Long Term Institutional Plan

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA

RAJA PANCHAM SINGH MARG, GWALIOR-474002 (M.P.)

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

Long Term Institutional Plan

The long-term institutional perspective plan for Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RVSKVV), Gwalior, outlines the strategic vision, goals, and initiatives to guide the development and growth of the institution over a defined period. This plan encompasses various aspects of academic, research, extension, infrastructure, and administrative functions, aimed at enhancing the quality and relevance of agricultural education and research while contributing to the socio-economic development of the region and beyond. Here's an overview of the key components of the long-term institutional perspective plan:

By adopting a holistic and forward-thinking approach, RVSKVV can lay the foundation for realizing its long-term vision and making significant contributions to the advancement of agricultural education, research, and extension services through:

1. **Strategic Planning:** By developing a comprehensive institutional perspective plan that encompasses all aspects of RVSKVV's mission and strategic goals, the institution sets a clear roadmap for its future direction. This plan serves as a guiding framework for decision-making and resource allocation, ensuring that efforts are aligned with the institution's overarching objectives.
2. **Alignment with Mission:** RVSKVV's commitment to fulfilling its mission of excellence in agricultural education, research, and extension services forms the cornerstone of its institutional perspective plan. By aligning strategic goals with this mission, the institution ensures that its efforts are focused on activities that have the greatest impact on its core mandate.
3. **Global Perspective:** While RVSKVV's primary focus may be on serving its local and regional agricultural community, adopting a global perspective allows the institution to stay abreast of

international trends, best practices, and innovations in agricultural sciences. This broader outlook enables RVSKVV to contribute to global agricultural development and engage in collaborative initiatives with international partners.

4. **Innovation and Adaptation:** A forward-thinking approach involves embracing innovation and adaptation to address evolving challenges and opportunities in the agricultural sector. RVSKVV can foster a culture of innovation among its faculty, staff, and students, encouraging them to explore new ideas, technologies, and approaches to agricultural education, research, and extension services.
5. **Partnerships and Collaboration:** Collaboration with other institutions, research organizations, industry partners, and government agencies enhances RVSKVV's capacity to achieve its strategic goals. By forging strategic partnerships and leveraging collective expertise and resources, the institution can maximize its impact and reach.
6. **Continuous Improvement:** RVSKVV's commitment to continuous improvement ensures that it remains responsive to changing needs and dynamics in the agricultural sector. Regular review and evaluation of its institutional perspective plan allow the institution to identify areas for enhancement and make necessary adjustments to stay on course towards its long-term objectives.

By embracing a holistic and forward-thinking approach, RVSKVV can effectively implement its institutional perspective plan and realize its vision of becoming a leading institution in agricultural education, research, and extension services. Through its efforts, RVSKVV not only contributes to the advancement of agriculture locally, nationally, and globally but also plays a pivotal role in addressing global food security challenges and promoting sustainable agricultural practices.

The long-term perspective of RVSKVV encompasses a proactive approach towards addressing the dynamic landscape of Indian agriculture. Through a meticulous analysis of our Strengths, Weaknesses, Opportunities, and Threats (SWOT), we aim to envision an agricultural paradigm that responds adeptly to the demands of stakeholders across the production-to-consumption continuum.

In this pursuit, we are committed to exceeding standards by envisioning an agricultural landscape that not only meets present needs but anticipates and adapts a proactive approach to strategically position ourself for the future.

RVSKVV has embarked on a strategic journey to harness opportunities and transform weaknesses into strengths by envisioning an alternate agricultural scenario for the next two decades. This forward-looking initiative involves a comprehensive SWOT analysis, focusing on academics, research, and technology development, to position our institution at the forefront of agricultural excellence.

In alignment with the National Education Policy (NEP) 2020, we are rigorously exploring avenues for academic enhancement, ensuring our educational framework remains adaptive, inclusive, and globally competitive. This involves revisiting curriculum structures, pedagogical approaches, and assessment methodologies to nurture holistic development and critical thinking among our students.

Our research agenda is driven by a commitment to address pressing agricultural challenges while seizing emerging opportunities. Through interdisciplinary collaboration and innovative methodologies, we identify key researchable issues and devise strategies to generate impactful insights that can drive sustainable agricultural practices, enhance productivity, and mitigate risks in the face of climate change and other external threats.

Furthermore, our extension and outreach programs are strategically designed to bridge the gap between academia and practice, empowering farmers, rural communities, and stakeholders with cutting-edge knowledge, skills, and technologies. By fostering partnerships, leveraging digital platforms, and tailoring interventions to local contexts, we aim to catalyze socio-economic development and enhance the resilience of agricultural ecosystems.

Through these concerted efforts, RVSKVV is committed to upholding its legacy of excellence in education, research, and extension services, thereby contributing significantly to the socio-economic advancement of the agricultural sector and the well-being of society at large.

1. **Vision and Mission**: Articulate institutional governance and leadership in accordance with the vision and mission and statement of RVSKVV's commitment to excellence in agricultural education, research, and extension services, with a focus on addressing contemporary challenges and opportunities in the agricultural sector.
2. **Strategic Goals and Objectives**: Define strategic goals and objectives aligned with the institution's vision and mission, encompassing areas such as:

   a) **Academic Excellence:** Enhance the quality of academic programs, curriculum development, and pedagogical approaches to foster innovative thinking, critical inquiry, and practical skills among students.

Institutional governance and leadership play a pivotal role in RVSKVV's commitment to academic excellence in agricultural education. RVSKVV articulates this commitment through following way:

1. **Strategic Planning:** RVSKVV's leadership should engage in strategic planning processes that prioritize academic excellence as a core objective. This involves setting clear goals and objectives for

enhancing the quality of academic programs and curriculum development.

2. **Investment in Faculty Development:** Leadership should invest in faculty development initiatives to ensure that educators are equipped with the latest knowledge, teaching methodologies, and technologies relevant to the agricultural sector. This could include providing opportunities for professional development, attending conferences, and conducting research.
3. **Curriculum Development:** RVSKVV should regularly review and update its curriculum to reflect advancements in agricultural sciences, emerging technologies, and changing industry demands. This ensures that students are receiving a relevant and comprehensive education that prepares them for the challenges of the agricultural sector.
4. **Pedagogical Innovation:** Encouraging innovative teaching approaches and pedagogical methods is crucial for fostering critical thinking, problem-solving skills, and practical knowledge among students. This could involve incorporating experiential learning opportunities, hands-on projects, and interdisciplinary coursework into the curriculum.
5. **Quality Assurance Mechanisms:** Implementing robust quality assurance mechanisms, such as accreditation processes and program evaluations, ensures that academic programs maintain high standards of excellence. Regular assessment and feedback loops help identify areas for improvement and opportunities for enhancement.
6. **Student Support Services:** RVSKVV should provide comprehensive student support services, including academic advising, mentoring, and career guidance, to ensure that students have the resources and support they need to succeed academically and professionally.

By prioritizing academic excellence and implementing strategies to enhance the quality of academic programs, curriculum development, and pedagogical approaches, RVSKVV demonstrates its commitment

to providing students with a world-class education in agricultural sciences.

b) **Research Innovation:** Promote interdisciplinary research collaborations, encourage faculty and student involvement in cutting-edge research projects, and establish research centers of excellence to address key challenges in agriculture, agri-business, and rural development.

Institutional governance and leadership are instrumental in fostering a culture of research innovation at RVSKVV. The University articulates its commitment to promote research excellence through:

1. **Strategic Research Agenda:** RVSKVV's leadership should develop a strategic research agenda that aligns with the institution's vision and mission while addressing contemporary challenges in agriculture, agri-business, and rural development. This agenda should prioritize interdisciplinary collaborations and focus on areas with high societal impact.
2. **Interdisciplinary Collaboration:** Encouraging interdisciplinary research collaborations allows faculty and students from diverse academic backgrounds to work together on complex agricultural issues. This fosters creativity, innovation, and the development of holistic solutions to real-world problems.
3. **Faculty and Student Involvement:** RVSKVV should actively encourage faculty members and students to engage in cutting-edge research projects. Providing support for research initiatives, including funding opportunities, access to state-of-the-art facilities, and mentorship, incentivizes participation and enhances the quality of research outputs.
4. **Research Centers of Excellence:** Establishing research centers of excellence dedicated to specific areas of agricultural research enables focused efforts to address key challenges. These centers serve as hubs for collaboration, knowledge exchange, and capacity building, attracting top talent and fostering innovation.

