and computerized electronics, robotics, nano-technologies and automated sensor-based decision support systems/applications/devices/products/tools in more and more advanced implementation of IPM/GAP certified production systems
- Developing diagnostics, which need to be simple, autonomous, rapid and enrichment-free, field operable, inexpensive, real-time, sensitive and specific with abilities for early detection and indeed responded timely.
- Plant health management and Bio security concerns.
- Development of eco-friendly bio-pesticides/fungicides for control of emerging pests and diseases.

Plant Pathology

- Resistance development in pathogens against crop diseases and fungicides.
- Minimization of chemical fertilizer doses by using effective strains of biofertilizer/nutrient solubilizers.
- Enrichment of soil organic carbon with the application of organic matter decomposing micro- organisms.
- Management of primary and secondary spread of pathogens by judicious use of plant protection chemicals.
- Impact of climate change and global warming in disease development.

- Identification of disease free areas and replacement of cropping pattern based on disease situation.
- Production of disease free planting material
- Use of natural energy resources (Soil solarization) for management of soil borne disease
- Challenges based on understanding the strategies for plant disease management on comprehensive knowledge of cellular, organismal and ecological interactions involving plants and pathogens.

Soil Science and Agricultural Chemistry

- Soil degradation
- Soil health decline
- Improper cultivational practices leading to degradation of micro flora of soil
- Declining soil organic carbon
- Non availability of organic manures and lack of their use
- Depletion of soil fertility
- Widening gap in nutrient demand and supply
- Imbalanced nutrition of crops
- Emerging multi-nutrient deficiencies
- Negligence towards crop residue utilization/crop residue burning
- Increasing dependency on external organic inputs
- Soil and water pollution by use of sewage and industrial effluent
- Release of toxic contaminants from various man made sources resulting in contamination of natural resources of earth and leading to scarcity of clean water and loss of soil fertility.
- Soil and water pollution is also severe where small industrial units are pouring their untreated effluents over near agricultural fields.
- Low fertilizer use efficiency
- Indiscriminate use of fertilizer
- Land use planning based on resource base
- Soil erosion
- Nutrient mining due to intensification

- Balanced fertilization
- The use of plants species for cleaning polluted soils and water necessitating phytoremediation.

Animal Husbandry and Dairy Science

- Non-availability of quality indigenous and crossbreds of Cattle & Buffalo.
- Limitations of feed resources both in terms of qualitative and quantitative terms.
- Lacks of technology for proper utilization of crop by products.
- Non availability of green fodder.
- High cost of concentrate feed.
- Lack modern facility dairy, poultry and goat development.
- Low-cost balanced feed and health management options for animal husbandary, poultry and fishery sectors.
- Multiplication of elite dairy animals by developments and application of newly emerging biotechniques.
- Meeting the nutritional requirement of high yielding dairy animals.
- Management strategies for improving dairy animal welfare under different production systems.
- Short shelf life of dairy products under ambient conditions.
- Increasing awareness regarding the nutritional and therapeutic virtues.

Social Sciences

Extension Education

- Low adoption of recommendations and improved technologies
- Agrarian crises
- Land fragmentation
- Migration of rural youth in urban areas
- Self employment crises
- Illiteracy of farmers towards ICT
- Scarcity of Labours for agricultural work
- Low income of farmers/landless labourers
- Motivating farmers towards Allied occupation for sustainable livelihood
- Motivating farmers for adoption of technology

- Excessive expenditure on social ceremonies
- Lack of Multidisciplinary research approach
- Assessment of Extension Education needs of farming Community
- Improvement in quality and type of technologies dissemination
- Need based and demand driven Research – Extension Systems
- Sustainability and accountability of Research–Extension for stake holders.
- Professionalism in extension education for appropriate transfer of technologies.
- Relation of Extension Education with end users farming community considering their socioeconomic status.
- Need of more vibrant T and V system of Extension
- Linkage between SAU and State Department of Agricultural and other line departments for rapid transfer of appropriate technologies.
- Retaining and holding interests of farmers in agriculture and allied sectors.
- Improving technology adoption and reducing technology fatigues.
- Integration of research-extension-market
- To arrest Rural Migration and increase employment for youths and woman on priority.

Agricultural Economics and Statistics

- Evaluation of structure of cost of cultivation.
- Design and Structuring of training policies in the field of Agril. Economics.
- Policy studies on contemporary agricultural R&D issues.
- Environmental economics.
- Challenges based studies and strategies for farm management.
- Development of a networking monitoring and response system to improve market intelligence and accessibility, preparedness for biotic and abiotic stresses.
- With unfolding of globalization, agri-food marketing systems will undergo a significant transformation towards demand – driven, vertically-coordinated system managed by the agribusiness and market firms. The main challenge will be to integrate small farmers on the demand-driven supply chain through appropriate institutions and policies.

- Changing quality consciousness and global competition- Non-existence of appropriate quality monitoring mechanism for domestic market is a challenge to be addressed.
- Absence of market linkage and resultant price fluctuations.

Agriculture Engineering and Technology

Irrigation and Drainage

- Low irrigation facilities
- Drainage in black soils
- Fertigation and stage wise nutrition of crops
- Agriculture Process Engineering
- Inefficient by-product utilization
- Low use of renewable energy sources for processing operations
- Development of cost effective and farmer friendly post harvest processing technologies
- Human drudgery reduction in processing operations
- Improve efficiency and recovery of the finish product
- Focus on minimal processing
- Shelf life enhancement of horticultural crops
- Establishment of Value Chains for various crops
- Establishment of Agro Processing Centres in the production catchment
- Entrepreneurship development through small scale processing
- Development of technologies useful for employment and self employment generation
- Adoption of post harvest processing technologies by the end user
- Reducing post-harvest losses and adding spatial, temporal and quality values to the produce-expansion of secondary agriculture, peri-urban agriculture, improvement of storage, packaging and transport etc.,

Unconventional Energy Sources & Electrical Engineering

- Development of solar energy gadgets for efficient utilization of solar energy.
- Development of thermo-chemical conversion technology for efficient utilization of biomass

- Development of waste utilization gadgets for energy generation

Soil and Water Conservation Engineering

- The major challenge in the coming decades is to mitigate the impacts of climate change on our finite degrading resources which may pose a question "Here is the land, but where is the soil".
- Indian agriculture has been experiencing several challenges due to tremendous pressure being exerted on our limited fertile soil and good quality water.
- It calls for anticipatory, strategic and proactive research to conserve resources and enhance productivity of various land use systems.
- Ground water levels have dropped alarmingly due to over exploitation of in industrial and agricultural sector.
- The late onset of monsoon and par below rains during subsequent years has compounded the problems.
- Efficient rain water harvesting and soil moisture conservation for increasing cropping intensity.

Farm Structure

- Design and development of modified shade net house for Vidarbha region
- Design and development of Eco friendly dairy barn
- Design and development of hydroponics structures
- Utilization of waste water for agriculture purpose

Forestry

- Long gestation period of tree crops
- Development of value added products from different forest crops
- Establishment of Van Vigan Kendra (VVK)
- Motivate unemployed rural youth for entrepreneurs in forestry sector
- Selective, volatile, secretive and unorganized market for non wood forest produce
- Climate change and global warming

- To meet the fuel, fodder, timber, fruits, biomass demand of growing population, local wood based industries and village enterprises it is necessary to increase production of these material
- To protect sustainability of agriculture and create balance in environment to combat Global Warming & Climate Change
- To arrest Degradation of soil, water & other natural Resources
- To undertake conversation of forest ecosystem and rural livelihood

Dry land Agriculture

- Sustaining the livelihoods of small and marginal farmers who still depend on agriculture despite increased climate variability and shrinking land holdings.
- Manpower shortage in farming
- Growing preference for commercial crops even in less endowed areas
- Balancing the land use and cropping pattern as per the resource capability and shifting markets
- Water scarcity, poor input use, resource degradation, low technology adoption, limited productive livestock, low socio-economic status of the people, poor market access, price fluctuations of farm produce, etc are the major constraints of rainfed agriculture
- The swings in the onset, continuity and withdrawal pattern of monsoon
- Prolonged dry spells prevailing the productivity

Vision and Focus: Research

Rice

- Develop rice varieties for high yield, abiotic & biotic stress tolerance and quality
- Development of super fine grain rice varieties of early and mid late and late duration
- Development of fine grain rice varieties resistance to gall midge and hopper
- Development of hybrid rice
- Development of nutritional rice varieties rich in Fe and Zn.
- Development of super fine red rice varieties
- Mutation breeding programme
- Development of multi resistance to pests and diseases (biotic stress) with high yielding paddy variety suitable for Eastern Vidarbha Zone
- Development of drought tolerant variety (abiotic stress)
- Development of high yielding multi resistance with aromatic paddy varieties
- Development of C.M.S. and restorer line for hybrid development programme
- To develop superfine hybrid varieties
- Collection and maintainance the germplasm for varietal development programme
- To identify new immerging pests and diseases in Eastern Vidarbha Zone
- Collection, evaluation, maintenance of Rice Germplasm and use in varietal development
- Utilization of rice straw for its alternate use
- Study on effective herbicides for rice based cropping systems
- Monitoring new occurring pests & develop effective insecticide
- Monitoring new occurring diseases & develop effective control measure

Wheat

- To improve wheat productivity under changing climatic conditions by developing climate resilient varieties sustainable wheat production, development of high yielding wheat varieties, development of product specific wheat varieties, Development of wheat varieties having high nutritive values,

development of wheat varieties which will be resistant to biotic and abiotic stresses and sustainable use of natural resources etc.

Sorghum

- Research on augmentation of economic benefit from the achieved productivity potential by preventing grain mold damage and yield loss from major pests, expansion of demand for the grain for food and alternate uses and increasing profitability from kharif sorghum is to precede further increase in productivity. In the absence of the latter strategy, the decline in kharif area would continue.
- Incorporation of grain mold resistance as well as resistance to major pests in high yield background could be achieved by combination of conventional or biotechnological breeding.
- Expansion of demand for grain could be achieved by rendering it mold free, by introduction of processing technology and through promoting its use as feed and industrial raw material for starch and alcohol production.
- Value-addition to the crop with sweet stalk and high biomass yield and favorable public policies.
- Specialized kharif sorghum farming for grain export to international market is another emerging option.
- Research on rabi sorghum to enhance productivity require gene pools, breeding lines and parental lines with different adaptation niches from those of kharif sorghum.
- Possible development of genetically engineered cultivars with resistance to shoot fly may offer opportunity to advanced rabi planting and avoid problems associated with terminal moisture stress and low temperature.
- Due to paucity of complete data base on several aspects of rabi sorghum such as its genetic variability, limits to dry matter production and partitioning, yield components and those which are easily maneuverable for achieving quick yield improvement, gene pool effecting higher levels of heterotic expression, breeding behavior for grain quality, biotic and abiotic stresses, control and correction of low temperature induced seed set and production problems, nutrient use

efficiency among genotypes and under variable receding soil moisture regimes, etc.

- Improvement of rabi sorghum productivity with the available scientific understanding on breeding and production management.
- Sorghum, particularly kharif sorghum with high productivity potential, has capability to emerge as a commercial crop of industrial importance.
- With progress in the overall economic well-being of the nation, empowerment of households below poverty line with adequate purchasing power, growth in dairy and meat production and shift in the food habit to increased intake of animal-derived food, a phenomenal demand for cheap coarse grain is expected to emerge in the country. Sorghum along with maize would be favored coarse grains.
- Suitability of grain to produce good quality potable alcohol may persist as long as it continues to be a competitive raw material.
- The chances are brighter as the policy of blending ethanol with petrol as biofuel, molasses existing a raw material will not be able to cater the total raw material requirement from biofuel production alone as the expansion programme.
- We can introduce this crop as a supplement to sugarcane for its utilization as an alternative raw material for ethanol production.
- While there is a scope for dual purpose cultivars in certain regions of the country in the immediate future, growing dairy industry may require cost-effective and efficient fodder or forage production system for supply round the year.
- This offers vast scope for developing high yielding, good quality cultivars for forage and similar cultivars for fodder supply.
- As fodder production is slowly become commercial, the dual purpose cultivars may be found yield limiting and this may shift the option to fodder sorghum cultivars.
- Apart from biomass yield, sugar content, protein content and digestible dry matter may assume importance in cultivar development.
- Parching sorghum varieties need to be exploited for development of small scale entrepreneurship and for alternate purpose.

Pulses

- Planning and execution of seed productions. Involvement of Public-Private Partnership in seed business.
- Need to focus on mid early duration (150-160 days) varieties of pigeonpea to avoid terminal stress which result into heavy losses in yield of piegon pea.
- For medium to deep black soil mid late cultivar (165-180 days) like PKV TARA, BSMR-736, BDN-708 etc. and on medium to deep black soil with protective irrigation ICPL-87119 (Asha) need to be promoted.
- On shallow textured soil early maturity (150-165 days maturity) varieties (AKT-8811, Rajeswari (PT-012) proves advantageous.
- Development of high yielding, wilt and SMD resistant and pod borer tolerant, stable and fertilizer pigeonpea hybrids to break the yield stagnation in pigeonpea.
- Development of efficient large scale seed production system in hybrid piegonpea to make available the hybrid seed at low cost to the farmers.
- Digging farm ponds/community reservoirs for providing supplemental irrigations through micro-irrigation system at critical growth stages of pigeonpea and chickpea. Integrated soil-water-irrigation-nutrient management should be aggressively promoted to bridge the yield gaps in pulse crops.
- Adoption of moisture conservation practices like sowing across the slope, sowing on BBF or Ridges and Furrows.
- Promotion of seed treatment campaign through Mobile Seed Treatment Machines to facilitate seed treatment at the door-steps of the farmers.
- Soil test based balanced fertilizer management. Research on efficient fertilizer practices such as balanced use of nutrients, correct timing and placement use of micronutrient and soil amendments.
- Development of varieties having resistant to both wilt and SMD in pigeonpea and MYMV resistant in mungbean and urdbean for summer cultivation.
- Development of transgenic pigeonpea and chickpea varieties for resistant to pod borer is need of future.
- Development of climate resilient varieties of pulses for sustaining abiotic stress.

- Development of varieties of mungbean, urdbean and chickpea suitable for mechanical harvesting.
- New Niches: Utilization of rice fallow area of EVZ for rabi and other minor rabi pulses (Peas, lentil and lathyrus) can be exploited provided attractive minimum support price. Promotion of summer mungbean cultivation where adequate irrigation facilities exists and pigeonpea on rice bunds of EVZ.
- Strengthen adaptive research and technology assessment, refinement and transfer capabilities of the country so that the existing technology transfer gaps are bridged.
- Isolation of efficient soil micro organism for nitrogen fixation and phosphate and potash solubilization for minimization of chemical fertilizers.
- Screening of efficient strains and their study on cheaper substrate for mass production of biofertilizers.
- Awareness among the farmers through training to developed knowledge for pre sowing seed treatment of biofertilizers.
- Supply of biofertilizers to the farming community in cheaper rates.

Soybean

- Development of varieties wit Molecular Markers.
- Utilization of Genetic Engineering for developing high yielding varieties.
- The application of Molecular Diagnostics for plant diseases.

Oilseeds

Sunflower

- Development of CMS based high oleic hybrids.
- Evolve early maturing high yielding hybrids/varieties for paddy fallows.
- Develop integrated insect pest and disease management modules
- Develop organic module for sunflower production
- Product diversification, bio-fortification and value-addition and economic use of byproducts
- Development of varieties for specific end users: high oil varieties for crushing, low oil varieties for direct consumption, high protein varieties as functional food etc.

Safflower

- Development of CMS based hybrids and varieties with high oil content (35 to 38%).
- Evolve early maturing and non-spiny varieties for paddy fallows.
- Develop integrated insect pest and disease management modules
- Identification of trait specific donors in the germplasm collection
- Pre-breeding
- New pests and diseases which may emerge under the changing scenario of climate
- Genetic enhancement for yield and quality traits as well as stress tolerance

Groundnut

- Identification of stable sources of resistance to biotic and abiotic stresses at hot spots.
- Development of high-yielding groundnut varieties resistance to drought; diseases and insect-pests; and high temperature, salinity and acid soils
- Development of groundnut based cropping system for exploiting yield potential of groundnut varieties.
- Demonstration of proven production and protection technologies through on-farm demonstrations in target areas
- Production of nucleus and breeder seed of important groundnut Varieties
- Identification of trait specific donors in the germplasm collection
- Genetic enhancement for yield and quality traits as well as stress tolerance
- Product diversification, bio-fortification and value-addition and economic use of byproducts

Cash Crops

Cotton

Crop Improvement

- Genetic enhancement with reference to climate change
- Breeding for Multi-Adversity-Resistant hybrids/varieties
- Intensification of research on heterotic pools and development of hybrids with high harvest index and boll development synchrony

- Markers for major economically important traits
- Marker Assisted Breeding initiatives for pest & disease resistance
- Exploring the possibility of harnessing stable epigenetic variations across generations to improve adaptability of cotton to changing environments, hybrid vigour and productivity
- Developing epigenetically engineered cotton by chemical treatments and/or spontaneous/environmentally induced epimutations for higher productivity
- Early maturing varieties for rainfed cultivation
- Robust genetic sources for abiotic resistance (salinity, drought and heat tolerance)

Characterization of genetic resources

- Need for rain-out shelters and phenotypic platforms to characterize genetic sources for resistance to biotic and abiotic stresses

Biotechnology

- IPR protected indigenous genes and promoters
- IPR protected genetic transformation constructs and genetic engineering technologies
- Novel technologies of RNAi and site directed gene integration
- Platforms for Bioinformatics and Molecular software application
- Indigenous gene data banks, molecular and microbial resources

Crop Production

- Conservation Agriculture Technologies and soil moisture conservation
- Intensive research to identify cropping systems of cotton with Nitrogen fixing crops (fodder and pulses) and microbial biofertilizers (Azolla, Anabaena, Azotobacter, Phosphorus solubilising microorganisms (PSM), Arbuscular Mycorrhiza (AM) etc.) also to ensure self sustaining IPM ecology and Integrated farming systems with animal husbandry
- Biological Weed Management Technologies
- Combined effective water-nutrition management
- Mechanization of operations to substitute labour drudgery
- Studies on the possible impact of technologies on labour displacement

- Real-time analysis of micro nutrient disorders and crop-specific formulations
- Standard package of practices for organic cotton production
- Research to mitigate the impact of climate change on crop productivity

Plant Protection

- Research on components of Integrated Pest Management (IPM) and Insect Resistance Management (IRM)
- Addressing the challenge of insect pests and diseases that are common to many crops such as Borers, viral diseases, virus vectors –whiteflies and thrips that have impact on cotton pest management
- Documentation of molecular diversity of cotton insect pests, parasitoids, predators, pathogens and economically important microbial populations in the cotton cropping systems
- Bio-security & planning for invasive pests such as whitefly B-biotype and Mealybugs
- Rapid diagnostic tools especially for cryptic insects and diseases

Seed Science and Technology

- Package of practices exclusively for cotton seed processing production
- Simple cost effective nurseries for hybrids
- Diagnostics – Critical for seed borne diseases
- Simple and cost effective genetic purity testing method for commercial hybrids (other than that for the transgene)
- Research on pollination for seed production and quality

Sugarcane

- Development of cost-effective, profitable and sustainable agro-techniques for improved plant and ratoon productivity.
- Establishment of jaggery preparation unit
- Development of drought tolerant variety of Sugarcane for the region
- Research on soil fertility and sugarcane productivity with INM
- Mechanized Sugarcane Cultivation
- Development of bio-intensive IPM module
- Technology assessment, transfer and refinement

- Impact assessment of technologies.
- Acquire funded AICRP Centre along with post of Plant Breeder

Horticulture

- Augment the share of horticulture in particular in the GDP of the country and its export basket.
- To provide national leadership for evolving science-led environment friendly and globally competitive Indian horticulture with a view to assuring sustained food, nutrition and livelihood security for all.
- Doubling the farmer's income by increasing the production, productivity and reducing post-harvest losses.
- Conservation and management of genetic resources of mandate fruits, vegetables and flower crops and their characterization through conventional and molecular approaches.
- Crop improvement through conventional breeding, mutation breeding and genetic engineering.
- Enhancing productivity through improving quality and quantity of planting materials using modern propagation techniques and rootstocks, precision farming practices including mechanization and management of biotic and abiotic stresses.
- Reduction in post-harvest losses through integrated pre and postharvest management practices, value addition and diversification of products.
- New market oriented technologies for secondary agriculture and value addition
- Promotion of the plantation crops viz., Cashew nut in Eastern Vidarbha Zone and Coffee in Melghat region.
- Area expansion of fruits under subtropical zone with high-value horticultural crops
- Mass multiplication of genuine and quality planting materials with traceability
- Canopy architecture management for harnessing adequate natural resources
- Promotion of multi-nutrient crop based /site- specific fertilizers usage; nano materials usage

- Development and technological strengthening of Horti value chains; nano technology applications
- Development of technology for organic fruits and vegetables as per global markets requirement.
- Development of polyhouses/nethouses for nursery, vegetable, etc.
- Promotion of micro irrigation systems in fruits, vegetables and flower crops.
- Precision farming approaches
- Market Information Systems
- Decision support system
- Collection and evaluation of germplasm of fruit crops (Indigenous/Exotic)
- Development of high yielding and disease/pest resistant varieties
- Standardize the agro techniques for increasing the productivity of fruit crops
- Supply the genuine planting material to the farmers
- Impart the training to the farmers/ Argil. Extension workers

Agronomy

- Facilitating an enabling environment which would foster the desired academic environment that commit to promoting innovation and creativity
- Strengthening quality assurance mechanisms to ensure that the research are at internationally accepted levels of quality.
- Establishing an Agronomical Technology Monitoring and Forecasting capacity to keep abreast of technological advances in Agronomy, worldwide
- Strengthening quality assurance mechanisms to ensure that the education, training, research and extension activities are at internationally accepted levels of quality
- Promoting well performing group of faculties to develop centers of excellence in their areas of strength and bring the infrastructure to the highest international levels
- Developing active partnership with all stakeholders including policy planners, farmers, agricultural industrialists, and community leaders
- Exploiting knowledge management and software development to accelerate use of knowledge tools in agricultural production

- Orienting research and extension activities towards increasing production and productivity of agriculture, earning capacity of rural poor, and improving the quality of life of the people
- Developing institutional partnership through better networking with sister institutions.
- Information technology enabled characterization of farming systems
- Future Family Farming
- District/village specific sustainable integrated farming system models & modules (Development of location specific farming for whole Vidarbha through OSR and OFR)
- Farming systems diversification / intensification
- Vertical farming systems, Terrace farming, Hydroponics
- Specialized farming systems
- Cluster and social farming
- Multiple uses of resources
- Organic farming systems
- Climate smart farms and systems
- Conservation agriculture
- Precision farming for higher input use efficiency
- Empowerment of women through IFS
- Gas emission studies
- Integrated approach of all resources like INM, IPM IDM, IIM, ICM to increase efficiency and profit with taking care of ecosystem and environment.

Agriculture Botany

- Developing varieties that can withstand under biotic and abiotic stress created by climatic change.
- Plant molecular breeding approaches such as Marker Assisted selection, GMOs, etc is useful to shorten breeding cycle to bred crop varieties for biotic & abiotic stress tolerance.

- Emphasis will be laid upon QTLs, Genome mapping, identification of desirable genes etc from available germplasm and wild relatives to harness the wealth of native biodiversity.
- Modernization and strengthening of Seed Technology Research Unit is visualized to undertake study on various aspects and problems pertaining to seed production, processing and storage.
- Development of varieties/hybrids with enhanced nutritional quality as well as economic yield
- Strengthening frontier research for genetic enhancement of yield and quality of agriculture produce.
- Improvement of genetic resources / germplasm
- Coping with the adverse effects of climate change
- Identification of cultivars suitable for different ecologies/ environments

Seed Technology

- Ensure the quality seed security to the farmers through technological intervention and sustainable agriculture
- Survey and collection of farmer saved seeds in different field crops under different agro-climatic zones to understand the status of seed biology in respect of seed viability and longevity.
- Standardization of Molecular tools and Techniques for identification of varieties and genetic purity/hybridity testing.
- Use of nano-technology for advance research in seed science & technology
- Determination of molecular and bio-chemical basis of seed dormancy and longevity.
- Value addition of seeds through seed enhancement techniques including priming, coating, pelleting and magnetism etc.
- Development of vigour test in major field crops.
- Development of new standards for seed health in major field crops.
- Development of suitable storage techniques for various field crops
- Development of dormancy breaking methods for enhancing seed germination in forage species.

- Identification of chemicals for synchronization of flowering between male and female parents in hybrid seed production.
- Strengthening of scientific seed processing, storage and effective quality control system
- Promotion of seed bank in rural areas
- Determining the influence of climate change on quality seed production

Biotechnology

- Disseminate information on recent innovations especially in the technologies related to bioprocessing, environmental biotechnology, invitro selection and amplification systems, and genomic science.
- Promote establishment of Biotechnology based entrepreneurship in the upcoming MIHAN project at Nagpur
- Cooperate and collaborate with regional,. National and International organizations including SAU's, ICRISAT, ICAR, CSIR, leading agro based industries that interface between contemporary molecular biology and biochemical processing.
- Plant tissue/cell culture and micro-propagation techniques.
- To develop biofortified varieties with all essential nutrients to overcome the problem of malnutrition as well as develop salt and drought tolerant variety to overcome salinity and water scarcity problem.
- Development of methods and technology to overcome the problem of water scarcity and pollution.
- Isolation and identification of micro-organisms for preparation of biopesticides and mass raring of biocontrol agents from crop ecosystem to minimize the use of poisonous chemical in agriculture.

Entomology

- Crop improvement and natural resource management through efficient and sustainable use of available natural input resources in pest management
- Focus on developing technologies on "Climate Smart Crop Protection".
- Use of nanotechnology for efficient delivery of pesticides.
- Lab on the chip based on advanced genomics

- Biosystematics based on molecular characterization, bar-coding and digitized keys for species level identification
- Databases/catalogues/monographs/inventories of major insect pests and natural enemies – its digitization for on field identification through high resolution images
- Molecular approaches for managing insecticide resistance through RNAi based transgenic development
- Molecular Novel Agrochemicals
- Mapping and monitoring of pests for development of weather based forewarning in GIS environment
- Robust forecasting models
- Genomics added pest management
- Biodiversity and butterfly park
- Exploration of organic pest management inputs viz., botanicals, microorganisms.
- Strain improvement of natural enemies through genetic modification for various traits including development of transgenic parasitoid, transgenic predator
- Development of indigenous technologies (ITK) and instruments for the benefit of farmers and getting intellectual property rights thereof.
- Emphasis on organic/ecological/sustainable and conservative pest management strategies
- Safety use of pesticides to protect environment and soil health
- Bio-intensive integrated pest management packages for major biotic stresses such as necrosis, alternaria, leaf hopper and head borer in sunflower. Aphids, Gujhia weevil, capsule borer, alternaria and wilt in safflower. Leaf hopper, defoliators, pea bud necrosis, tikka, root and stem rot in groundnut.
- Identification of resources of resistant for including in Integrated Pest management
- Develop hybrids/varieties tolerant to biotic stress.
- Pest forecasting are to be developed and validate for managing the major and invasive pests which may hamper the production critically.