5. **Partnerships and Networks:** Forge partnerships with government agencies, industry stakeholders, research institutions, and international organizations to leverage resources, expertise, and networks. Collaborative research initiatives enhance the relevance and impact of RVSKVV's research efforts, facilitating technology transfer and adoption.
6. **Promotion of Research Outputs:** RVSKVV should actively promote research outputs, including publications, patents, innovations, and policy recommendations, to maximize their impact. This may involve organizing conferences, workshops, and seminars, as well as engaging with the media and policymakers to disseminate research findings.

By promoting interdisciplinary research collaborations, encouraging faculty and student involvement in cutting-edge projects, establishing research centers of excellence, and fostering partnerships, RVSKVV demonstrates its commitment to research innovation and its role in addressing the evolving challenges and opportunities in the agricultural sector.

c) Extension and Outreach: Strengthen extension services, technology transfer initiatives, and community engagement programs to empower farmers, rural communities, and stakeholders with knowledge, skills, and technologies to improve agricultural productivity, sustainability, and livelihoods.

Institutional governance and leadership are critical in driving effective extension and outreach efforts at RVSKVV. The institute articulates its commitment to strengthening extension services and community engagement through:

1. **Strategic Planning:** RVSKVV's leadership should develop a strategic plan for extension and outreach activities that aligns with the

institution's vision and mission. This plan should prioritize initiatives aimed at empowering farmers, rural communities, and stakeholders with knowledge, skills, and technologies to improve agricultural productivity, sustainability, and livelihoods.

2. **Capacity Building:** Invest in capacity building initiatives for extension agents, educators, and community outreach specialists to enhance their skills in delivering extension services, technology transfer, and community engagement programs. Training programs, workshops, and professional development opportunities can equip staff with the necessary expertise to effectively engage with target audiences.
3. **Technology Transfer:** Facilitate the transfer of research-based technologies and best practices from the university to farmers and rural communities through extension services. This may involve organizing field demonstrations, farmer training programs, and technology dissemination events to showcase innovative agricultural practices and techniques.
4. **Community Engagement:** Foster partnerships with local communities, farmer organizations, cooperatives, and government agencies to co-create extension programs tailored to the specific needs and priorities of target audiences. Engage stakeholders in participatory decision-making processes to ensure that extension services are relevant, inclusive, and responsive to local contexts.
5. **ICT and Digital Platforms:** Leverage Information and Communication Technologies (ICT) and digital platforms to enhance the reach and impact of extension services. Develop mobile applications, online portals, and interactive tools that provide farmers with access to timely information, advisory services, market intelligence, and training resources.
6. **Monitoring and Evaluation:** Establish robust monitoring and evaluation mechanisms to assess the effectiveness and impact of extension and outreach programs. Collect feedback from beneficiaries, track key performance indicators, and conduct

periodic reviews to identify successes, challenges, and opportunities for improvement.

By strengthening extension services, technology transfer initiatives, and community engagement programs, RVSKVV demonstrates its commitment to empowering farmers, rural communities, and stakeholders with the knowledge, skills, and technologies needed to enhance agricultural productivity, sustainability, and livelihoods.

d) Infrastructure Development: Invest in infrastructure upgrades, modernization of laboratories, research facilities, libraries, and IT infrastructure to create conducive learning and research environments that support academic and research excellence.

Institutional governance and leadership play a crucial role in driving infrastructure development initiatives at RVSKVV. The University articulates its commitment to investing in infrastructure upgrades to support academic and research excellence in following ways:

1. **Strategic Planning:** Develop a comprehensive infrastructure development plan that aligns with the institution's long-term goals and strategic priorities. This plan should identify areas for improvement, prioritize infrastructure upgrades, and allocate resources effectively to create conducive learning and research environments.
2. **Needs Assessment:** Conduct a thorough needs assessment to identify gaps and deficiencies in existing infrastructure facilities, including laboratories, research facilities, libraries, and IT infrastructure. Solicit feedback from faculty, researchers, and students to ensure that infrastructure investments address the specific requirements of academic and research activities.
3. **Modernization of Facilities:** Invest in the modernization of laboratories, research facilities, and libraries to enhance their functionality, accessibility, and efficiency. This may involve

upgrading equipment, renovating facilities, and expanding spaces to accommodate growing research programs and academic activities.

4. **IT Infrastructure:** Strengthen IT infrastructure and digital capabilities to support teaching, learning, and research activities. Upgrade networking infrastructure, enhance internet connectivity, and provide access to digital resources, online databases, and research tools to facilitate collaborative research and knowledge sharing.
5. **Safety and Sustainability:** Prioritize safety and sustainability considerations in infrastructure development projects. Ensure compliance with relevant regulations and standards, implement safety protocols, and incorporate energy-efficient and environmentally friendly design features into new construction and renovation projects.
6. **Partnerships and Funding:** Seek partnerships with government agencies, private sector organizations, philanthropic foundations, and alumni networks to secure funding for infrastructure development initiatives. Explore opportunities for grants, donations, sponsorships, and public-private partnerships to supplement institutional resources and accelerate infrastructure upgrades.

By investing in infrastructure upgrades and modernization initiatives, RVSKVV demonstrates its commitment to creating conducive learning and research environments that support academic and research excellence. A well-equipped and modern infrastructure enhances the institution's ability to attract and retain talented faculty, researchers, and students, while also facilitating interdisciplinary collaboration and innovation in agricultural education and research.

e) Institutional Collaboration: Foster partnerships with national and international academic institutions, research organizations, industry stakeholders, government agencies, and non-profit organizations to enhance collaborative research, student exchange programs, and knowledge sharing initiatives.

Institutional governance and leadership play a pivotal role in fostering institutional collaboration at RVSKVV. Following are the measures through which the institute can articulate its commitment to fostering partnerships with various stakeholders:

1. **Strategic Planning:** Develop a strategic plan for institutional collaboration that outlines clear goals, objectives, and priority areas for partnership development. Align collaboration efforts with the institution's mission and strategic priorities to maximize impact and relevance.
2. **Stakeholder Engagement:** Engage stakeholders, including national and international academic institutions, research organizations, industry stakeholders, government agencies, and non-profit organizations, in collaborative dialogue and partnership-building activities. Foster relationships based on mutual trust, respect, and shared interests to facilitate effective collaboration.
3. **Partnership Development:** Actively seek out opportunities to establish partnerships with key stakeholders through formal agreements, memoranda of understanding (MoUs), and collaborative projects. Identify complementary strengths and expertise among partner institutions to leverage resources and capabilities for mutual benefit.
4. **Research Collaboration:** Foster collaborative research initiatives with partner institutions to address shared challenges and advance knowledge in agricultural sciences. Facilitate joint research projects, interdisciplinary collaborations, and technology transfer activities to drive innovation and impact.
5. **Student Exchange Programs:** Promote student exchange programs and mobility initiatives that provide students with opportunities to gain international experience, exposure to diverse cultures, and access to world-class educational resources. Facilitate academic exchanges, internships, and study abroad programs to enhance students' academic and personal growth.

6. **Knowledge Sharing Initiatives:** Establish mechanisms for knowledge sharing and capacity building among partner institutions, including workshops, seminars, conferences, and training programs. Create platforms for sharing best practices, lessons learned, and research findings to foster collaboration and learning.
7. **Monitoring and Evaluation:** Implement monitoring and evaluation mechanisms to assess the effectiveness and impact of collaborative initiatives. Track key performance indicators, collect feedback from stakeholders, and conduct periodic reviews to identify successes, challenges, and opportunities for improvement.

By fostering partnerships with national and international stakeholders, RVSKVV demonstrates its commitment to enhancing collaborative research, student exchange programs, and knowledge sharing initiatives. These partnerships enable the institution to leverage diverse expertise, resources, and networks to address complex agricultural challenges, drive innovation, and create positive societal impact.

f) Governance and Institutional Development: Strengthen governance mechanisms, administrative systems, and institutional policies to ensure transparency, accountability, and effective decision-making processes that support the institution's strategic objectives.

Institutional governance and leadership are essential for fostering transparency, accountability, and effective decision-making processes at RVSKVV. The University articulates its commitment to strengthening governance and institutional development:

1. **Transparency and Accountability:** RVSKVV's leadership should prioritize transparency and accountability in all institutional activities and decision-making processes. This includes promoting open communication, providing access to information, and

establishing mechanisms for stakeholders to participate in governance processes.

2. **Governance Mechanisms:** Strengthen governance mechanisms, such as governing bodies, committees, and advisory councils, to provide oversight and guidance on institutional policies, strategic planning, and resource allocation. Ensure that governance structures are representative, inclusive, and responsive to the needs of diverse stakeholders.
3. **Administrative Systems:** Enhance administrative systems and processes to streamline operations, improve efficiency, and enhance service delivery. This may involve implementing digital solutions, automation tools, and performance metrics to monitor and evaluate administrative performance.
4. **Institutional Policies:** Develop and update institutional policies and procedures to align with best practices, legal requirements, and emerging trends in higher education. Ensure that policies are clear, consistent, and accessible to all stakeholders, and regularly review them to address changing needs and priorities.
5. **Capacity Building:** Invest in capacity building initiatives for administrative staff, governance members, and other stakeholders to enhance their knowledge, skills, and competencies in governance and institutional development. Provide training, workshops, and professional development opportunities to promote effective governance practices.
6. **Ethical Standards:** Uphold high ethical standards and integrity in all institutional activities and interactions. Foster a culture of ethics, professionalism, and integrity among faculty, staff, students, and governance members, and enforce codes of conduct and ethical guidelines to prevent misconduct and promote trust.
7. **Continuous Improvement:** Foster a culture of continuous improvement and learning within the institution, where feedback, evaluation, and reflection are valued and used to inform decision-making and drive organizational change. Encourage innovation,

experimentation, and adaptation to address evolving challenges and opportunities.

By strengthening governance mechanisms, administrative systems, and institutional policies, RVSKVV demonstrates its commitment to fostering transparency, accountability, and effective decision-making processes that support the institution's strategic objectives and enhance its overall performance and reputation.

3. **Implementation Strategies**: Develop detailed action plans, timelines, and performance indicators for each strategic goal and objective. Identify responsible stakeholders, allocate resources, and establish monitoring and evaluation mechanisms to track progress, identify challenges, and make necessary adjustments to achieve desired outcomes.

   Implementing detailed action plans, timelines, and performance indicators is crucial for achieving RVSKVV's strategic goals and objectives effectively. Here's how the University can develop and implement implementation strategies:

1. **Goal Setting and Objective Alignment:** Begin by breaking down each strategic goal into specific, measurable, achievable, relevant, and time-bound (SMART) objectives. Ensure that these objectives are aligned with the institution's overall mission and strategic priorities.
2. **Action Planning:** Develop detailed action plans outlining the specific steps, activities, and tasks required to achieve each objective. Assign responsibilities to relevant stakeholders and establish clear timelines for implementation.
3. **Resource Allocation:** Identify the resources required to support implementation efforts, including financial, human, and technological resources. Allocate resources strategically to prioritize activities and initiatives that have the greatest impact on achieving strategic goals.

4. **Stakeholder Engagement:** Engage stakeholders, including faculty, staff, students, governance members, and external partners, in the implementation process. Foster collaboration, communication, and buy-in to ensure that everyone is aligned and committed to achieving the desired outcomes.
5. **Monitoring and Evaluation:** Establish monitoring and evaluation mechanisms to track progress, measure performance against established benchmarks, and identify areas for improvement. Develop key performance indicators (KPIs) and metrics to assess the effectiveness and impact of implementation efforts.
6. **Regular Review and Adjustment:** Conduct regular reviews and assessments of implementation progress to identify successes, challenges, and opportunities for adjustment. Use feedback from stakeholders and performance data to make informed decisions and adapt strategies as needed to stay on track towards achieving strategic goals.
7. **Communication and Reporting:** Maintain open and transparent communication channels to keep stakeholders informed about progress, challenges, and achievements. Provide regular updates, reports, and presentations to governance bodies, leadership teams, and other relevant stakeholders.
8. **Capacity Building:** Invest in capacity building initiatives to enhance the skills, knowledge, and competencies of staff involved in implementation efforts. Provide training, workshops, and professional development opportunities to equip individuals with the tools and resources needed to succeed.

By developing detailed action plans, timelines, and performance indicators, RVSKVV can effectively implement its strategic goals and objectives, track progress, identify challenges, and make necessary adjustments to achieve desired outcomes. This structured approach ensures accountability, transparency, and alignment throughout the implementation process, ultimately leading to the successful realization of the institution's strategic vision.

4. **Resource Mobilization and Sustainability**: Develop a sustainable financial plan encompassing diversified revenue sources, fundraising initiatives, grant opportunities, and efficient resource allocation strategies to support the implementation of the institutional perspective plan and ensure long-term financial viability.

Developing a sustainable financial plan is crucial for RVSKVV to support the implementation of its institutional perspective plan and ensure long-term financial viability. The strategy to be adopted by the institute to approach resource mobilization and sustainability is appended below:

1. **Diversified Revenue Sources:** RVSKVV should explore opportunities to diversify its revenue sources beyond traditional funding streams. This may include generating income from tuition fees, research grants, consultancy services, agricultural products, and partnerships with industry stakeholders.
2. **Fund Raising Initiatives:** Develop targeted fundraising initiatives to engage alumni, donors, philanthropic organizations, and corporate partners in supporting RVSKVV's strategic initiatives. This could involve launching capital campaigns, alumni giving programs, sponsorship opportunities, and donor recognition initiatives.
3. **Grant Opportunities:** Identify and pursue grant opportunities from government agencies, foundations, and international organizations to support research, innovation, and capacity building initiatives. Develop competitive grant proposals that align with RVSKVV's strategic priorities and leverage its strengths and expertise.
4. **Efficient Resource Allocation:** Implement efficient resource allocation strategies to optimize the use of available funds and maximize impact. Conduct regular budget reviews, prioritize investment in high-impact areas, and identify opportunities for cost savings and efficiency gains.

5. **Partnerships and Collaborations:** Forge strategic partnerships and collaborations with government agencies, industry stakeholders, research institutions, and non-profit organizations to access additional resources, expertise, and networks. Jointly pursue funding opportunities, share infrastructure and facilities, and collaborate on mutually beneficial projects.
6. **Financial Planning and Management:** Develop robust financial planning and management practices to ensure prudent fiscal management and accountability. Establish clear budgeting processes, financial controls, and reporting mechanisms to track expenditures, monitor revenue streams, and ensure compliance with regulatory requirements.
7. **Long-term Sustainability:** Integrate sustainability considerations into financial planning and decision-making processes to ensure long-term viability and resilience. Develop strategies to mitigate financial risks, build financial reserves, and adapt to changing economic conditions and market dynamics.
8. **Stakeholder Engagement:** Engage stakeholders, including faculty, staff, students, alumni, donors, and community members, in discussions about financial sustainability and resource mobilization. Foster a culture of philanthropy, transparency, and shared responsibility for ensuring the institution's financial health and sustainability.

By developing a sustainable financial plan encompassing diversified revenue sources, fundraising initiatives, grant opportunities, and efficient resource allocation strategies, RVSKVV can support the implementation of its institutional perspective plan and position itself for long-term success and impact in agricultural education, research, and extension services.

5. **Continuous Improvement and Adaptation**: Foster a culture of continuous improvement, innovation, and adaptation to emerging trends, technologies, and challenges in the agricultural sector.

Regularly review and update the institutional perspective plan in response to changing internal and external dynamics, stakeholder feedback, and performance evaluations.

Fostering a culture of continuous improvement, innovation, and adaptation is essential for RVSKVV to remain responsive to emerging trends, technologies, and challenges in the agricultural sector. Following strategy explains the way the institute can promote continuous improvement and adaptation:

1. **Promote a Culture of Continuous Learning:** Encourage faculty, staff, and students to embrace a mindset of lifelong learning and professional development. Provide opportunities for training, workshops, seminars, and conferences to stay updated on the latest advancements and best practices in agricultural sciences.
2. **Encourage Innovation and Creativity:** Create an environment that values innovation, creativity, and experimentation. Encourage faculty, researchers, and students to explore new ideas, approaches, and technologies to address agricultural challenges and opportunities.
3. **Support Research and Development:** Invest in research and development initiatives that drive innovation and technological advancement in agriculture. Provide funding, infrastructure, and support for research projects that have the potential to generate new knowledge, products, and technologies.
4. **Foster Collaboration and Knowledge Sharing:** Encourage interdisciplinary collaboration and knowledge sharing among faculty, researchers, students, and external stakeholders. Facilitate partnerships, networks, and collaborative projects that enable the exchange of ideas, expertise, and resources.
5. **Regular Review and Evaluation:** Establish processes for regular review and evaluation of institutional plans, policies, and programs. Monitor key performance indicators, collect feedback from stakeholders, and conduct performance evaluations to assess

effectiveness, identify areas for improvement, and make data-driven decisions.

6. **Adaptability to Change:** Build organizational resilience and adaptability to respond effectively to changing internal and external dynamics. Anticipate and proactively address emerging trends, challenges, and opportunities in the agricultural sector through strategic planning, scenario analysis, and risk management.
7. **Feedback Mechanisms:** Create mechanisms for soliciting feedback from stakeholders, including faculty, staff, students, alumni, and external partners. Encourage open communication, constructive feedback, and dialogue to foster continuous improvement and adaptation.
8. **Update Institutional Plans:** Regularly review and update the institutional perspective plan in response to changing circumstances, stakeholder feedback, and performance evaluations. Ensure that strategic goals and objectives remain relevant, achievable, and aligned with the institution's mission and vision.