Plant Pathology

- Setting up Molecular Plant Pathology laboratory
- Seed Pathology laboratory
- Development of the Plant Diseases Museum
- Strengthening of the Mushroom Demonstration Unit
- Dhingri production Unit and Starting of the pilot Demonstration unit for demonstration to the farmers and students
- Strengthening of the biomass-recycling unit.
- Strengthening of the infrastructure and the laboratory set up at each research station with production and sale of biopesticides.
- Renovation of the existing laboratory setup, renovations of the glass house, net house for research work.
- Setting up of the biofertilizers demonstration and production and unit for the undergraduate students under 'Hands on Training'
- Setting up of the biopesticides and bio-agent production Unit at Department of Plant Pathology.
- Setting up of the CIB standard biopesticides, biofertilizers and biopesticides laboratory for testing of samples
- Advance Centre for Soil borne Plant Pathogens
- Production of good quality of the bio-agents, biopesticides and biofertilizers as per the norms setup by the BIS and CIB for sale to the farming community also to generate the revenue for the development of the infrastructure
- Production of the literature regarding the diseases of the various crops and ensuring their distribution among the farmers for the management of the disease.
- Development of the forecasting modules and management tactics for the various crops in the region
- Work on the patenting of the research technologies that can earn the revenue
- Development of disease resistance lines special reference to chickpea wilt and soybean root rot complex.

- Fertilizers and nutritional requirements of kharif and rabi crops through biofertilizers / biodegradable cultures (Chaetomium, Cellulomonas, Trichurus and Trichoderma)
- Reclamation of physical and chemical properties of the soil with the help of biofertilizers, bioagents and organic matter decomposer
- Reclamation of saline tract soils through the application of salt tolerance strains of Rhizobium, Azotobactor, PSB and Trichoderma etc.
- Screening of efficient strains and studies on cheaper substrates for mass production of Trichoderma, Metarhizium, Beauveria, Nomurea and Verticillium.
- Identification of disease problems of the crops and their management grown under polyhouse and green house condition.
- Impact of environmental condition on disease development under polyhouse and green house condition.
- Crop disease messages through Doordarshan, News papers, Krishi Melawas and Akashwani etc.

Soil Science and Agricultural Chemistry

- Improvement in soil health by enhancing soil organic carbon sequestration.
- Adoption of improved nutrient management strategies
- Utilization of agricultural waste as an indigenous source of nutrients.
- Preparation of GPS-GIS based soil fertility maps for each Tahasil in the region.
- Nutrient management strategies based on climatic variability.
- Production of enriched organic manure, viz; vermicompost, phosphocompost, compost etc.
- Promotion of farmers participation in research
- Promotion of climate – Soil-Water consortia
- Designing of interdisciplinary research approach
- Interlinking of microclimate, soil and plant relationship
- Focus on precision soil management practices
- Adoption of sensor based applications in identifying nutrient stress
- Development of "Nutrient Expert Tool" for various crops

- Use of Nano organic and inorganic resources
- Promotion and development of organo mineral compost
- Crop Residue Recycling and Agricultural Waste Management
- Development of site specific diagnostic techniques
- Enhanced fertilizer use efficiency
- Organic agriculture and soil health
- Soil quality evaluation
- Land use planning based on resource inventory
- Long Term Fertility management for soil health and crop productivity
- Management of problematic soils and Agricultural Waste Management
- Irrigation water quality evaluation
- Use of fortification techniques for enhancing nutritional quality
- Site specific land configuration techniques for efficient nutrient management.
- Adoption of conservation tillage under rainfed condition
- Use of sewage waste water after treatment for irrigation of crops.
- Improving soil health and input use efficiency for sustainable production

Animal Husbandry and Dairy Science

- Enhancing milk production to meet the nutritional requirement of human population.
- Socio economic sustainable development of farmers, livestock owners, rural and urban population associated with this sector.
- More emphasis on climate change, its impact and measures, organic livestock production, fodder banks concept, Hydroponic fodder production, improving quality and availability of fodder, enrichment of low quality roughages.
- Technological innovation and development for indigenous milk products and energy conservation methods in dairy processing, Skill manpower development through extension training organization, etc.

Social Sciences

Extension Education

- Strengthening KVKs
- Capacity building of farmers in scientific seed production through SAUs

- Promotion of Direct Interface between Farmers and Scientists
- Para Extension Workers
- Capacity Building Programmes for Argil. Media people involved in religious discourse
- Strong Regional Extension Centers
- Farm Advisory Services through ATIC
- Need of Vibrant T & V System
- Planning and execution of effective extension programmes
- Hands on training regarding post harvest technologies like bio-pesticides and bio-productions, organic farming, soil health and soil testing, horticultural products.
- Use of innovative and appropriate tools for dissemination of the technology

Intervention with KVKs regarding Priorities/Policies and Programmes

- Better and spontaneous agricultural practices
- Better marketing exposure and pricing
- Reduction of agricultural risks and enhanced incomes.
- Better awareness and information
- Improved networking and communication
- Facility of online trading and e-commerce

Agricultural Economics

- Impact of Agricultural research on upliftment of farming community
- Interaction of crop-livestock Enterprises-Farming systems
- Trends of Agricultural Productivity and growth
- Marketing & price behaviour of agricultural commodities, market co integration, price volatility, value chain of Agril. Commodities.
- Risk Management in Agriculture
- Agricultural credit management and insurance.
- Income diversification and inequality
- Acceleration of Agriculture growth
- Bench mark surveys and assess the impact of technologies on farm economy and socio economic status of farmers.

Agricultural Engineering

Irrigation and Drainage

- Development of low cost pressurized irrigation system
- Economical design of micro irrigation system
- Use of micro irrigation system around the year on different crops with change in crop geometry
- Use of micro irrigation system in inter cropping
- Development of technique for use of poor quality water (saline water) through micro irrigation system
- Pressurized irrigation system on canal water
- Use of remote sensing and GIS in irrigation water management
- Development and testing of useful equipment/instrumentation
- Effect of pressurized irrigation system on growth, yield and quality of produce
- Use of mulching in drip irrigation
- Identification of type and grade of the fertilizer suitable for fertigation
- Fertigation scheduling in respect of number of splits, amount of fertilizer and time of application for different crops.
- Testing of different fertilizer applicators
- Effect of fertigation on growth, yield and quality of produce
- Economical design of farm drainage systems
- Incorporation of easily decomposable and available plant material in the soil
- Soil manipulation for increasing drainable properties of soil
- Use of broad bed furrow technique for crop development
- Use of Balram plough for directing the water towards drain
- Design and development of surface drainage system
- Design and development of subsurface drainage system
- Design and development of mole plough/subsoiler and its use for removal of excess water.
- Conjunctive use of poor quality groundwater and canal water
- Reclamation of problematic soils with poor drainage.

- Influence of climate change on the availability and demand of water for irrigation.
- Studies on trends of evapotranspiration.
- Irrigation scheduling for different crops using different irrigation methods as per crop needs.

Agriculture Process Engineering

- Development of processing technology according to need of market.
- Reduction in post harvest losses by awareness programme.
- Entrepreneurship development programme.
- Efficient use of agro waste/industrial by product for additional benefit.
- Application of solar energy for post harvest operations.
- Development of cost effective and farmer friendly post harvest processing technologies.
- Use of robotics and automation in processing industry.
- Adaption of innovative technology to improve quality, quantity of the end product.
- Application of minimal processing in fruits and vegetable sector.
- Development of value chain for various crops to reduce the production cost and minimize the losses.
- Establishment of Agro Processing Centres in the production catchment
- Development of small scale processing unit for entrepreneurs.
- Self employment generation by developing low cost technologies useful for the farmers.
- Use of computer and IT in food processing
- Selective mechanization and value addition to overcome labour shortage and to enhance profitability
- Accelerated technology transfer and commercialization through ICT and public private partnership.
- Development of facilities of custom hiring of different implements in rural areas
- Creation of storage facilities for grains in rural areas

Soil and Water Conservation Engineering

- Developing and optimizing water saving technologies
- Strengthening of resource conservation techniques for improving resource use efficiency and improving natural resource base.
- Refinement and upgradation of technologies developed
- Research priorities under changing climate scenario under rainfed agriculture for judicious use of available rainfall and amelioration of stresses due to biotic and abiotic factors.

Farm structure

- Creating hubs or high tech Agricultural produce
- To create awareness among the farmers through demonstration of advanced protected structures.
- Create modern dairy barn by using ecofriendly tumbler tiles.
- To establish paver manufacturing plant and chain-link manufacturing unit

Dry land Agriculture

- *In-situ* moisture conservation practices for sustainable productivity of major crops in Vidarbha region.
- Catchment storage command relationship studies
- Real time Contingency Planning for rainfed agroecosystem
- Evaluation of efficient crop & cropping systems for resilience to climate variability
- Integrated nutrient management studies for sole, intercropping and rotational cropping systems under rainfed condition
- Carbon sequestration studies
- Development of farmer friendly and decision support system viz., SSNM, Agro advisory etc.
- Dryland Agricultural technologies demonstration / action research under National Initiative on Climate Resilient Agriculture (NICRA)
- Biomass utilization and incorporation
- Convergence with ICAR institutes /Crop AICRPs, RKVY, NHM, KVKs, ATMA, NGOs for technology upscaling and capacity building.
- Seed banks and central seed storage facility for the poor and marginal farmers
- Strengthening farmers capabilities and management options to carryout timely adaptation measures to weather aberrations/climate change.

Goals and Strategies

SN	Crop/ Discipline	Goals	Strategies
1.	Rice	• Rice varieties to enhance genetic yield potential and super fine short slender varieties. • Germplasm improvement • Improving the grain and nutritional quality and value addition of rice • Stabilizing rice productivity through improving biotic and abiotic stress tolerance and high quality seed • To develop superfine high yielding paddy variety and also high nutritive value • To develop multi resistance to pests and diseases (biotic stress) with high yielding paddy variety • To develop drought tolerant variety (abiotic stress). • To develop high yielding multi resistance with aromatic paddy varieties. • To develop C.M.S. and restorer line for hybrid development programme. • To develop superfine hybrid varieties. • To collect and maintain the germplasm for varietal development programme. • To identify new immerging pests and diseases • Research on agronomical practices for paddy varieties	• Exploiting gene pool to introgression traits related to high yield. • Development of hybrids with higher yield and resistance. • Development of super fine short slender varieties with good quality. • Collection, evaluation and maintenance of local land races/germplasm. • Developing pre-breeding material by effective utilization of rice germplasm. • Improving rice quality for consumer preference for domestic and export through conventional and molecular breeding. • Enhancing the nutritional quality of rice such as high iron, Zn, protein and low glycemic index. • Improving specialty rices for instant food through conventional breeding. • Improving short slender grain aromatic rice. • Developing short slender red rice as per domestic market

			demand • Identification, mapping and introgression of novel genes for major disease and pest resistance using conventional breeding and refined molecular marker technology. • Developing rice varieties with tolerance to cold, heat, drought, flood and Zn,N and P deficiency tolerance. • Improving rice to high and low N, P, Zn, S and water use efficiency through conventional and other breeding approaches. • Collection, maintain and improvement in germplasm
2.	**Oilseeds** Sunflower Safflower Groundnut	• Introduction and Crop Expansion in New Niches • Production Enhancement Through Sustainable Low Input Cost Management Practices • Mitigate Effects of Biotic, Abiotic Stresses and Climate Change • Improve oil Quality and Value Addition • Dissemination of Improved Technologies	• Development of ideal genotypes suited for prevailing cropping systems in newer areas. • Development of agro-technology for cultivation of sunflower in paddy fallows to utilize residual moisture and fertility. • Facilitate linkages with industry for ensuring stable market. • Adoption of recommended soil and moisture conservation practices

			• Climate resilient strategies • Adequate and balanced fertilizer application • Site specific sustainable crop management • Identification of genotypes for terminal heat, drought and excess moisture • Increase oleic acid content and develop confectionery types in sunflower. • Adopt ICT tools for effective dissemination of agro-technology on large scale. • Identification of germplasm resistance to major abiotic and biotic stresses. • Development of short duration varieties and hybrids and thermo insensitive varieties in safflower. • Promoting oilseed crops as contingency crops.
3.	**Soybean**	• Removing of antinutritional factors (ANFs) • Biotic stress • Develop new quantitative trait loci to diseases • Abiotic stress • Seed composition • Increase the genetic • diversity • Development of herbicide tolerant soybean	• Use of modern analytical tools to screen the germplasm • Use of wild germplasm for hybridization. • Modern quantitative genetics. • Work with Biotech Centre for molecular work. • Collection of germplasm

		• Yield improvements drive.	line throught the world and use it for crossing • Linking with DSR., Indore.
4.	**Cotton**	• To attain productivity levels equivalent to the world • To produce premium quality cotton • To reduce cost of cultivation by reducing the dependence on chemical fertilizers, pesticides and labour	• Enhance indigenous and exotic diversity of genetic resources in gene banks • Phenotypic platforms for biotic and abiotic stress • Breeding for climate resilient multi-diversity resistant varieties • Breeding for resource-use-efficiency • Breeding for organic cotton • Focus on improvement of Desi G. arboreum and G. herbaceum varieties • Collection and characterization of germplasm of North East state • Sturdy Compact Early Maturing Varieties for low inputs and amenable for High Density (20 times the existing) • Marker Assisted Breeding (MAB) for validated markers. Multiple resistance breeding using Marker Assisted Selection (MAS) and marker assisted inter-specific trait introgression

			• Centralized PGR (Plant Genetic Resources) management with Public-Private-Partnership (PPP) • Development of heterotic pools and MS lines for hybrid development • Indigenously developed GM (Genetically Modified) cotton for resistance to prioritized biotic and abiotic stresses using IPR protected genes.
5.	**Sugarcane**	• Crop Improvement • Crop Production • Plant Protection (Entomology & Plant Pathology) • Value addition	• Testing and Development of drought tolerant variety of Sugarcane for the region • Crop Improvement in drought tolerant variety of Sugarcane for the region. • Research on soil fertility and sugarcane productivity with INM • Development of bio-intensive IPM module • Establishment of jaggery preparation unit
6.	**Horticulture**	• Conservation of genetic diversity of fruits, vegetables and flower crops for future utilization. • Augment production, productivity, sustainability and competitiveness of tropical and subtropical fruits, vegetables and flower culture.	• Introduction of exotic germplasm, their evaluation and utilization in genetic introgression for development of trait-specific varieties including color, off-season fruiting,

		• Reduction in post-harvest losses through integrated pre and post-harvest management practices, value addition and diversification of products.	productivity, extended shelf life / regularity in bearing, weather resilience etc. • Development of low cost technologies and minimal processing for reduction of post harvest losses in fruits • Assurance of better quality, safe and branded fruit products to the consumer. • Utilization of fruit processing industry wastes for food, feed, fuel and fibres. • Effective post-harvest handling and storage protocols for enhancing shelf life and reducing post-harvest losses. • Development of recipes for value addition of commercial and underutilized fruits of the region.
7.	**Agronomy**	• Mitigating the effects of biotic, abiotic stresses and climate change • To carry on strategic, basic and applied research in agronomy • Testing new generation weedicide molecules • Monitoring weed flora in different crops • Development of land configuration techniques	• Establishment of new Post Graduate Department of Agrometeorology with sound observational network and Agromet database • To reorient agronomic research by undertaking all the possible measures to increase productivity reflecting over increasing yields,

			diversification to higher value crops, and developing value chains • To create observational network and agromet database for precise weather forecasting and crop modelling • Drought and scarce water resources management • Application of Remote sensing in agriculture • Mitigation Effects of Biotic, Abiotic Stresses and Climate Change
8.	**Agril. Botany**	• Development of germplasm • Germplasm maintenance and utilization	• Collection, evaluation Characterization and conservation of available genetic resources. • Identification and utilization of trait specific germplasm • Cataloguing of accessions • Pre breeding to develop trait specific genotypes by utilizing wild species, land races, inter and specific combinations etc
9.	**Seed Technology**	• To conduct the research on various aspect of seed and develop seed production technology including drying, processing, value addition etc. • To generate basic information on seed certification standards including seed health. • To disseminate information and impart training on seed	• New standards for seed health • Promotion of seed bank • Quality seed security to farmers

		production, processing, storage and packaging, quality control and seed health. • To make linkage with crop improvement project, seed industry, seed certification agency, seed trade etc.	
10.	**Biotechnology**	• To understand the basic cellular processes at Biochemical and molecular level. • To develop farmer oriented new technologies for improvement in quality and yield. • To established high-tech tissue culture laboratory • MoU with private companies for Plant Protection and Biotechnological need base projects • Regular National and International training and workshops to faculty members	• Consultancy services for bioprocess and there by production of important metabolites • Creation of facility to undertake in depth biochemistry and molecular biology studies to understand underneath mechanism of various important plant metabolites • To establish platform for plant breeders to accelerate crop improvement programs using molecular marker assisted selection and genomic approaches • To initiate studies on genetic fingerprinting of promising local germplasm of important crops • Establishment of Medicinal plant garden in college campus • Establishment of crop court for identification of major pests and diseases of important crops of the region for awareness of the farmers

			• Improvement of various biological strains and supply of commercial products to farmers and entrepreneurs • Establishment of commercial plant tissue culture unit • Standardize different protocol for tissue culture for crops and supply the starter culture. • Biotic and abiotic stress resistance verity develop by Somatic embryogenesis • Secondary metabolites production. • New research in the field of pharmaceutical and medicinal biotechnology.
11.	**Entomology**	• Climate Smart Crop Protection • Developing effective bio-pesticide formulations • Lab on the chip technology • Biosystematics based on molecular characterization, bar-coding and digitized keys • Databases/catalogues/monographs/inventories of major insect pests and natural enemies	• Satellite based forewarning system will be developed for accuracy • Use of nanotechnology • advanced genomics • Use of molecular characterization/ mitochondrial DNA for quick identification of insect pests • Development of various databases based on morphological, ecological, genetical, molecular, bionomics of insect pests

12.	**Soil Science and Agricultural Chemistry**	• Improvement in soil health by enhancing soil organic carbon sequestration. • Utilization of agricultural waste as an indigenous source of nutrients. • Preparation of GPS-GIS based soil fertility maps for each Tahasil in the state region. • Nutrient management strategies based on climatic variability. • Production of enriched organic manure, viz; vermicompost, phosphocompost, compost, etc. • Development of "Nutrient Expert Tool" for various crops • Use of Nano organic and inorganic resources • Promotion and development of organo mineral compost • Crop Residue Recycling and Agricultural Waste Management • Long Term Fertility management for soil health and crop productivity • Management of problematic soils and Agricultural Waste Management • Site specific land configuration techniques for efficient nutrient management. • Adoption of conservation tillage • Use of sewage waste water after treatment for irrigation of crops.	• In-situ moisture conservation • Site specific land configuration techniques • Soil specific land use planning • Balanced integration of production inputs • Potential use of crop residues, green manures and green leaf manures • Value addition of crop residues • Precise application of production inputs • Bioremediation of waste water • Minimum disturbance to the soil • Development of natural habitat through waste recycling • Development of nutrient expert tools for different crops • Monitoring multinutrient deficiency • Soil health cards • Soil quality evaluation • Fertigation for enhancing use efficiency • Bio fortification • Nanotechnology • Site specific nutrient management

13.	**Animal Husbandry and Dairy Science**	• Feed and livestock management. • Milk production and processing.	• Improvement of degradable forest pastures land. • Importance of concentrate feeding for milk production to meet the nutritional requirement of high yielding dairy animals. • Management Strategies for improving dairy animal for animal welfare under different production system. • Genetic improvement in livestock and conservation indigenous germ plasm. • Inclusion of unconventional feeds and fodder • Management of milk production and health of dairy animals. • Improving the quality of raw milk in ensuring the food safety. • Short shelf life of traditional milk product. • Large scale mechanized process for traditional dairy product. • Value addition in milk and milk products.
14.	**Social Sciences a. Extension Education**	• To connect every KVK in Vidarbha with each KVK in India and University to reach infinite farmers • To reach each and every village in Vidarbha	• ICT based information dissemination • Organization in KVKs every year and to make them aware about university developed

		• To reach 100000 farmers every year • To train 5500 Krishi doots every year • To document their Experiences &wide publicity • To Create awareness about low cost technologies for moral boosting of farmers • Wider coverage in lesser time, available at university website • To reach farming community in remote area for soil analysis and dissemination of technology	technologies • Organization in KVKs before onset of monsoon • Youth nominated by Gram Sabha will be selected for trainings • Innovative farmers will share their experiences & success with university scientists • Rally, Group Discussions, Gramsevak Mela, Distribution of Dr. PDKV Diary, Krishi Patrika, Night Meetings in Villages, Documentary Shows etc Audio visual media • Soil & water testing, identification of insect pest & diseases, LED message system, audio visual aids & sale of university publications
	b. Agricultural Economics	• Socio-economic and cultural dynamics in socialisation of technology. • Participatory technology generation and management. • Media production and information packages for diversification of agriculture. • Multi-media and computer aided information technology in agriculture. Development of rural entrepreneurship.	• Marketing of agricultural commodities • Trends in productivity • Decision support system
15.	**Agril. Engineering**	• Post harvest technologies for loss reduction • Value addition technologies • Technology transfer,	• Constant assessment and minimization of post harvest losses in food grains, oilseeds,

		entrepreneurship development, training and capacity building through market intelligence • Byproduct utilization and Waste management • Improvement of storage structures • Biotechnology in PHT sector • Implementation of site specific schemes to conserve and manage soil and water • Appropriate water conservation measures in and outside forest area, impounding of water wherever site permits to increase ground water recharge • To provide technical guidance to implement catchment area treatment projects. • Conduct hydrological evaluation of watersheds under different land use and management practices. • Establishment of Renewable Energy Park in College of Agricultural Engineering & Technology. • Establishment of solar photovoltaic power generating plant in the University Campus to meet out the energy need of whole buildings of the University main campus. • To establish renewable energy technologies for demonstration, training and research for UG and PG students and farmers also. • To impart awareness to public,	horticultural crops, livestock and fish during harvesting, handling, storage, transport through upgrading existing practices and adopting modern technique. • Modernization of dal milling and oil expelling industries for higher recovery & better product and by-product. • Modernization of traditional food processing, packaging and improvement in product shelf life. • Novel technologies for processing and utilization of vegetable and their by-products. • Modernization of processing industry and development of value added products for increased domestic consumption and export. • Development of prototypes/technologies /equipment for processing of medicinal and aromatic plants. • Develop/refine suitable technologies for seed extraction of various crops • Use of remote sensing and GIS technology for

		students, visitors and beneficiaries about the use of renewable energy.	conservation, monitoring and improvement of natural resources. • Optimization of on farm water harvesting strategies and development of ground water resources • Studies on hydrological behaviour of the watersheds for developing and monitoring natural resources • Drought characterization and monitoring for effective assessment of ground level facts • Development of contingent cropping strategy for major rainfed crops with special emphasis on soil and water conservation • Location specific soil and water conservation strategies for minimizing adverse impact of rainfall variation • Location specific bioengineering measures for different degraded lands • Effective rain water management in catchment areas through inter basin water

			utilization • Water conservation literacy and awareness
16.	**Dry land Agriculture**	• Rainwater management: in-situ and ex- situ. • Climate Resilient Agriculture • Higher resource use efficiency through Conservation agriculture • Diversification of rainfed agriculture	• Estimating of harvestable surface runoff for different rainfall scenarios. • Development and evaluation of location/region specific, in-situ and ex-situ water harvesting technologies. • Identification/evaluation of crop varieties and breeds tolerant to various stresses. • Development of technologies that can enhance the crops to adopt and mitigate aberrant weather conditions • Identification of location specific crops and cropping systems • Development of cost effective water and nutrient management technologies • Development of cost effective, location specific integrated farming system modules

17.	**Farming System**	• Development of location specific IFS model for Vidarbha region (Irrigated) • Reduction in cost of production • Recycling of organic by products • Value addition and processing • Employment generation • Popularisation of diverse IFS model in farming community	• Planning, approval , implementation, processing, marketing and analyses of IFS model with advanced techniques at Akola • Popularisation of diverse IFS model in farming community through ECF

Extension Education

Technology Support

Dr. PDKV is providing technological support to the stake holders through 14 KVKs, 19 Agriculture Research Centers, 26 All India Coordinated Research Projects, 19 Agriculture, Agriculture Engineering, Horticulture and Forestry Departments.

Extent of adoption of technologies

- Blackgram TAU -1 cultivar covered 92% area in Maharashtra.
- Chickpea cv Jaki 9218 is spread on 4.10 lakh ha., and PKV Kabuli (Chickpea) cultivated on 1.00 lakh ha.
- Groundnut variety TAG-24 occupies 90 per cent area among cultivated groundnut crop
- PDKV water shed model of water conservation is highly acclaimed at national level and by the farmers.
- Paddy variety PDKV Kisan covered 2792 ha area, PKV Ganesh covered 71.88 ha. area in Eastern Vidarbha and PKV HMT variety is also spread on large area.
- PDKV recommendations are adopting plant protection measures for control of sucking pests in paddy crop of Eastern Vidarbha.
- Pigeon pea variety PKV Tara is adopted by over 30 per cent farmers.
- PKV Dal mill is highly popular among small entrepreneurs for entrepreneurship development and till date over 1000 units have been established. Most of the SHGs have adopted this technology.
- Sweet lime variety Katol gold is highly accepted by the farmers.
- Wheat variety PDKV Washim is getting popularity amongst the farmers having limited water sources. This variety is most suitable in changing climate resilience.
- Rabi Jowar variety PKV Kranti is spread on more than 5000 ha in Vidarbha.

Achievements

- University has developed new methods of agricultural extension for speedy transfer of university developed technologies in an effective manner. Among them, prominent extension education programmes are Hope Generation Programme, Sarpanch Melawa, Agricultural Extension through religious discourse, Krishak Vigyan Manch, Women Empowerment Programme, Shivar Pheri, Pre-monsoon Mela, Krishi Doot Trainings, State Level Agriculture Exhibition (Agrotech), ICT programmes with private partnership and International Farmers Dialogue-2014, wherein 28 progressive farmers over 11 different countries across the world have been actively participated along with 200 farmers from Vidarbha. In the Agriculture Exhibition, more than 8 Lakh farmers every year including the farmers of other states viz. Chhattisgarh, Madhya Pradesh, Andhra Pradesh and Karnataka participated in exhibition and took the advantage of newly developed agriculture technologies. The women Self Help Groups have earned handsome profit of around Rs. 1 Crore through sale of the products during the exhibition. Besides organization of Agrotech, Directorate of Extension Education also participated in various exhibitions organized throughout Maharashtra for dissemination of University developed technologies. During this year Directorate participated in 13 such outdoor exhibitions held at Pune, Nagpur, Jalgaon, Khamgaon etc.

- There are 14 Krishi Vigyan Kendras under the jurisdiction of University. Krishi Vigyan Kendras under the Directorate of Extension Education successfully conducted Front Line Demonstrations, On Farm Testing's and Training Programmes through which, the university developed technologies reach to approximately 20000 farmers every year. More than 900 rural youths have started enterprises like Dal Mill, Lac cultivation, Apiculture, Vermi compost Unit, Sericulture, Mushroom production, Shed net houses, Backyard poultry, Goat unit, Pearl culture etc in last few years as an impact of vocational trainings conducted by KVKs. Nearly 3500 rural youths have started lac cultivation due to intervention of KVK, Gondia. Numerous success stories have been generated by the university. Few of them are uploaded on university website www.pdkv.ac.in. KVK, Bhandara is disseminating weather related information to 5000 farmers of Bhandara District in collaboration with IMD, Pune and NABARD. In addition 3.00 Lakh farmers have been provided need based Voice Agricultural messages in collaboration with Reliance Agricultural Foundation, Mumbai every day. Agricultural Information Technology Centre is working for providing information to farmers visiting University. 66 study tours comprising 5000 farmers from Maharashtra and outside Maharashtra had visited the University last year.