By fostering a culture of continuous improvement, innovation, and adaptation, RVSKVV can position itself as a dynamic and forward-thinking institution that remains at the forefront of agricultural education, research, and extension services. This proactive approach enables the institution to effectively navigate changes and challenges in the agricultural sector while maximizing its impact and relevance.

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Short Term Perspective Plan

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA

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Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

Short Term Perspective Plan

1. **Research Focus:** Outline specific research areas and projects that the **Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior** University aims to focus on in the short term. This could involve agricultural innovation, crop improvement, sustainable farming practices, etc.

2. **Infrastructure Development**: Identify infrastructure needs and plans for development, such as upgrading laboratories, establishing new research centers, improving farm facilities, etc.

3. **Academic Programs**: Review and potentially revise existing academic programs as per NEP 2020 to ensure they remain relevant and meet the needs of students and the agricultural industry. This might involve introducing new courses, updating curriculum, or offering specialized training programs.

4. **Collaborations and Partnerships**: Strengthen ties with other institutions, government agencies, industry partners, and international organizations to facilitate knowledge exchange, joint research projects, and funding opportunities.

5. **Extension Services**: Enhance outreach activities to disseminate research findings and provide technical assistance to farmers and rural communities. This could involve organizing workshops, training sessions, field demonstrations, and developing extension materials.

6. **Student Support and Development**: Implement initiatives to support student success, such as scholarships, internships, career counseling, and extracurricular activities.

7. **Technology Adoption**: Promote the adoption of technology and innovation in agriculture through demonstration farms, technology transfer programs, and capacity building initiatives.

8. **Sustainability Initiatives**: Integrate sustainability principles into research, teaching, and campus operations, with a focus on environmental stewardship, resource conservation, and resilience to climate change.

9. **Quality Assurance**: Implement mechanisms to ensure the quality of education, research, and extension services offered by the university, including monitoring and evaluation systems, accreditation processes, and continuous improvement efforts.

10. **Financial Planning**: Develop a budget and fundraising strategy to support the implementation of the institutional plan, including securing grants, attracting donations, and optimizing resource allocation.

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior
Short Term Perspective Plan

a) **Research Focus:**

Crop Improvement and Breeding Programs:

- Develop high-yielding and climate-resilient crop varieties suitable for the agro-climatic conditions of the region.
- Utilize modern biotechnological tools such as marker-assisted selection and genetic engineering to accelerate the breeding process.
- Incorporate traits such as drought tolerance, pest and disease resistance, and nutritional enhancement into crop varieties.

Soil Health and Management:

- Study soil fertility levels, nutrient dynamics, and soil health indicators in different cropping systems.
- Develop integrated soil fertility management strategies to optimize nutrient use efficiency and minimize environmental degradation.
- Investigate the impact of organic and natural farming practices, cover cropping, and conservation agriculture on soil health and productivity.

Water Management and Irrigation Efficiency:

- Evaluate water-saving irrigation technologies such as drip irrigation, sprinkler systems, and precision agriculture techniques.
- Assess the performance of water harvesting structures, including farm ponds, check dams, and rooftop rainwater harvesting systems.
- Conduct research on crop water requirements, scheduling techniques, and water-use efficiency in diverse cropping systems.

Sustainable Farming Practices:

- Promote agro-ecological approaches to pest and disease management, including integrated pest management (IPM) and bio-control methods.
- Explore the potential of organic farming, agro-forestry, and mixed cropping systems for enhancing farm resilience and biodiversity conservation.
- Investigate the socio-economic impacts of sustainable agriculture practices on farm income, livelihoods, and rural development.

Climate Change Adaptation and Mitigation:

- Assess the vulnerability of agricultural systems to climate change impacts such as temperature extremes, erratic rainfall, and increased pest pressure.
- Develop adaptation strategies for crop diversification, crop-livestock integration, and resilient farming practices.
- Explore options for carbon sequestration, agro-forestry, and renewable energy integration to mitigate greenhouse gas emissions from agriculture.

Value Addition and Post-Harvest Management:

- Explore value addition opportunities for agricultural produce through processing, packaging, and marketing innovations.
- Investigate post-harvest losses reduction techniques, storage technologies, and supply chain management strategies.
- Conduct market surveys and consumer preference studies to identify niche markets and value chain opportunities for farmers.

Extension and Farmer Empowerment:

- Strengthen extension services through capacity building programs, farmer field schools, and mobile advisory services.

- Facilitate knowledge exchange and technology transfer through farmer participatory research and demonstration plots.
- Empower women and youth in agriculture through skill development, entrepreneurship training, and gender-inclusive extension approaches.

These research areas and projects align with the overarching goals of advancing agricultural innovation, improving farm productivity, and promoting sustainability in the region served by RVSKVV, Gwalior.

b) **Infrastructure Development**

Laboratory Upgrades and Modernization:

- Upgrade existing laboratories to ensure they are equipped with state-of-the-art equipment and facilities.
- Invest in advanced instrumentation for molecular biology, genetics, soil science, plant pathology, and biotechnology research.
- Establish specialized laboratories for emerging research areas such as precision agriculture, remote sensing, and bioinformatics.

Research Center Expansion and Establishment:

- Expand existing research centers to accommodate growing research activities and multidisciplinary collaborations.
- Establish new research centers focused on priority areas such as climate resilience, agribusiness development, and rural innovation.
- Develop interdisciplinary research hubs to foster collaboration between scientists from different departments and institutions.

Farm Facilities Improvement:

- Upgrade farm infrastructure including irrigation systems, drainage networks, and farm machinery to enhance operational efficiency.
- Establish model farms showcasing best practices in crop production, livestock management, and natural resource conservation.
- Develop experimental fields for field trials, demonstration plots, and on-farm research trials to validate research findings in real-world conditions.

Greenhouse and Nursery Facilities:

- Expand greenhouse facilities for controlled environment research, plant breeding, and seedling production.
- Establish nurseries for raising high-quality planting material of horticultural crops, forestry species, and medicinal plants.
- Invest in climate-controlled facilities for germplasm conservation, tissue culture, and plant propagation activities.

Library and Information Technology Infrastructure:

- Modernize the university library with digital resources, online databases, and e-journals to support research and teaching activities.
- Upgrade IT infrastructure including computer labs, internet connectivity, and campus-wide network systems.
- Provide access to remote sensing and GIS facilities for spatial analysis, land use planning, and natural resource management.

Student Amenities and Accommodation:

- Expand student housing facilities to accommodate the growing student population and ensure comfortable living conditions.
- Improve recreational facilities, dining halls, and student support services to enhance the overall campus experience.
- Establish innovation and entrepreneurship centers to foster creativity, collaboration, and entrepreneurial mindset among students.

Extension Service Centers:

- Strengthen extension service centers located in rural areas to facilitate technology transfer, farmer training, and advisory services.
- Equip extension centers with demonstration farms, training halls, and multimedia resources for effective outreach activities.
- Collaborate with government agencies, NGOs, and private sector partners to establish Farmer Producer Organizations (FPOs) and market linkages for smallholder farmers.

Infrastructure for Gender and Social Inclusion:

- Strengthen gender-friendly facilities including women's hostels, daycare centers, and sanitary hygiene amenities.
- Strengthen inclusive infrastructure for persons with disabilities, including accessible buildings, ramps, and assistive technologies.
- Promote social inclusion through community engagement centers, outreach programs, and skill development initiatives targeting marginalized groups.

By addressing these infrastructure needs and implementing these development projects, RVSKVV, Gwalior can create a conducive environment for cutting-edge research, innovative teaching, and impactful extension services in the agricultural sector.

c) Academic Programs

Curriculum Alignment with NEP 2020:

- Conduct a comprehensive review of existing academic programs to assess their alignment with the key principles and objectives of NEP 2020.
- Identify areas where the curriculum can be updated or revised to incorporate interdisciplinary learning, skill development, and experiential learning opportunities.

- Ensure that the curriculum emphasizes critical thinking, creativity, problem-solving skills, and practical application of knowledge in real-world contexts.