Apart from this, 7000 farmers have enquired about agriculture related problems on telephone helpline and get themselves satisfied.

- The activities of TOT have also been geared up at high speed. University is reaching more than one Lakh farmers daily through different media's. Names of few Media are Voice messages, Krishi Vani, Krishi Varta, Krishi Patrika, Krishi Sanvadini, Hello Kastakar, Cable TV bulletins, Blog, Trainings, Video Conferencing, Helpline etc. University publications are very popular among farming community. About 20,000 copies of Krishi Sanvadini, a popular publication of University have been sold every year. Over 35000 farmers registered in extension programme of Krishak-Vigyan Manch(Farmers-Scientists Interaction Programme) since inception and adopted improved methods of farming. During last few years, Directorate Extension Education has implemented eight external funded projects. It includes the projects funded by Navajbai Ratan Tata Trust, Manav Vikas Mission, Cotton Corporation of India, Central Water Board, ICAR, RKVY, NICRA, ATMA, Government of Maharashtra and Central Government.

The collaborative activities with other agencies/departments are being implemented by this Directorate like organizing training, demonstrations, farm advisory services etc.

1. Indian Council of Agricultural Research (ICAR), New Delhi
2. State Department of Agriculture, Maharashtra
3. NABARD
4. Agriculture Technology Management Agency (ATMA)
5. National Horticulture Mission
6. Reliance Foundation Information System, Mumbai
7. Sir Ratan Tata Trust, Mumbai
8. Rashtriya Krishi Vikas Yojna, Govt. of Maharashtra
9. State Department of Agriculture, Madhya Pradesh
10. YASHADA, Pune
11. MAVIM, Akola
12. IFFCO, Nagpur

13. BAIF
14. Department of Forest
15. Marvin Chemicals, Pune
16. MANAGE, Hyderabad (MOU since 2018) – Organized Faculty Development Training Programme for 2 days & 15 days durations
17. UPL – Training programmes for farmers and Extension functionaries

- In the recent past MOUs are made with other organizations / private organization for implementing the activities related to transfer of technologies. The names of the organizations are as below:
    1. United Phosphorus Limited, Mumbai
    2. MANAGE, Hyderabad
    3. Maharashtra State Skill Development Society (MSSDS)
- Manav Vikas Mission, Aurangabad has sanctioned 11 Mobile Soil Testing Vans with all modern appliances for soil testing costing Rs. 4 crore to KVKs. The vans are functioning on the objective of analysis of soil samples on the farmers field & issue of soil health cards on the spot. Apart from this, van also contains technology exhibits and LCD, TV for showcasing University developed technologies. Total numbers of 21090 soil samples were tested and Soil Health Cards were distributed during the 2013-14 to 2017-18.

Challenges

Constraints

Despite the in-built strength, University often face following bottlenecks to deliver efficient and effective extension in transfer of technology, which are functional in nature.

- Lack of role clarity of University and line departments
- Weak research-extension-farmers linkages
- Inadequate field extension facilities
- About 85 per cent cropped area is rainfed.
- Limited irrigation infrastructure.
- More than 70 per cent small and marginal farmers with poor resource base.
- Low marketable surplus due to high domestic need.

- Lack of proper marketing infrastructure-marketing extension.
- Lack of credit/finance at proper time
- Inadequate professional and technical manpower
- Inadequate field extension facilities with University.
- Inadequate agricultural extension services, input delivery system and unavailability of quality seeds in remote parts of the region.
- There is a mono cropping culture of soybean in Western Vidarbha and growing paddy as subsistence farming in Eastern Vidarbha
- Unavailability of skilled labour.
- Inadequacies in availability of quality planting material in time especially for perennial horticulture crops
- Indigenous non-descript cattle population with low milk productivity accounts for 70% of the cattle population

Challenges

- Assessment of Extension Education needs of the farming Community
- Improvement in quality and type of technologies dissemination
- Need based and demand driven Research – Extension Systems
- Sustainability and accountability of Research – Extension for stake holders.
- Professionalism in extension education for appropriate transfer of technologies.
- Relation of Extension Education with end users farming community considering their socioeconomic status.
- Need of more vibrant T and V system of Extension
- Linkage between SAU and State Department of Agricultural and other line departments for rapid transfer of appropriate technologies.

Vision and Focus

Strengthening KVKs

- The KVK emerged as imperative part of public extension system has to play a major role now. KVKs being the ambassador of the University need to be modernized to train rural youths, farmers and farm women for faster transfer of Agril. Technology and skill development in rural areas.

- All KVKs in the University jurisdiction need to be provided with cyber extension facilities for effective communication in the rural areas.

Capacity building of farmers in scientific seed production through SAUs

Quality seed is the one of crucial factor in achieving potential yield at farm level. Due to withdrawal of farm grants by the state Govt. SAUs could not achieve the supply target of seeds to farmer's in spite of high demand from farming community.A sort of mechanism shall be worked out involving Farmers, SAUs, Mahabeej, Seed certification Agencies, Private sector, Agriculture department in PPP mode for meeting the heavy demand of peasants and effective utilization of farms of SAUs. A coordinating mechanism among these partners should be established.

Promotion of Direct Interface between Farmers and Scientists

The direct interface between scientists and farmers is the most ideal and should be undertaken wherever possible. Dr. PDKV has achieved significant success through this system. Dr PDKV Krishak-Vigyan Manch is an excellent example of direct interface between farmers and scientist's. Up till now 35000 farmers registered under KVM programme. This model should be replicated at village level in years ahead.

Para Extension Workers

The Para extension workers at grass root level can be supported through public training and capacity building support and some incentives in the form of reward/token for their Recognization. **Krishi Doot Scheme** implemented by Dr. PDKV, public organization involving Sir Ratan Tata trust, Mumbai, corporate body for funds utilization and 10 NGOs by selecting 200 krishi doots (farmer's friend) from 200 villages is an excellent example of PPP. Such model of TOT should be replicated covering large number of villages in the coming years.

Capacity Building Programmes for Argil. Media Personals and Person's involved in religious discourse

Capacity building programmes for Agril. Media Personnel's shall be taken at KVKs at regular intervals. Similarly TOT throughPerson's involved in religious discourses is proved effective in transferring simple agriculture messages. Capacity building programmes for such personnel's shall be also being taken at KVKs.

Strong Regional Extension Centers

There is Agro-climatic, agro-ecological and socio-economic diversities within the jurisdiction of University operational area. There is a need for establishment of at least four strong Regional Extension Centres (REC) with Mobile Agri. Clinic Facilities. These RECs will cater the needs of location specific problems of farming communities.

Farm Advisory Services through ATIC

- Agriculture Technology Information Centre (ATIC) being conceptualized as single window system of delivery of technological inputs and services, need to be continued and properly strengthened with modernization.
- There is need of mini-ATICs with mobile Agri-clinics at four proposed Regional Extension Centers.

Need of Vibrant T & V System

- T & V system of Extension should be made more vibrant to develop strong linkage between SAU and State Department of Agricultural and other line departments for rapid transfer of appropriate and need based Agricultural technology at the doorstep of the resource poor farmers.
- Formation of self-help groups (SHGs) and specialists – farmers Interface meetings need to be organized for blending of ITK with modern knowledge.

Strengthening of Directorate of Extension Education

- Strengthening of the Directorate of Extension Education at the head quarters with one post of Associate Director of Extension Education in the discipline of extension education and three posts of Deputy Directors of Extension in important disciplines of agriculture are needed.

- There is need to establish one District Extension Centre (DEC) in each district attached to an agricultural research Station. This centre should have one Assistant Director of Extension and a team of subject matter specialists. They should organize integrated farming system demonstrations (IFSDs) on the farmer's fields, crop seminars, pests and disease surveillance, diagnostic visits, training programmes and other related activities.

Planning and execution of extension programmes

- Governmental and Non-governmental extension organizations are required to develop and maintain strong functional relationship and play complementary and supplementary roles in increasing the total agricultural production of the region. The University will have to play the role of catalyst in this regard.
- The extension approach should be geared up for effective Transfer of Technology on the basis of Farming System. This required higher technical competence on the part of extension staff and an effective support from the subject matter specialist.
- Extension service has to cater the need of commercial farmers, as well as resource poor farmers.
- The Extension service needs to sensitize farmers, train and guide them to adopt suitable measures in conserving, improving and managing the farm resources including soil, water and vegetation, along with practicing combination of enterprises with improved practices. The extension service should create awareness among average farming communities regarding environmental and pollution concerns
- With regard to extension approach, shift in emphasis from individual farmers contact to group contact, involving farm women and farm youth is necessary.
- The linkage with mass media should be strengthened. More importance should be given to the distance education. The information technology tools such as radio, television, video programmes, compact discs, internet, etc., should be harnessed for effective communication in rural areas.

Intervention with KVKs regarding Priorities / Policies and Programmes

- University has plan to implement various extension education activities for the up-liftment of farmers, farm women, farm labour and extension functionaries through transfer of agriculture technologies with the help of information technology tools in an effective manner. Some of the benefits of ICT for the improvement and strengthening of agriculture sector in Vidarbha are:
    a) Timely information on weather forecasts and calamities
    b) Better and spontaneous agricultural practices
    c) Better marketing exposure and pricing
    d) Reduction of agricultural risks and enhanced incomes.
    e) Better awareness and information
    f) Improved networking and communication
    g) Facility of online trading and e-commerce

Some of the initiative that has already be taken includes, prices information delivered to farmers. Agricultural radio and TV programmes offering farming advice, hosting subject matter expert's talks, extension of computers and Internet for KVKs to gather information from farmers, training programmes for farmers, journalists on agricultural policies, markets, will have to be mobilized. Still there is long way to go in this domain area.

- Good scope for enhancing ICAR-SAU linkage for transfer of technologies in areas of Citrus, Cotton crop and Soil resource management.
- Greater scope for private partnership in extension education.
- Vidarbha also holds the potential to become one of the most popular eco-tourism destinations in the country.
- Improvement of productivity and profitability of thrust crops by adopting a newer and sustainable technologies and use of inputs.
- Village adoption & integrated village development programme.
- Perspective Plan of each KVK should be prepared as per agriculture & allied situation of district.
- Domestic & Export Market intelligence cell at each KVK.
- Reducing barriers to entry for private sector provider.

- KVK should be actively involved in district planning & development committee's.
- Each activity related to agriculture or line department must be executed through KVK by providing additional funds to KVK.
- Popularization of improved farm implements & micro irrigation.
- Concentration on rural resource rejuvenation.
- Social & equity consideration at each KVK.
- Warehouse with cold storage facility should be provided to each KVK as Model Unit.
- Mobilizing Mass Media support for sharing agro-information.
- Strengthening of IT for TOT.
- Development of rainfed area through watershed management approach on large scale for efficient use of natural resources.
- Development of Model Fodder Bank at KVK.
- Technical Human Resource for Mobile Van provided by ICAR/State Govt.
- Demonstration of Integrated proven technologies package in one Village.
- Organization of Farmers Field School at various stages of study crop with separate financial support from ICAR.
- Formation of Growers Association / Commodity Interest Group.
- Seed Village Programme in PPP mode.
- Agriculture production & women participation.
- Soil Health Management & Efficient utilization of fertilizers.
- Recycling of agricultural waste on farms.
- Skilled based vocational training.
- Agri. Business & Agro-clinic Training.
- Trainings for school dropouts & illiterates.
- Production of inputs at site.
- Low cost production technology for sustainable agriculture.
- Sharing of experiences of innovative/progressive farmers among farmers & scientists.

- Promotion of forest product utilization as a subsidiary business in remote and tribal areas.
- Promotion of Innovative Extension Education approaches for agriculture development.

Goals and Strategies: Extension Education

SN	Programme	Goals	Strategies
1	e-connectivity at KVKs	To connect every KVK in Vidarbha with each KVK in India and University reach infinite farmers	ICT based information dissemination
2	Sarpanch Mela	To reach each and every village in Vidarbha	Organization in KVKs every year and to make them aware about university developed technologies
3	Krushi Jagrukta week	To reach 100000 farmers every year	Organization in KVKs before onset of monsoon
4	Krishi Doot Trainings	To train 5500 Krishi doots every year	Youth nominated by Gram Sabha will be selected for trainings
5	Innovative farmers Meet	To document their Experiences &wide publicity	Innovative farmers will shared their experiences & success with university scientists
6	Hope Generation Programme	To Create awareness about low cost technologies for moral boosting of farmers	Rally, Group Discussions, Gramsevak Mela, Distribution of Dr. PDKV Diary, Krishi Patrika, Night Meetings in Villages, Documentary Shows etc
7	CDs of University developed technologies	Wider coverage in lesser time, available at university website	Audio visual media
8	Advanced Mobile Diagnostic Van	To reach farming community in remote area for soil analysis	Soil & water testing, identification of insect pest & diseases, LED message system,

		and dissemination of technology	audio visual aids & sale of university publications
9	Formation of Commodity wise farmers group	To form 500 groups every year	Contract farming, formation of producers group
10	Women empowerment programme	To invite 5000 farm women every year	Gathering of progressive women, felicitation & sharing experience
11	Kirtankar Mela	To invite 10000 Kirtankar's every year	Agricultural Extension through Religious discourse and dissemination of low cost technologies through their discourse
12	Helpline services	50000 farmers expected from whole vidarbha	Receiving calls of farmers & answering the queries of farmers
13	Strengthening of Toll Free Service (18002330724)	To reach infinite stakeholders	Receiving calls of farmers & answering the queries of farmers. To establish in every KVK of Vidarbha
14	Skilldevelopment programme	3000 youths per year	Trainings
15	SMS Service	To reach infinite stakeholders	Free SMS service to farmers
16	Voice mail service	To reach infinite stakeholders	Free Voice mail to farmers
17	Information kiosks (Touch Screen facility to 11 districts of Vidarbha)	To reach infinite stakeholders	To establish in every KVK of Vidarbha
18	Hallo Kastakar	To reach infinite stakeholders	Online Radio Programme in every KVK of Vidarbha
19	ICT based programmes	To reach infinite stakeholders	Voice Message Services
20	ICT based programmes	To reach infinite stakeholders	Live Phone in programme
21	ICT based programmes	To reach infinite stakeholders	Live Cable TV in programme

22	ICT based programmes	To reach infinite stakeholders	Agricultural Message Strip on Cable TV
23	ICT based programmes	To reach infinite stakeholders	Agricultural Bulletins on Cable TV
24	ICT based programmes	To reach infinite stakeholders	Documentation of success stories
25	Publication of books, folders, leaflets	25000 every year	Publications at university level
26	Pre Monsoon Mela	25000 every year	Organization in KVKs and university every year before onset of monsoon and to make farmers aware about university developed technologies
27	Shivar Pheri	5000 every year	Organization in University every year before onset of rabi and to make farmers aware about university developed technologies
28	Agro technology week	25000 every year	Organization in KVKs and university every year before onset of rabi and to make farmers aware about university developed technologies
29	Agrotech (Agricultural Exhibition)	1000000 every year	Organization in University every year and to make farmers aware about university developed technologies
30	Jal Jagruti Week	25000 every year	Organization in KVKs and university every year during summer season and to make farmers aware about university developed soil and water conservation technologies
31	Soil and water testing campaign	Soil and water analysis of each and every farmer of Vidarbha and distribution of soil health card and water quality reports.	Soil and water sample collection and soil analysis of farmers during 5 months in a year by the KVKs

SWOT Analysis

Dr. Panjabaro Deshmukh Krishi Vidyapeeth came into existence in October 1969 with the mandate for executing and strengthening the functions of education, research and extension education. The University represents eleven districts covering entire Vidarbha region of the Maharashtra State. The University is functioning in a typical semi-arid type of climate in the state. Hence, drought, erratic rainfall and lack of irrigation water facilities are the major constraints limiting productivity and agricultural production of this region. Despite all these constraints, the University has responded most dynamically to the needs, challenges and opportunities of agriculture in the region and fine-tuned its mandate, plans and programmes accordingly.

Strengths

The great strength of the University is the very resourceful, experienced, highly qualified faculty. The University has huge infrastructure including large research farms, well equipped laboratories. The University has collaboration with international, national and state level and private firms.

- In Post Graduate Institute the well equipped departments and laboratories are available for Post Graduate Students.
- The under graduate colleges is the faculty of agriculture, horticulture, forestry and agril. Engineering are available with well qualified teachers and well equipped laboratories.
- An excellent network of KVKs is available in the University in each district for transfer of technologies.
- Availability of Centre of Excellence of Organic agriculture
- Very good facility of hostel is available for UG, PG students, girls and boys in each college.
- Very good sport complex is available for students for many indoor and outdoor games.
- The University has large research farms for ICAR research projects, seed production and research of post graduate students
- The infrastructure of college buildings, well equipped laboratories with modern analytical facilities are available.
- Digital class rooms with ICT facilities are available at each college for teaching.
- The University has library with large number of books in each disciplines, internet facility and online book.

- The University has ARIS with advanced computer facilities, information of University provided in digitalized form on website with Wi-Fi and internet facility to each and every department.
- Biotechnology has the power to increase human health, environmental sustainability and the wellbeing of consumers and farm communities globally.
- Crops improved through biotechnology are producing higher yields worldwide to help feed a hungry and growing world.
- Well developed tissue culture laboratory for better understanding with practical experience.
- Well established and equipped molecular biology, animal biotechnology and food technology laboratory.
- Exposure of the students to emerging educational technologies
- Emphasis on entrepreneurship development through ELP
- An excellent interaction with the national and international institutes.
- Fairly good placement to Undergraduate students through campus interviews.
- Well-developed Wood Working Workshop with modern machinery.
- Diverse soil resources to facilitate diversified Agroforestry cropping around the year.
- Climate fairly congenial for Agroforestry crops.
- Rich biodiversity of tree species
- Good deal of interaction between the Scientists and the end users of the technology, which help to develop site specific modifications and refinements, wherever necessary and also provide good feedback to plan future research.
- Very resourceful, experienced, highly qualified faculty.
- The Colleges have huge infrastructure including large research farms, huge buildings, well equipped laboratories.
- The huge historical gardens and Agro-forestry farms having significant germplasm and biodiversity are the additional strengths.
- The University has made MoU with many National (ICAR, CSIR, State) institutes, International Institutes, Private companies for mutual benefits.
- Available region specific germplasm.
- Availability of Trait specific germplasm
- Available independent research unit in all crops.
- University has developed and released 169 varieties of different crops.

- Availability of well equipped seed science and technology laboratory with DUS testing centre
- Highly qualified well experienced faculty with vision and capacity to impart quality education.
- University administration is highly supportive for the upliftment of the college.
- Adequate farm and irrigation facilities for field demonstrations/ practicals.
- Well established orchards of various fruit crops.
- Student's placements in ARS, Banks, Government and private services etc. created reputation at National level.
- Well-furnished University Guest House for farmers, parents and visitors.
- Availability of cattle's and forage field
- India is the country of youths, they do not have access for earning/employment. These youth can be readily available to solve the man power.
- Externally funded Ad-hoc projects from National, State level and private organization are functioning.
- Biofertilizers production unit is available to cater the requirement of farmers.
- Well equipped Seed Technology Research is well established in the University.
- Well established and equipped molecular biology, animal biotechnology and food technology laboratory.
- Developed of Bt cotton varieties/hybrids for rainfed cultivation of Vidarbha and hybrids suitable for changing climate.
- Developed cotton varieties and hybrids suitable for HDPS and organic cultivation

Weaknesses

The University is having some weaknesses like inadequate funds for international exposure to scientists, inadequate funds for maintenance and repairs of the existing infrastructure.

- Loss of biodiversity due to increased monoculturing.
- Lack of awareness about the importance of biotechnology research.
- Limited funds for modernization of laboratories and field development
- Inadequate supporting staff
- Non availability of Vehicle hampering the mobility of researchers/students.
- Inadequate field extension facilities for Transfer of Technology.
- Insufficient funds hamper research work.

- The Colleges have inadequate contingencies and deficit of funds. The hostel facility for girl students is insufficient.
- Inadequate funds for international exposure to scientists. Inadequate funds for maintenance and repairs of the existing infrastructure.
- Lacking in own laboratory facilities for quality analysis, Molecular breeding and marker assisted selection.
- Lack of assured irrigation facilities on research farms.
- Lack of protection of experimental field from wild animals and birds.
- Insufficient staff due to vacancy and need to create additional post.
- Insufficient laboratory facility for basic plant physiology experiments
- Very less availability of farm machinaries, implements and equipments.
- Need to establish of Molecular and Bar-coding Laboratory
- Very less fund availability to run the experiential learning modules efficiently.
- Inadequate laboratory equipments particularly for PHT, plant tissue culture, etc.
- Insufficient facilities, polyhouse, growth chamber, cold store etc.
- Biotic and abiotic stress in region
- Assured irrigation sources like dams, ponds are not available in University campus.
- Timely and seasonally shortage of improved /quality seeds and other inputs and higher cost of the inputs including labour in university and market.
- To combat with the labour cost, efficient, cheap, farmers friendly implements are not readily available.
- Constant intermittent, long and short dry spells in the rainfall.
- Due to delayed onset of mansoon, sowing of major crops is delayed that leads to heavy infestation of diseases, insects and weeds. It also shortens length of growing season for the crops to properly complete its duration.
- Social constraints like reluctance of the youth towards agriculture & hard work.
- Trained manpower superannuating &creating gap in technological advances.
- Low participation in trainings of capacity building of academic & technical staff.

Opportunities

The agriculture in the region is most intensive and characterized by variety of natural resources and crops and cropping systems including Cotton, Paddy, Nagpur orange cultivation and Soybean. There is immense scope for further development of agriculture towards sustainability in this region based on quality

education and by developing expert human resource. The qualified and experienced faculty in the college provided with good infrastructure facilities have opportunity to build youths most of which are coming from rural areas for development of agriculture as well as to initiate agriculture linked enterprises in villages based on the knowledge obtained by them.

- Establishment of residue analysis laboratory in the University
- Creation of facilities of Nano technology research for its use in agriculture
- Development of platform for students to qualify for different agricultural services, forest services at National and State level.
- Genetically engineered plant varieties that provide improved human nutrition.
- Diagnosis and prevention of plant and animal diseases
- Products designed for use in improved animal feeds.
- Development of crops varieties resistant to drought and other environmental stresses such as salinity.
- Crops resistant to pests and diseases.
- Additional crops containing a number of transgenic traits incorporated in the same plant.
- Crops engineered for particular industrial uses. (e.g., increased starch content, producing useful enzymes or higher content of oil to use as biofuel).
- Transgenic animals for higher and quality milk and meat production.
- Entrepreneurship Development amongst the students through ELP to sustain global competition
- Creation of new basic courses for better understanding of agriculture students.
- Focus on tissue culturing regional horticultural crops for easy availability of the good planting material to the farmers.
- Collaborative projects on biotech for improving research quality.
- Biomass and agril. waste processing and recycling for its utilization to supply nutrients and improve soil health.
- Gateway to National and International Institutions for Education and Service to Undergraduate and Postgraduate students.
- To start Doctoral program in Forestry.
- Promotion of Agroforestry farming system approach.
- Market development and export promotion for Non Wood Forest Products.
- Forest based Small scale and cottage industries can be established.

- Good scope for ICFRE / ICAR and SAU linkage for transfer of technologies in areas of natural resource management
- Greater scope for linkages with private partnership in different domain.
- Opportunity to motivate unemployed rural youth for adoptions of innovation for starting entrepreneurs in forestry sector.
- Development of value added products by establishing post harvest industries.
- The agriculture in the region is most intensive and characterized by variety of natural resources and crops and cropping systems including a traditional tract of world famous Nagpur orange cultivation.
- Utilize human resource to use advance plant molecular and conventional breeding technologies.
- Development of crop varieties to overcome effect of climate change.
- Development of crop varieties tolerant to biotic and abiotic stress.
- To solve the crop yield stagnation problem, the knowledge of basic plant physiology will become more useful tool to the plant breeder.
- To identify and develop high yield and biomass producing genotypes
- Initiation of PPP model in seed production.
- Extend services for seed village concept.
- Providing services to farmer under PPP programme.
- Self-employment through nursery raising, processing and value addition in horticultural crops, ornamental plants and cut flowers, consultancy services, horticulture supervisors and landscape development.
- Diversity in horticulture production to attract private sector entrepreneur thus creating more job opportunity.
- High demand for trained and skilled manpower locally and internationally for fruits, vegetables and flower production and processing.
- High demand for export of fruits and vegetables.
- Protected cultivation of vegetables and flowers.
- Entrepreneurship Development amongst the students through ELP for global competition
- Efficient use of natural resources especially land, labour, water and environmental factors.
- Crop diversification
- Rainwater harvesting
- Allied enterprises like dairy and poultry

- Agricultural mechanization
- Biofortification in various food grain crops.
- Development of crop varieties to overcome bad effect of climate change.
- Development of bio fortified genotypes of micro and secondary nutrients
- Diversity in horticulture production attract private sector entrepreneur thus creating more job opportunity.
- High demand for trained and skilled manpower locally and internationally forfruits, vegetables and flower production and processing.
- High demand for export of fruits and vegetables.
- Protected cultivation of vegetables and flowers.
- Collaborative research with leading universities at national and international level.
- Establishment of "Type Culture Collection" at Department of Plant Pathology.
- Production of good quality of the bio-agents, biopesticides and biofertilizers as per the norms setup by BIS and CIB for sale to the farming community also to generate the revenue for the development of the infrastructure
- Setting up of the CIB standard biopesticides, biofertilizers and biopesticides laboratory for testing of samples
- Development of disease resistance lines special reference to chickpea wilt and soybean root rot complex.
- Development of infrastructural facilities for advanced level trainings in the frontier areas like integrated soil and nutrient management, water management, organic farming, weed management, for officers and farmers.
- Collaborative programme for dissemination of technologies along with Govt. agencies, KVK and NGO's.
- Establishment of Multi-disciplinary, multi-institutional projects
- Development of cold storage facility for perishable crops and post harvest processed products.
- Scope for development of various post harvest processing machines, value added products from different crops, exploring possibility to use renewable energy to operate these machines.
- Scope for establishment of Jaggery units
- Employment generation throughout the year.
- Efficient use of natural resources especially land, labour, water and environmental factors.

- Focus on tissue culturing of regional horticultural crops for easy availability of the good planting material to the farmers.
- Expertise the staff in handling the advance equipment.
- Transfer of technology in unconventional energy sources and electrical engineering through various activities like demonstrations, distribution of pamphlets, leaflets, booklets etc.

Threats

The newly emerging ailments in successful agriculture in this region are the adverse effects of climate change which comprise of reduction in number of rainy days, prolonged dry spells, hailstorms, erratic and uneven rains, rise in temperature, sudden changes in temperatures etc. and they are showing their impact on crop growth, yields, soil health, water table depth etc. and threatening the sustainability of agriculture in this region. This offers several challenges which need to be overcome based on systematic research and quality education.