- **Introduction of Multidisciplinary Courses**:
  - Introduce multidisciplinary courses that integrate agricultural sciences with other relevant disciplines such as economics, environmental studies, data science, and entrepreneurship.
  - Offer elective courses and minors that allow students to explore diverse interests and customize their academic experience according to their career aspirations.
  - Foster collaboration between different departments and faculties to design and deliver interdisciplinary modules that address contemporary challenges in agriculture and allied sectors.
- **Skill Development and Entrepreneurship Training**:
  - Incorporate skill development modules focused on agri-preneurship, agribusiness management, marketing, financial literacy, and rural leadership.
  - Provide hands-on training, industry internships, and experiential learning opportunities to equip students with practical skills and industry-relevant competencies.
  - Collaborate with industry partners, startup incubators, and agricultural extension agencies to facilitate mentorship, networking, and access to resources for aspiring entrepreneurs.
- **Technology-Enabled Learning**:
  - Integrate technology-enabled learning tools and digital resources into the curriculum to enhance engagement, accessibility, and flexibility for students.
  - Offer online courses, virtual labs, and multimedia materials that complement traditional classroom instruction and facilitate self-paced learning.

- Train faculty members in instructional design, online pedagogy, and educational technology to ensure effective delivery of online and blended learning experiences.

Research-Informed Teaching Practices:

- Promote a culture of research-informed teaching by encouraging faculty members to integrate their research findings and scholarly expertise into the curriculum.
- Facilitate faculty development programs, research sabbaticals, and collaborative research projects that enhance teaching effectiveness and student learning outcomes.
- Establish mechanisms for continuous feedback, assessment, and improvement of teaching practices based on student evaluations, peer reviews, and learning analytics data.

Flexible and Modular Learning Pathways:

- Offer flexible learning pathways such as credit-based systems, modular courses, and stackable credentials that allow students to pursue education at their own pace and convenience.
- Implement mechanisms for credit transfer, recognition of prior learning, and lifelong learning opportunities to accommodate diverse learner needs and career trajectories.
- Provide academic counseling, career guidance, and mentorship support to help students navigate their educational journey and make informed decisions about their academic and professional goals.

By implementing these initiatives, RVSKVV, Gwalior can enhance the quality, relevance, and effectiveness of its academic programs in alignment with the goals and priorities of NEP 2020, thereby better equipping students to meet the evolving needs of the agricultural industry and contribute to sustainable rural development.

d) Collaborations and Partnerships:

Identification of Potential Collaborators:

- Conduct a comprehensive assessment to identify potential collaborators, including other academic institutions,

government agencies, industry partners, and international organizations, with expertise and resources complementary to RVSKVV's focus areas.

- Prioritize partners based on mutual interests, strategic goals, geographical proximity, and existing networks.

Establishment of Dual/Joint Degree Programs:

- Explore opportunities to establish dual/joint degree programs with reputed national and international universities that offer complementary strengths in agricultural sciences, technology, business management, and related disciplines.
- Develop collaborative curriculum frameworks, credit transfer mechanisms, and student exchange protocols to facilitate seamless integration of academic programs and enhance learning opportunities for students.

Faculty Exchange and Adjunct Faculty Appointments:

- Facilitate faculty exchange programs with partner institutions to promote knowledge sharing, cross-cultural learning, and professional development opportunities for faculty members.
- Invite renowned scholars, experts, and industry practitioners as adjunct faculty members to enrich teaching, research, and mentoring activities at RVSKVV.
- Establish visiting professorships, research fellowships, and short-term appointments to attract external expertise and foster interdisciplinary collaborations.

Knowledge Exchange Platforms:

- Create platforms for knowledge exchange, including seminars, workshops, conferences, and symposia, to facilitate dialogue, collaboration, and dissemination of research findings among academia, government, industry, and civil society stakeholders.

- Organize thematic roundtables, expert panels, and networking events to address emerging challenges, share best practices, and catalyze innovation in agriculture and rural development.

Joint Research Projects and Consortia:

- Form consortia and research alliances with partner institutions to undertake collaborative research projects on priority themes such as crop improvement, sustainable farming practices, climate change adaptation, and agribusiness development.
- Foster interdisciplinary research teams comprising experts from diverse disciplines, including agronomy, genetics, economics, engineering, and social sciences, to address complex agricultural and environmental challenges.
- Seek funding support from government grants, industry sponsorships, and international funding agencies to support joint research initiatives and leverage resources for maximum impact.

Industry Partnerships and Technology Transfer:

- Forge strategic partnerships with agribusinesses, agri-startups, and agricultural input providers to facilitate technology transfer, commercialization of research outcomes, and market-driven innovation.
- Collaborate with industry partners to co-develop and pilot-test innovative technologies, farm machinery, precision agriculture tools, and value-added agri-products that address specific needs and preferences of farmers and agribusinesses.
- Establish technology transfer offices, incubation centers, and innovation hubs to facilitate industry-academia linkages, technology licensing, and commercialization pathways for agricultural innovations.

International Collaborations and Global Engagement:

- Strengthen international collaborations and global engagement through partnerships with foreign universities, research institutes, bilateral agencies, and multilateral organizations.
- Participate in international research networks, consortiums, and collaborative projects to access global expertise, funding opportunities, and cutting-edge technologies.
- Promote cross-border student mobility, joint research publications, and cross-cultural exchange programs to foster global citizenship, intercultural understanding, and internationalization of higher education.

By implementing these strategies, RVSKVV, Gwalior can enhance its capacity for innovation, knowledge creation, and societal impact through strategic collaborations and partnerships with diverse stakeholders across the academic, governmental, industrial, and international spheres

e) Extension Services:

Needs Assessment and Target Audience Identification:

- Conduct a needs assessment to identify the specific requirements and challenges faced by farmers and rural communities in the region.
- Segment the target audience based on factors such as cropping patterns, agro-climatic zones, socio-economic status, and gender considerations.

Capacity Building and Training Programs:

- Organize regular workshops, training sessions, and capacity-building programs on topics relevant to agriculture, horticulture, animal husbandry, and allied sectors.
- Offer hands-on training in modern farming techniques, sustainable agricultural practices, pest and disease management, organic farming, and value addition.
- Collaborate with agricultural experts, extension specialists, and industry professionals to deliver high-quality training programs tailored to the needs of different target groups.

Field Demonstrations and Technology Showcases:

- Conduct on-farm demonstrations and technology showcases to introduce farmers to innovative agricultural technologies, improved crop varieties, and best management practices.
- Establish model farms, demonstration plots, and farmer field schools to serve as learning platforms for showcasing successful agricultural interventions and adoption pathways.
- Provide technical support, input subsidies, and post-demonstration follow-up to ensure successful adoption and scaling-up of demonstrated technologies by farmers.

Development of Extension Materials:

- Develop extension materials such as pamphlets, brochures, fact sheets, posters, and audio-visual aids to communicate research findings, technical recommendations, and good agricultural practices to farmers.
- Utilize multimedia platforms, including mobile apps, webinars, podcasts, and social media channels, to disseminate extension materials and engage with a wider audience.
- Translate extension materials into local languages and dialects to enhance accessibility and understanding among diverse rural communities.

Farm Advisory Services and Help lines:

- Establish farm advisory services and help lines staffed by agricultural experts, extension officers, and trained volunteers to provide personalized advice, troubleshooting support, and real-time solutions to farmers' queries.
- Implement toll-free help lines, SMS-based information services, and interactive voice response (IVR) systems to facilitate easy access to agricultural information and advisory services for farmers.

Partnerships with NGOs, Self-Help Groups, and Community Organizations:

- Forge partnerships with non-governmental organizations (NGOs), self-help groups (SHGs), and community-based organizations

(CBOs) to extend the reach of extension services and grassroots-level mobilization.

- Collaborate with women's groups, youth clubs, and farmer cooperatives to empower marginalized groups, promote gender equality, and foster community-led initiatives for sustainable rural development.

Monitoring and Evaluation Mechanisms:

- Establish monitoring and evaluation mechanisms to track the effectiveness, reach, and impact of extension services and outreach activities.
- Conduct regular surveys, feedback sessions, and participatory assessments to gather feedback from stakeholders, assess knowledge uptake, and measure behavior change outcomes.
- Use data-driven insights and performance indicators to continuously improve extension strategies, refine communication approaches, and prioritize interventions based on evidence-based results.

By implementing these strategies, RVSKVV, Gwalior can enhance its extension services, strengthen linkages between research and practice, and empower farmers and rural communities with the knowledge, skills, and resources needed to improve agricultural productivity, livelihoods, and well-being.

f) Student Support and Development:

Scholarship Programs:

- Establish merit-based and need-based scholarship programs to support academically talented and financially disadvantaged students.
- Collaborate with government agencies, corporate sponsors, alumni associations, and philanthropic organizations to fund scholarships and financial aid packages.
- Provide scholarships for students pursuing undergraduate, postgraduate, and doctoral degrees in agricultural sciences, agribusiness management, and related fields.