- The newly emerging ailments in successful agriculture in this region are the adverse effects of climate change which comprise of reduction in number of rainy days, prolonged dry spells, hailstorms, erratic and uneven rains, rise in temperature, sudden changes in temperatures etc. and they are showing their impact on crop growth, yields, soil health, water table depth etc. and threatening the sustainability of agriculture in this region.
- Development of resistance in various insect, pest and diseases.
- Impact on non target insect.
- Impact on Agricultural practices and socio-economic structures.
- Impact on biodiversity.
- Gene transfer to GE crop to other crops through cross pollination or other eg. Herbicide tolerant gene to weeds.
- Increased Risk of Bioterrorism via GM Crops.
- Erratic distribution of rainfall drought, wild animals, irrigation & drinking water scarcity in this area, Biotic and abiotic stress leads to low productivity of crops.
- Vacant post as well as other work rather than teaching creates additional load on teachers which hamper quality teaching
- Low adoption of improved crop management practices
- Nutrient mining and depletion of soil health by monocropping
- Fluctuation in market prices to many field crops, fruits and vegetables.

- Private college strength increasing the work load of University teachers and suffer quality education.
- Non induction of Forest Graduates directly in State Forest Service.
- Non availability of modern sophisticated equipment's.
- Non availability of trained personnel in recently advanced fields.
- Selective, volatile, secretive & unorganized market for medicinal & aromatic plants.
- Many forest produce including timber, aromatic and medicinal cannot be sold directly to end users.
- Generally low receptivity of Agroforestry farmers towards adoption of recommended practices of forest crop.
- Change in cropping pattern and crop competitiveness.
- Climate change and its effects
- Emergence/outbreak of new insect pests &diseases occurrence due to climatic change
- High post-harvest losses of horticultural crops
- Value addition and processing is in high demand but percentage is very less.
- Inadequate funding for basic science research from state and central government
- Resource degradation, soil health decline, multinutrient deficiency in soils, water scarcity, soil sodification organic carbon depletion.
- Nutritional security
- Emergence of new pests and diseases occurrence due to climatic vagaries.
- Resurgence of pests and diseases with changing climatic condition.
- Post harvest losses food grains due to poor threshing ware house structures.

Action Plan and Framework

Reorganization of Agricultural Education to meet Future Challenges

The major challenges including food security, nutritional security, human health and climate change are closely related to agriculture. Academic institutions in agriculture foster the next generation of leaders and professionals needed to address these challenges. However, to keep pace with changing times, agricultural education needs a new focus. Agriculture in India is facing several challenges. Productivity of principal food crops has reached a plateau. The farm business has become global. Issues such as global warming and climate change, new pests and diseases, nutrition security, food safety and agricultural trade regimes have emerged. Agricultural practice is becoming technologically challenging and trade in agricultural commodities has become complex. These issues can be addressed only through a paradigm shift in human resource development, research, technology generation and dissemination. There is a need to reorient agricultural education to meet these new challenges.The situation can be corrected only through wide range of reforms in our education system. Introduction of new courses in entrepreneurship development, agribusiness, biotechnology, international trade, patent regimes and environmental science are needed. In order to develop a cadre of skilled professionals, an experiential learning has been felt necessary. Measures for faculty improvement include mandatory training in national and international institutes, rotation within the state agriculture university system and exposure to industry. There should be movement of students and faculty across states and freedom for students to select course modules of their interest.

One key to make agricultural education interesting as well as relevant is by way of classroom teaching interactive through the use of new media techniques. Faculty and scientists need training to develop teaching resources, using multimedia, Web-based technologies and training in the transmission and retrieval of digital resources. Under the biotechnology component, a strategic alliance has been envisaged for training and research on development of transgenic crops with resistance to economically important viruses, tolerance to drought, heat and salinity and micro-nutrient utilization efficiency.

India's National Agricultural Policy accords high priority to the sustainability of agriculture. ICAR and the State Agricultural Universities, which comprise the

National Agricultural Research System (NARS), also emphasize the importance of incorporating the sustainability perspective into their research and education programmes. But this requires an analytical framework for sustainable agriculture that can guide a transition from research and education directed towards productivity goals to research and education that addresses productivity issues keeping sustainability concerns in sight.The National Agricultural Policy of the Government of India aims at agricultural growth (4% annually to 2020) with sustainability, by a path that will be determined by three important factors: technologies, globalization and markets. Agricultural research and education of the future must therefore address two related challenges: increasing agricultural productivity and profitability to keep pace with demand and ensuring long-term sustainability of production.

Climate change is projected to have significant impacts on agricultural conditions, food supply, and food security. The agricultural education in future will have to be reorganized in the context of ways and means for mitigating the adverse effects of climate change, uneven and erratic nature of rain and increasing scarcity of water, degradation of land at an alarming rate, stagnation in crop productivity, emerging problems of pests and diseases of crops, soil fertility decline and emerging micro and secondary nutrient deficiencies in soils, need of more resistant cultivars to drought stress, salinity and other adverse conditions, farm mechanization in view of increasing labour problems, market intelligence in view of globalization and issues of sustainability of soil, water and biodiversity.The future challenges in agricultural education also include development of human resource to combat with the new challenges and need of their dedicated efforts to find solutions. The changes in agriculture occurred during the past years call for defining strategic ways for newly revamping the agricultural education.

Quality Assessment in Higher Education

Agriculture continues to be the main stay for providing food, nutrition and livelihood security to large and growing population of the country. Major economic resources for Indian livelihood is the agricultural development which can be achieved by educational initiatives, research planning and extension methodology. The tri-functional responsibility of the university faculty in teaching, research and extension is the unique feature of India's agricultural education.Agricultural education has to keep pace with scientific advances in the fields of biotechnology, food processing, communication and marketing. In

addition to skill sets as per market demands, education must keep pace with global standards considering environmental and sustainable aspects. The key to our success in agricultural education is to have an adequate supply of well prepared people motivated to help prepare students for successful careers in Agriculture, Food and Natural Resources industries.

Agricultural education need to produce two types of graduates – one type with strong basic focus aiming for higher degree in research and second type with broad based education aiming at non-academic jobs. This is possible by providing more choice on courses in the form of electives, or having colleges aiming at these skills. Some colleges may be mandated to produce graduates with more basic skills which may be a better choice for students to sustain in international competition.

We need to develop Exchange Programme among agricultural and other universities so that students could take courses not only within the campus but also across the campus within India and outside the country for a term or two. Internationalization of agricultural education and research is long overdue. We need to increase the quota for international students on priority so that the cosmopolitan outlook of the campus improves the educational environment also.

Strategies for future research

The jurisdiction of university in Vidarbha region of Maharashtra experiences drought as a common occurrence during crop season imposing abiotic stress which is the major cause of productivity decline. Agriculture in the region is mainly rainfed and the irrigation potential is very meager. The strategy for improving crop productivity therefore would involve emphasis on development of climate resilient crop varieties, resource conservation technologies, ground water recharging and water harvesting through farm ponds and use of improved management practices. Crop diversification would need to be adopted to a great extent in view of the mono-cropping in the past many years. The potential dry land horticultural crops need to be identified for the region and their improved cultivation should be encouraged. High density planting advocated by the University for Orange needs further refinement and enhancement in the region with the use of modern pruning machineries and fertigation technique. Early duration drought tolerant and suitable varieties of cotton for mechanical picking would need priority. High yielding soybean varieties tolerant to pest and diseases with short duration and suitable for mechanical harvesting is the need which needs emphasis in future research programme. The pulses and oilseeds equally need

priority in respect of development of improved varieties suitable in the region. The crops like sorghum, groundnut, safflower which were grown in the region earlier need to be encouraged as there is decline in the area of these crops in the region. The potential crop like maize needs emphasis in view of its suitability and high yield potential. Rice is the main crop in the Eastern Vidarbha and emphasis will be given to develop fine grained rice varieties tolerant to pest and diseases. Drill rice cultivation will be encouraged in the region facilitating the possibility of second crop after rice during rabi. The crops like chick pea, rabi sorghum, linseed, safflower, mustard have large scope to be grown as a second crop in rice tract. The crop production constraints will be identified and the improved technologies will be generated for sustainable crop yields. Soil health decline has been observed as evidenced by multinutrient deficiencies and severe reduction in soil organic carbon contents which calls for balanced fertilization, organic agriculture, crop residue recycling and conservation agriculture practices. Adoption of BBF on large scale will be a strategy for rainfed crops in the region. The heavy black sodic soils in Purna valley region in the jurisdiction covering over four lakh hectare area need interventions like reclamation technique, suitable management options and proper crops and cropping systems. The shade net and polyhouse cultivation for vegetables and flowers would be advocated depending upon the available resources by providing technological package. Mechanization in agriculture would be the agenda in future research to overcome the problems of labour shortage, to reduce the cost of cultivation and improve the productivity.

The future perspectives of agriculture development in the region lie with effective deployment of genomic configurations of the adapted biodiversity with available natural resources in the form of innovative technologies. Prioritizing the basic requirements for enhancing agricultural productivity suggests focusing mainly upon development of early high yielding varieties having resistance/tolerance against major biotic/abiotic stresses, production technologies with high water and nutrient use efficiency, efficient protection technologies to address the issue of pesticide residue problems, post harvest management etc. An introduction and intervention of innovative technologies can help to boost the present productivity and farmers' income.The gap between yields of research stations and farmer's fields are wide but are expected to narrow down in the future. However in some areas, the yield gaps will remain high even in 2050 both due to non-adoption of technologies and non-availability of tailor-made package of practices. Therefore,

while evolving strategies for bridging yield gaps, due attention will be given to regional imbalances in terms of natural resources and technology intake capacity of farmers. For yield maximization, selecting genotypes with wide adaptability and resilience to climate variability remains a challenge. Developing crop simulation models and region specific decision support systems will be given attention.

The high levels of malnutrition, especially among poor, needs immediate attention. Biofortification of rainfed crops, particularly millets would be the future challenge as most of the tribal people and farm labour in rainfed and remote areas are suffering from protein and micronutrient malnutrition.

The declining factor productivity of fertilizers in rainfed as well as irrigated areas is a matter of concern. Ensuring optimum fertility of soils in the backdrop of declining animal population is a key challenge. The soil organic carbon, which is a seat of major soil processes and functions, is < 5 g/kg in rainfed soils whereas the desired level is 11 g/kg. Even though, about 80 million tonnes of crop residues are produced annually in rainfed areas, their recycling is not done due to competitive uses and burning.

Droughts during crop season and extreme weather events affect crop productivity and livelihoods of farmers. Such conditions require a continuous monitoring system. The crop contingency plans need to be implemented at field level based on the outcomes of such monitoring tools. For this appropriate decision support systems need to be evolved. Such efforts will help in timely interventions during aberrant weather conditions.

Modern science tools such as nanotechnology will be exploited to develop a variety of applications in agriculture. These include improved seed germination, soil moisture conservation, nanofertilizers, nano-biosensor based diagnostics for detection of plant stresses and nanocarriers for plant and animal health care compounds. Such products and processes are capable of delivering nutrients and other agri-inputs judiciously in appropriate quantities at required time thus increasing input use efficiency.

Entrepreneurship development is the need for creating self employment and ensuring livelihood security. Rural youths will be promoted to become agri-preneurs and to take trainingfrom specialized institutions for initiating their enterprises.

There is growing realization that the existing extension system needs to revamp to respond to the emerging demand of the farmers. Also many times, research system is not getting adequate feedback to plan and conduct demand driven research thereby, a huge gap exists in the quality of research output required at the farm level and that being developed. In this context, the concept of **"Farmer First"** may be pursued with basic components: Massive Farmers- Scientist Contact for enabling involvement of researchers in the extension education programmes, for continuous interaction with farm conditions, problem orientation and quick dissemination and exchange of knowhow between farmers, scientists and other stakeholders.

The important focused research areas will be; organic farming, Integrated nutrient management, and weed management; Development of technologies for **"per drop more crop"** ; Development of packages for harvesting, processing and value addition in medicinal and aromatic crops, seed production in different crops, Development of GAP's in important crops with major focus on pesticide residue management; Emphasizing value addition and post-harvest processes for fruits, vegetables and spices; Test for assessment of genetic purity of breeder seed; Selection of genotypes of different crops for drought tolerance, salt tolerance and early maturity; Off-season vegetable cultivation technologies for better returns; High density plantation and canopy management of fruit crops for efficient resources utilization; Testing of new plant protection chemicals and screening of germplasm of various crops against insect-pests, nematodes and diseases in climate change scenario; Studies on crop and area specific insect-pest threshold levels and potency evaluation of natural enemies for developing effective bio-control protocols; Development of Herbal garden with all local medicinal plants; Upgradation of ARS and creation of new research stations for strengthening location specific and need based research in the region.

Short Term plans and Framework (till 2030)

Education:

Dr. PDKV is committed to develop competent human resource to serve the society in general and farmers and food industry in particular for sustainable livelihood, efficient use of natural resources, ensuring food security and safety for the nation.

The following action plan and framework has been proposed for future development in education.

- The education system needs to be harmonized with existing and emerging issues related to World Trade Agreement, free market economies and new agriculture.
- New educational and learning systems and environments
- Create educational environments that foster continuous learning
- Efforts will be made to develop state-of-the art infrastructure and to enhance faculty competence for improving higher education in agriculture and allied disciplines.
- Reform agricultural education and extension systems and enhance human resource befitting global competition
- Investments in developing state of art infrastructure and laboratories and scientific capacity building will be required in coming future.
- Improving faculty in terms of strength and competence must be recognized as the key factor for reinforcing the quality in the current education system.
- The number of Emeritus Scientists/Professors should be increased
- Schemes like postdoctoral fellowship, visiting faculty, adjunct faculty should be introduced.
- Opportunities for physical exchange of faculty/specialists, creation of necessary infrastructure like video-conferencing facilities that will benefit both the teachers and students, should be created.
- Involvement of eminent superannuated scientists/professors
- Inviting overseas accomplished professors and researchers for imparting training in frontal areas, interaction on curriculum development, education technology would lead to capacity development of a large number of faculty and students. This will also result in formulation and initiation of research programmes in frontier areas.
- In order to strengthen degree programmes in the emerging and frontier areas of science and technology, fellowships need to be earmarked in cutting edge areas. A separate provision of special research grants should be extended for innovative PG research.
- Graduates need to be empowered by linking production and post harvest technologies in a mutually reinforcing manner. For this, Agricultural Technology Parks can be set up. These Parks will promote technology

incubation and dissemination. It will also establish economic viability of new technologies. Such Parks, linked to appropriate public and private sector enterprises from the point of view of marketing arrangements, will help to enhance self-confidence of the graduates and stimulate them to take up a career of self-employment.