Internship Opportunities:

- Facilitate internship placements for students in agricultural enterprises, research institutes, government agencies, non-profit organizations, and agribusiness firms.
- Establish formal partnerships with industry partners to offer internship opportunities that provide hands-on experience, industry exposure, and professional networking opportunities.
- Coordinate with faculty mentors and industry supervisors to monitor and evaluate students' internship experiences and ensure alignment with learning objectives and career goals.

Career Counseling and Placement Services:

- Offer comprehensive career counseling services to help students explore career options, develop career goals, and make informed decisions about their academic and professional pathways.
- Organize career fairs, job expos, and networking events to connect students with potential employers, recruiters, and industry professionals.
- Provide resume writing workshops, mock interviews, and soft skills training sessions to enhance students' employability and prepare them for the job market.

Extracurricular Activities and Student Organizations:

- Promote extracurricular activities such as sports clubs, cultural societies, student associations, and volunteer groups to foster holistic development, leadership skills, and social engagement among students.
- Encourage student participation in competitions, conferences, seminars, hackathons, and innovation challenges related to agriculture, entrepreneurship, and sustainable development.
- Support the establishment and functioning of student-led initiatives, clubs, and organizations focused on specific interests such as sustainability, community service, youth empowerment, and rural development.

Mentorship Programs:

- Pair students with faculty mentors, alumni mentors, industry professionals, and community leaders to provide guidance, advice, and support throughout their academic journey and career development.
- Organize mentorship circles, peer mentoring groups, and alumni networking events to facilitate knowledge sharing, networking, and professional development opportunities for students.
- Offer mentor training workshops and resources to equip mentors with the skills, tools, and resources needed to support students effectively and promote their personal and professional growth.

Wellness and Support Services:

- Provide holistic support services for students' physical, mental, and emotional well-being, including counseling services, health clinics, wellness programs, and stress management workshops.
- Raise awareness about mental health issues, resilience-building strategies, and self-care practices through awareness campaigns, educational workshops, and peer support initiatives.
- Establish student support centers, helplines, and online resources to provide confidential support, crisis intervention, and referral services for students facing personal or academic challenges.

By implementing these initiatives, RVSKVV, Gwalior can create a supportive and empowering environment that nurtures student success, enhances their employability, and prepares them to become future leaders and change-makers in the field of agriculture and allied sectors.

g) Technology Adoption:

Demonstration Farms and Field Trials:

- Establish demonstration farms and model plots showcasing innovative agricultural technologies, sustainable farming practices, and climate-resilient crop varieties.
- Conduct field trials and on-farm demonstrations to evaluate the performance and efficacy of new technologies, crop management practices, and agri-inputs in real-world conditions.
- Organize field days, farmer field schools, and extension events to facilitate farmer participation, hands-on learning, and knowledge exchange.

Technology Transfer Programs:

- Develop technology transfer programs to disseminate research findings, best practices, and proven technologies to farmers, extension agents, and agricultural stakeholders.
- Collaborate with agricultural extension agencies, development organizations, and agribusiness firms to facilitate technology diffusion, adoption, and scaling-up across rural communities.
- Utilize extension networks, farmer cooperatives, and community-based organizations as intermediaries to bridge the gap between research institutions and end-users.

Capacity Building Initiatives:

- Offer training programs, workshops, and capacity-building initiatives to enhance farmers' and extension agents' skills, knowledge, and competencies in utilizing modern agricultural technologies.
- Provide hands-on training in precision agriculture, digital farming tools, remote sensing, GIS, farm mechanization, and post-harvest technologies to improve productivity and efficiency.
- Incorporate experiential learning, farmer-to-farmer extension, and participatory approaches to empower farmers as active partners in technology adoption and innovation diffusion.

ICT Solutions and Digital Platforms:

- Leverage Information and Communication Technology (ICT) solutions, mobile applications, and digital platforms to deliver agricultural advisory services, weather forecasts, market information, and e-extension services to farmers.
- Develop custom-tailored digital tools and decision support systems for crop management, pest and disease diagnosis, soil health monitoring, and farm planning based on local agro-ecological conditions.
- Collaborate with telecom providers, IT firms, and startups to develop user-friendly, locally relevant, and language-specific digital solutions accessible to farmers even in remote areas.

Farm Mechanization and Automation:

- Promote farm mechanization and automation technologies to reduce labor dependency, enhance productivity, and improve farm efficiency.
- Facilitate access to affordable and appropriate farm machinery, equipment, and precision agriculture tools through rental services, cooperative ownership models, and subsidy schemes.
- Provide training on machinery operation, maintenance, and safety practices to farmers and service providers to ensure proper utilization and sustainable management of farm mechanization technologies.

Innovation Hubs and Agri-Tech Incubators:

- Establish innovation hubs, agri-tech incubators, and technology parks to foster collaboration, entrepreneurship, and innovation in the agricultural sector.
- Support agri-startups, technology entrepreneurs, and research commercialization ventures through mentorship, seed funding, and access to infrastructure, networks, and business development services.
- Facilitate technology scouting, validation, and scaling-up of promising innovations that address specific challenges and opportunities in agriculture value chains.

By implementing these strategies, RVSKVV, Gwalior can accelerate the adoption of technology and innovation in agriculture, empower farmers with tools and knowledge to enhance their livelihoods and resilience, and contribute to sustainable agricultural development in the region.

h) Sustainability Initiatives:

- **Research Initiatives**:
  - Prioritize research projects that address sustainability challenges in agriculture, including soil degradation, water scarcity, biodiversity loss, and climate change adaptation.
  - Foster interdisciplinary collaborations among researchers from diverse disciplines such as agronomy, ecology, economics, and social sciences to develop holistic solutions to complex sustainability issues.
  - Emphasize participatory research approaches that engage farmers, local communities, and stakeholders in co-designing and co-implementing sustainable agricultural practices and technologies.
- **Teaching and Curriculum Development**:
  - Integrate sustainability principles into the curriculum across all academic programs, including agriculture, horticulture, forestry, veterinary sciences, and agribusiness management.
  - Offer courses and modules on topics such as agroecology, sustainable crop management, organic farming, conservation agriculture, and ecosystem services.
  - Incorporate experiential learning opportunities, field-based projects, and case studies that highlight real-world sustainability challenges and solutions into teaching pedagogies.
- **Campus Operations and Infrastructure**:
  - Conduct a sustainability audit to assess the environmental footprint of campus operations, including energy

consumption, waste generation, water usage, and greenhouse gas emissions.

- Implement energy conservation measures, renewable energy installations, and green building practices to reduce the carbon footprint and promote energy efficiency on campus.
- Establish waste management systems, recycling programs, and composting facilities to minimize solid waste generation and promote circular economy principles.
- Promote water conservation and rainwater harvesting techniques to mitigate water scarcity and enhance water resource management on campus.

Biodiversity Conservation and Natural Resource Management:

- Designate green spaces, botanical gardens, and arboretums on campus to conserve native plant species, promote biodiversity, and create living laboratories for ecological research and education.
- Implement sustainable land use practices, such as agroforestry, riparian buffer zones, and wetland restoration, to protect soil fertility, prevent erosion, and enhance ecosystem resilience.
- Engage students, faculty, and staff in tree planting campaigns, habitat restoration projects, and citizen science initiatives to raise awareness about biodiversity conservation and ecosystem restoration.

Climate Resilience and Disaster Preparedness:

- Develop climate change adaptation strategies and resilience plans to mitigate the impacts of extreme weather events, such as droughts, floods, and storms, on campus infrastructure and agricultural systems.
- Incorporate climate-smart agriculture practices, such as drought-tolerant crop varieties, water-efficient irrigation

technologies, and agroforestry systems, into campus agricultural operations.

- Provide training and capacity-building programs on disaster preparedness, risk management, and emergency response for students, faculty, and staff to enhance campus resilience to climate-related hazards.

Community Engagement and Outreach:

- Forge partnerships with local communities, government agencies, NGOs, and civil society organizations to promote sustainability awareness, education, and action beyond the campus boundaries.
- Collaborate with farmers, extension agents, and rural cooperatives to disseminate sustainable farming practices, conservation techniques, and climate-smart technologies to rural communities.
- Organize outreach events, extension programs, and community workshops that empower stakeholders with the knowledge, skills, and resources needed to adopt sustainable lifestyles and livelihoods.

By implementing these sustainability initiatives, RVSKVV, Gwalior can demonstrate leadership in promoting environmental stewardship, resource conservation, and resilience to climate change, both within its campus operations and in the broader agricultural landscape it serves.

i) Quality assurance:

Establish Monitoring and Evaluation System: Develop robust monitoring and evaluation frameworks to track the performance of educational programs, research initiatives, and extension services. This could involve setting up key performance indicators (KPIs),

conducting regular assessments, and utilizing feedback mechanisms from stakeholders.

- **Accreditation Processes:** Pursue accreditation from reputable accreditation bodies to validate the quality of education, research, and extension services provided by RVSKVV. Compliance with accreditation standards ensures adherence to best practices and benchmarks in the field of agricultural education and research.
- **Continuous Improvement Efforts:** Foster a culture of continuous improvement by soliciting feedback from students, faculty, researchers, and stakeholders. Utilize feedback mechanisms to identify areas for enhancement and implement corrective measures accordingly. Encourage innovation and experimentation to stay abreast of emerging trends and advancements in agricultural sciences.
- **Faculty Development Programs:** Invest in faculty development programs to enhance the competencies of teaching and research staff. Provide opportunities for professional development, training workshops, and academic collaborations to ensure faculty members remain updated with the latest developments in their respective fields.
- **Student Support Services:** Implement comprehensive student support services to facilitate the academic and personal development of students. This may include mentoring programs, counseling services, career guidance, and opportunities for experiential learning and internships.
- **Research Excellence Centers:** Establish research excellence centers within RVSKVV to promote interdisciplinary research collaborations, attract funding, and address critical challenges facing the agricultural sector. Encourage faculty and students to engage in cutting-edge research projects with practical implications for agriculture and allied industries.
- **Industry Partnerships:** Forge strategic partnerships with industry stakeholders, government agencies, and non-profit organizations to enrich the educational experience, facilitate technology transfer, and

promote knowledge exchange. Collaborate on joint research projects, internship opportunities, and outreach programs to bridge the gap between academia and industry.

- **Community Engagement Initiatives:** Engage local communities through extension programs, outreach activities, and technology transfer initiatives. Empower farmers and rural communities with knowledge and skills to enhance agricultural productivity, sustainability, and resilience to climate change.

By implementing these strategies, RVSKVV can uphold its commitment to delivering high-quality education, conducting impactful research, and providing valuable extension services to address the evolving needs of the agricultural sector and contribute to socio-economic development.

j) Financial Planning:

- **Assessment of Financial Needs**: Conduct a thorough assessment of the financial requirements for executing the institutional plan, including costs associated with infrastructure development, faculty hiring, research projects, student scholarships, and operational expenses.
- **Budget Development**: Develop a detailed budget outlining projected income and expenses over a specific time frame (e.g., fiscal year). Ensure alignment with the strategic priorities outlined in the institutional plan. Allocate resources based on priority areas while maintaining financial sustainability.
- **Diversification of Revenue Sources**: Explore opportunities to diversify revenue sources beyond traditional funding streams. This may include:
  - **Grant Writing:** Identify funding opportunities from government agencies, private foundations, and international organizations. Develop grant proposals aligned with the research priorities and institutional objectives of RVSKVV.

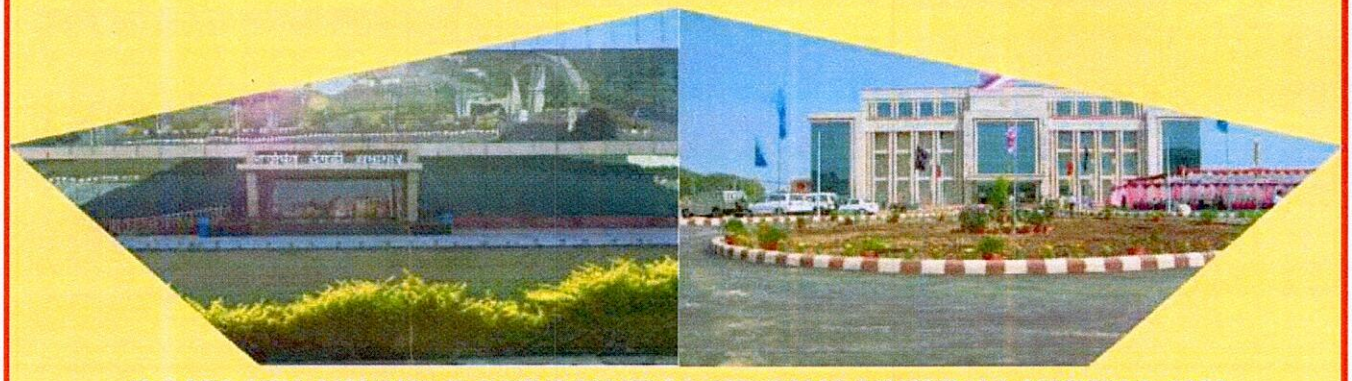
- **Corporate Sponsorships**: Cultivate relationships with corporate partners in the agricultural sector to secure sponsorships for research projects, events, and infrastructure development.
- **Alumni Engagement**: Strengthen ties with alumni through targeted fundraising campaigns, alumni events, and networking opportunities. Encourage alumni to contribute financially to support scholarships, research endowments, and infrastructure upgrades.
- **Philanthropic Donations**: Develop a donor cultivation strategy to attract philanthropic donations from individuals, families, and philanthropic organizations passionate about supporting agricultural education, research, and extension services.

- **Optimization of Resource Allocation**: Implement measures to optimize resource allocation and enhance operational efficiency. This may involve:
  - Prioritizing initiatives with the highest impact and alignment with institutional goals.
  - Conducting regular budget reviews and performance evaluations to identify areas for cost savings and reallocation of resources.
  - Exploring opportunities for collaborative resource sharing with other academic institutions, research centers, and industry partners.
- **Fundraising Events and Campaigns**: Organize fundraising events, campaigns, and awareness drives to engage stakeholders and generate financial support for RVSKVV. Utilize various platforms, including social media, alumni networks, and community outreach, to promote fundraising initiatives and mobilize support.
- **Stewardship and Donor Relations**: Establish robust stewardship practices to cultivate long-term relationships with donors and supporters. Acknowledge contributions, provide updates on the

impact of donations, and demonstrate transparency in financial management practices.

- **Monitoring and Reporting**: Develop mechanisms to monitor fundraising activities, track progress towards fundraising goals, and report outcomes to stakeholders. Regularly communicate with donors, grantors, and funding agencies to provide updates on the utilization of funds and the achievements of RVSKVV.

By implementing these strategies, RVSKVV can develop a sustainable financial plan to support the implementation of its institutional plan and advance its mission of excellence in agricultural education, research, and extension services.



RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA

RAJA PANCHAM SINGH MARG, GWALIOR-474002 (M.P.)

Vision – 2035

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWAVIDYALAYA,

GWALIOR 474 002, MADHYA PRADESH

Ram Naresh Yadav

RAJ BHAVAN
Bhopal - 462 052

PHONE : 0755-4080170
FAX : 0755-4080172

MESSAGE

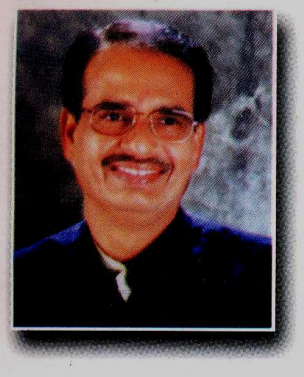
It is a matter of pleasure to know that the Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior has brought out the university's first vision document "Vision 2035" for publication.

I hope that the document will prove useful for the researchers, policy makers and stake holders to address the future challenges for growth and development of the agricultural sector and ensure the level of living of rural people, availability of sufficient food and income security with a human touch.

My best wishes.

Ram Naresh Yadav

(Ram Naresh Yadav)



Government of
Madhya Pradesh
Bhopal - 462 004

S.No. 265,
21 April, 2012

Shivraj Singh Chouhan
Chief Minister

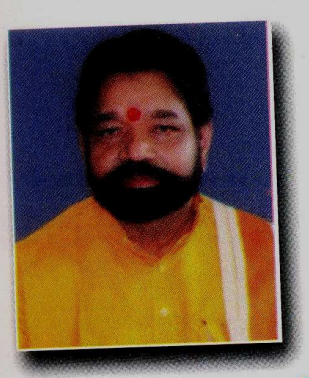
MESSAGE

I am happy to know that the Rajamata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior is publishing "Vision 2035" document propose strategies for the coming two decades.

Madhya Pradesh is privilged to have diverse agroclimatic conditions, soil types and socio-economic strata. I am sure that the document will prove a guide to scientists, policy makers and stakeholders inspiring them to design action plan for development of agriculture in the state. I record my appreciation for building the "Vision 2035".

Regards.