Research

Global food demand is expected to be doubled by 2050, while production environment and natural resources are continuously shrinking and deteriorating. Rainfed agriculture has huge potential if natural resources, especially soil and water, are scientifically and efficiently managed. For research and development, the key challenges would be: (i) to develop promising technologies and management options to raise productivity to meet growing food demand in a situation of deteriorating production environment at the lowest cost; and (ii) to develop appropriate technologies, create required infrastructure and to evolve institutional arrangements for production, post-harvest and marketing of high-value and perishable commodities and their value-added products. The research focus will be given to evolve technologies and management options to suit needs of smallholders' agriculture, and also to involve them in agri-supply chain through institutional innovations. The farmer centric need based research will be the strategy for future research.

The following action plan and framework has been proposed for future development in Research.

- Encourage scientific excellence and promote interdisciplinary, knowledge intensive and problem-solving research
- Enhancement in Agricultural productivity, efficiency and profitability
- Enhancing the natural resource base of agriculture for future generations
- Resilience to climate change and abiotic and biotic stresses
- Development of improved genotypes (varieties and hybrids) and management practices for raising productivity
- Consumer-preferred quality traits and food safety would be given high priority
- Foster repositories of genetic resources related to crop, livestock, insects and micro-organisms for their sustainable utilization
- Diagnostic tools for DNA fingerprinting and IPR protection

- Agricultural biotechnology has a considerable potential to address many of the future challenges in the agricultural crops and horticultural crops
- Improvement in nutritional security
- Sustainability of natural resources
- Providing highest priority to farmers and responding proactively
- Ensuring farmers' prosperity
- Productivity enhancement through mechanization of agriculture
- Ensure the benefit of agriculture to access emerging markets
- Development of standards for organic produce of agriculture and horticulture
- Promote opportunities for the farming community and society
- Development of farm implements suitable for small and marginal farmers
- Development of new generation fertilizers to meet the nutrient needs of different crops
- Utilization of Information Technology tools in marketing for sale of Agricultural products
- Development of weather based technologies for control of pests and diseases
- Use of drone technology for imaging, aerial spraying in areas of plant protection, irrigation, soil and plant health, crop yield estimates.
- Use of advanced technology for developing cattle, sheep, goat and poultry with higher yield potential
- Studies on nutrient dynamics in organic agriculture and conservation agriculture
- Promote partnerships for value addition in agriculture
- Restructuring and strengthening of research units and stations
- Upstream research for up gradation of technology with biotechnology, molecular biology, nanotechnology and information technology and geospatial technology.
- Strengthening collaboration with public and private sector for agricultural production and value chains.
- Since the commodities are perishable in nature, research and development focus would be on the entire value-chain from production and post harvest to value-

addition, processing and marketing. Enhancing shelf - life and improving demand-driven commodity traits (colour, size, and aroma) of these perishable commodities through different post-harvest approaches in partnership mode would be prioritized to promote agricultural diversification.

- Promote innovations and improve human resource capacity by involving all stakeholders in the food-supply chain
- Link research and development system with society by improving science communication. Awareness and sensitization programmes would be developed addressing benefits of science and food safety concerns of the society.
- Producing enough food for increased demand against the background of changing climate scenario is a challenging task for agricultural research. This would require increased adaptation and mitigation research, capacity-building, changes in policies, and regional as well as global co-operation.
- Priority areas will include Agricultural Information and Data Analysis, Organic farming and green technology, Agricultural Microbiology, Natural resource management, Apiculture, Pesticide residue analysis and management.
- Centres of Excellence modes will be adopted to ensure interdisciplinary, excellence and efficiency in research.
- Under resource generation the activities which will be given priority to increase the income of the university are seed production of agronomical and horticultural crops, nursery establishment of fruits, ornamental plants and vegetables; production of bio-fertilisers and bio-pesticides; soil and water testing facilities; mushroom cultivation etc.

Infrastructure Development

As regards infrastructure development emphasis will be given to develop modern research farms having fencing around and equipped with improved implements and machineries, construction of water harvesting structures, to develop modern irrigation facilities and to establish protected cultivation structures suitable for semi arid conditions.

Extension Education

The major emphasis for; training of farmers and in-service field functionaries of line departments; organization of farmers' fair in addition to demonstrations and field days for farmers, farm women and rural youths ; creating facilities of mobile

soil and water testing units; development of crop museum; participatory seed production at farmers' field.

Skill Development Trainings to be organized on different aspects for students, educated youths, entrepreneurs; Seed quality testing, Seed certification; Plantation techniques for Horticultural crops; Phytosanitation; Production of Bio-fertilizers and Bio-pesticides; Soil and Water testing; Honey Bee keeping; Mushroom cultivation; Modern irrigation techniques; Custom hiring services, hi-tech horticulture etc. A convergence of traditional knowledge with innovative science is needed to bring in the much needed break through in agriculture of the State.

Long term plans and Framework (till 2050)

Education

Development of Online Student Portal for students linked with the University website; Establishment of new colleges, Facilities for audio-video recording of class room lecture and their repository on University website; Development of smart class rooms at each college. Greater infusion of frontier science subjects, legal aspects and good practices of trade, ethics of IPR and GMO, and modern information and communication techniques will become more important to promote efficiency, awareness, equity and competitiveness in agriculture.

There is a need for developing internationally accepted levels of quality of trained agricultural professionals. Requirement is also there, for training all agricultural graduates to acquire high levels of skills with adequate knowledge base. Using modern IT tools in the educational process and equipping all graduates with competence in using them for information search and exchange, system modeling and optimization and software development for agricultural production, storage and marketing activities is also needed.

Major strategies for achieving standard in higher education will involve:

- Attract & retain best academic staff & provide favourable working conditions
- Academic freedom and an atmosphere of intellectual excitement
- Significant measures of internal self-governance for academic community
- Adequate funding and facilities to support the research and teaching
- Entrepreneurialism & active co-operation with social & economic environment
- Support for individual and team autonomy to obtain external funds

Research

Development of high yielding abiotic and biotic stress resistant varieties suitable for the region would need more emphasis. Establishment of Centre of Excellence on different aspects such as abiotic stresses, climate change and potential crops, Insect pest management of crops in field and protected cultivation through environment-friendly technologies including semiochemicals, nanotechnology would be prioritized. Development of Post-harvest Technologies for vegetables and fruits to increase their shelf life and processing; Studies will be envisaged on Biochemical/Molecular basis of abiotic stress particularly salinity /water / temperature in crop plants and microbes; Development of suitable dryland farming technologies for field and horticulture crops; Development of package of practices for high value horticultural crops under protected cultivation.

Planning research base for conservation agriculture, precision agriculture, specialty and secondary agriculture would be involved as a strategy. Preservation of soil fertility and nutrition management is very important component. More focus is needed to reduce indiscriminate use of synthetic chemical fertilizers which can seriously disturb the natural soil ecosystem. The balanced use based on soil testing and integration with bionutrients in the form of bio-fertilizers and composts needs promotion. Rejuvenation of soil health through addition of soil organic matter, crop residue recycling, needs serious attention. There is need to develop specific land use plans as per the capacity of land for different farming situations to ensure that no land is left unused. There is a need and scope of crop diversification in the region for the cultivation of dry land horticultural crops, medicinal and aromatic plants and floriculture. Land use planning is required at district, block and village levels. The marginal lands should be used for plantation and medicinal crops. The lands that are not suitable for agriculture need to be optimally used for rainwater catchment areas, agro-tourism. Application of ICT in the form of GIS and remote sensing needs special attention in this direction. Pursuance of cluster approach would need to showcase the model of technology adoption related to agriculture, livestock and allied sectors.

Infrastructure development

Construction of farm roads and mechanization of instructional farms; Farm ponds, Micro irrigation facilities and Upgradation of internet connectivity; Establishment of University Cultural Center, yoga cum meditation centre, Development of sports complex facility; Development of University museum.

Extension Education

Encouraging farmers for setting up agro-processing centre for post harvest crop management in each Agro-climatic zone in collaboration with supporting agencies; Intensive use of ICT to disseminate technologies, problem identification and ready solution. Skill Development, production and marketing of processed products from fruits, vegetables, seed spices and medicinal plants.Providing farmers the state of the art services of soil testing, quality seed, quality planting materials and breeds of the animals and quality inputs of allied enterprises is very essential. The digital revolution and mobile technology will be very useful to organize and share information and knowledge for the benefit of farming community.

A well defined and regular capacity building plan needs to be prepared in emerging areas of extension in order to update the skills and proficiency of subject matter experts. Agro-climatic zone based extension plan and thrust areas are required to be identified for each KVKs. The KVKs need to demonstrate new technologies and methods to the farmers, commercialize technology so that its social value can be felt and should promote public private partnership.

Developing centers of excellence

- Organic farming
- Millets, pulses, oilseeds, cash crops, fruit, vegetable and medicinal crops
- Farm mechanization
- Rain water management for Rainfed agriculture
- Secondary agriculture
- Biological control of pest and diseases
- Land reclamation and Use of saline water
- Micro-irrigation and Fertigation
- Protected Cultivation and Precision farming

Strengthening linkages

The existing formal and informal linkages with State Agricultural Universities, line departments, national institutes under Indian Council of Agricultural Research, Department of Biotechnology, Council of Scientific and Industrial Research, international institutes like International Crops Research Institute for the Semi-Arid Tropics, Government organizations like Maharashtra State Seed Corporation etc. would be further strengthened for better cooperation in various activities.

Parternership with private seed companies/ manufacturers, NGOs, Farmers' organizations, Marketing institutions, etc. would be stepped up for target based research and dissemination of new agricultural technology.

Way forward

Through this "VISION 2050" document, PDKV foresees an opportunity to attain further heights for becoming a leading agricultural education hub by fruitfully utilizing the prevailing high capacity and opportunities as set in the document. The proposed investments, programmes, funds and recognition will certainly create landmarks in the history of agricultural education, research and knowledge dissemination. The innovative deliverables will remain highly supportive for overall development of agriculture based sectors as well as rural societies with active penetration of global agricultural knowledge in emerging key areas considering needs at local, regional, national and global levels. Such focus on educators as well as scholars will certainly lead to offer higher advantages and benefits to end clients of agricultural sector, which includes farmers, entrepreneur, rural youth and many socio economically deprived sections of the state and the country.

In recent years, PDKV has played many active roles for gaining a status of model agricultural university, which in turn improved its significance. The PDKV has been an active organization in terms of attracting grants, cooperative agreements, collaboration/consultancies, trainings, HRD, technical assistance, technological disseminations, student-teacher-farmer-industry bonds, wider employability, social sensitivity and many other measures/offers for farmers and agricultural stake holders. The end goal is set to visualize a transformative view of present PDKV into eminence, where our students, faculty, staff, farmers and stake holder will remain key players on a centralized elevated platform. The so achieved transformation is certainly going to revolutionize the learning environments to nurture respect for merit based education, research and knowledge sharing by accommodating diversity, equality, adversities (climatic, social, economic, human) with meaningful ground solutions.

The key parameter that remains the sole target for the improvements/gap reduction are centered towards achieving excellence in research, world-class facilities and funding, consistent academic freedom, and an atmosphere of intellectual excitement. Existing importance of PDKV and its prevailing strength will be appropriately utilized to establish the advances in agricultural and allied

sciences which will create common understanding and target oriented interaction with people across the nation and globe. More relevant policy and practice solutions may get evolved to help in solving issues and concerns faced by farmers and all agricultural stakeholders/communities/cultures in a great way.

In addition to assisting challenging goal of the state and Indian Government, the PDKV under the proposed transformation, will certainly attempt to address and fulfill the need for leadership personnel, teaching, research, training, and capacity development in agricultural resources management, production, marketing, business, socio-economic uplifts and overall societal improvements. The eminent patrons will be facilitated via variety of innovative and inclusive efforts for carving conducive environment and physical settings to create and release next generation of agricultural leadership professionals and human resource of different categories to meet overall demands for modern agriculture under vastly uncertain climatic and environmental settings as well as challenging socio-economic conditions.

Epilogue

Dr. PDKV, Akola is committed to bring a need-based and technology-led revolution to meet challenges of the rising demand of ever increasing population for food, improving livelihood of farmers and for ensuring sustainable agriculture. We envision that innovations in agriculture would transform existing slowdown in agriculture into a vibrant and competitive environment by harnessing untapped opportunities in domestic and global markets. The University firmly believes that agricultural education, research and development would augment farmers' income, generate employment opportunities, conserve natural resources, promote exports and increase value addition for higher and comprehensive agricultural growth. Concerted efforts would be made to transform the University to be more sensitive to the needs of the farming community, especially of the smallholders and of the poor living in the backward, fragile, rural and marginal areas. The University would also make efforts to transform education techniques to change the view of our students from job seekers to job providers. Experiential Learning Programme would be further strengthened. Intensive endeavours will be made to emphasize agro-eco region specific research and finding solutions to local problems through the existing network. In years to come, climate change and climate variability will certainly drivethe research programme of the faculty of our University in form and substance. Dr. PDKV, Akola is marching ahead with renewed zeal and is committed to play pivotal role in teaching, research and extension education for sustained development of agriculture and allied sectors. In this context, University is absolutely devoted in realizing the new paradigms and using them to develop excellent human resource, innovative technologies and their dissemination so as to proficiently serve the farming community of the state and the country. The University will develop mechanism to regularly monitor the changes in agriculture scenario at state level, and the strategies to respond to the changes for the benefit of the students and farmers. Efforts will be made to maintain a culture of responsibility, accountability and integrity in agriculture and sciences in the University.