(Shivraj Singh Chouhan)



डॉ. रामकृष्ण कुसमरिया
मंत्री
किसान कल्याण एवं कृषि विकास
मध्य प्रदेश

मंत्रालय कक्ष क्रमांक . 543
दूरभाष : 0755–2441438 (मंत्रालय)
0755–2661299, 2661370 (नि.)
0755–2660516(फैक्स)
ई–मेल : minagri@mp.gov.in
निवास – बी–3, श्यामला हिल्स,
भोपाल (म.प्र.) 462002

पत्र क्रमांक 1149
भोपाल, दिनांक 20.04.2012

सन्देश

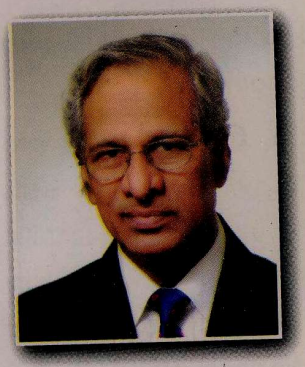
मुझे यह जानकर हार्दिक प्रशन्नता हो रही है कि राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर द्वारा एक दृष्टि 2035 नामक दस्तावेज उच्च कृषि शिक्षा अनुसंधान एवं कृषि विस्तार की रणनीति को दृष्टिगत रखते हुये तैयार किया जा रहा है। कृषि विकास की दिशा में यह एक अच्छा प्रयास है।

आशा करता हूँ कि यह दस्तावेज प्राकृतिक संसाधनों विशेष रूप से जल एवं भूमि के संरक्षण, सुरक्षा और कृषि उत्पादकता बढ़ाने की दृष्टि से उपयोगी साबित होगा।

शुभकामनाओं सहित।

आपका

(डॉ. रामकृष्ण कुसमरिया)



Prof. V. S. Tomar
Vice Chancellor

Foreword

It has been known since ancient times that agriculture is the backbone of the nation's economic growth and development. About 5200 years ago, (this fact) was highlighted in Shrimad Bhagwat Gita, Chapter-3, Verse-14 by Lord Krishna. It reads as follows:-

"अन्नाद्भवन्ति भूतानि पर्जन्यादन्न सम्भवः।
यज्ञाद्भवति पर्जन्यो यज्ञः कर्मसमुद्भवः।।

Mankind has been harnessing the natural resources without caring for their replenishment. This indiscretion has led to diverse problems. Therefore, it is the need of the hour to take care of these resources so that they may be able to support human civilization for all times to come.

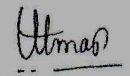
The State of Madhya Pradesh is endowed with high potential of agriculture owing to its diversified natural resources and crops. In spite of this, the agriculture in the State is at a critical stage. Stagnation in production of cereals, erratic behavior of monsoon, cost escalation of different inputs; lower farm income, continual degradation of natural resources and non-availability of quality seed and planting material are some of the hindrances or stumbling blocks which are responsible for the uneconomic scenario of agriculture sector in the State. The State has established two Agriculture and one Veterinary and Animal Husbandry

Universities to work in the realm of agriculture and allied sectors so that they may contribute immensely to the strengthening of the State's economy.

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior came into existence on August 19, 2008 as the second State Agriculture University. Its territorial jurisdiction spans over 25 districts located in 6 different agro-climatic zones. Although it is new yet it is growing fast and is known for imparting quality education, need-oriented research and farmers' participatory extension of technology in the field of agriculture and allied sciences. We encounter diversified problems in our targeted zones. The mission of the University is to explore new frontiers of science and technology and to develop human resources and policy guidance to create a vibrant, responsive and resilient agriculture in the State. "Making Agriculture A Profitable Business" in these zones is a big challenge to all of us.

Considering the needs, problems, potential and scope for agricultural development in the State, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior has brought out Vision-2035 a document which highlights the priority areas and outlines programmes that need to be initiated and strengthened with respect to infrastructure, HRD, education, research and extension perspective.

I am confident that "VISION-2035" will prove its worth with regards to conservation, preservation and protection of natural resources, particularly land and water together with and enhancing the productivity, profitability in agricultural sector and improving the level of living of rural people, producing well trained agriculture graduates and post graduates, simultaneously healthy ecosystems, especially in the State of Madhya Pradesh.



V. S. Tomar
Vice Chancellor

Preface

Dr. Y.M. Kool
Dean Faculty of Agriculture

India today is not only self-sufficient in grain production, but has a substantial reserve also. Agriculture in India is the means of livelihood of almost two thirds of the work force in the country. It employs nearly 62% of the country's total population and occupies 42% of its total geographical area. Agriculture, at present, is at a critical juncture. Stagnation of production in cereals, erratic behavior of climate, cost escalation of inputs, lower farm income, degradation and depletion of natural resources, inadequacy in the availability of quality seed and planting material, diversified market demands are some of the burning problems. The Vishwa Vidyalaya has geared up with research programmes to address some of these issues with the available manpower and resources using cutting-edge technologies like biotechnology and molecular biology, information and communication technology, physical sciences, nanotechnology, etc.

Ever since the establishment of Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya at Gwalior in the year 2008, concerted efforts are being made to improve the quality of agricultural research, education and extension. Its premier colleges, research stations and KVKs located in different parts of the State have served the State by developing appropriate technologies through basic, strategic and need-based research resulting in crop improvement and agricultural productivity. Organic farming is another issue which is engaging our attention.

In view of the changing national needs and the emergence of new problems, it has become essential to redefine goal in agriculture education, research and technology transfer strategies to capitalize emerging opportunities for the betterment of farming community in the State. Now-a-days, the greatest challenge

is to make agriculture a profitable business. Continuing support of GOI, ICAR, State government and coordinated efforts of staff and students of the University will be effective in the implementation of the programmes.

I am thankful to all the honourable members of Board of Management, RVSKVV, Gwalior, for their keen interest, guidance and support to elevate this University to new heights. I express my heartfelt gratitude to Dr. V.S. Tomar; founder Vice Chancellor for his leadership in initiating, guidance and inspiration in all the endeavours of the Vishwa Vidyalaya and in the preparation of the perspective plan. The Vishwa Vidyalaya is indebted to Dr. S. Ayyappan, Director General and all senior officers and staff of Indian Council of Agriculture, New Delhi, for their unceasing and valuable support. We express our gratitude to the Ministry of Agriculture and Agriculture Marketing Board for their cooperation. I am extremely thankful to Dr. H.S. Yadav, Director Research Services, Dr. Rajeev Saxena, Registrar, Dr. S.S. Tomar, Director Extension Services, Dr. A.M. Rajput, Director Instructions, all the Deans of the Colleges; Dr. B.S. Baghel, Dr. N.S. Tomar, Dr. Ashok Krishna, Dr. V.S. Gautam and Dr. P.P. Shastry. Thanks are due to Dr. H.B.S. Bhadauria, Dr. S.P.S. Tomar, Dr. A. Chatterjee, Shri. Y.M. Indapurkar, all Associate Director Research, Incharge Research Projects & Regional Research Stations, Programme Coordinators of Krishi Vigyan Kendra and all the staff members under RVSKVV, for providing necessary help. I also take this opportunity to appreciate Dr. R.A. Sharma, Ex-Dean, College of Agriculture, Indore, Dr. O.P. Joshi, I/C Ex- Director, Soybean Research (ICAR), Indore and Dr. S.P. Tiwari, Ex-Deputy Director General, ICAR, New Delhi for the consultations provided for this publication.

This perspective plan document (VISION-2035) has been prepared keeping in view the recent developments in international agriculture. We are sure that it will provide the framework for new priorities, new programmes, participatory mode of actions, and organizational adjustments for effectively addressing the new challenges before us and for ushering in an ever green revolution. There is a need to make agriculture a profitable enterprise so that it may help enhanced employment for rural youth and bring prosperity to farming community.

Dr. Y. M. Kool
Dean, Faculty of Agriculture

Preamble

The "Rajmata Vijayaraje Scindia Krishi.Vishwa Vidyaiaya", Gwalior was established by Govt. of Madhya Pradesh vide ordinance No.4 of 2008 notified in Extraordinary Gazette No. 507 dated 19 August 2008. As Per RVSKVV act (No.4, Year 2009), the territorial jurisdiction of RVS Krishi Vishwa Vidyalaya is spread over 25 districts of Madhya Pradesh encompassing six Colleges (four Agriculture, one Horticulture, one Veterinary Science and Animal Husbandry Colleges); five Zonal Agricultural Research Stations (ZARS); four Regional Agricultural Research Stations (RARS) and 19 Krishi Vigyan Kendras (KVKs) and 19 All India Coordinated Research Projects.

The University represents a well knitted and action oriented network of research and education Centres operating in agriculture and allied fields in the State. The overall climate varies from semi arid to sub-humid with hot summer, cool and dry winter and 600 - 1000 mm mean rainfall range. The geographical area of the state under the university jurisdiction contains three types of soils varying from alluvial to medium and heavy black soils and six agro-climatic zones.

RVSKVV has competent human resource for managing the activities of agriculture and allied sectors and playing a pivotal role in the growth and development of agriculture and live stock production in the state. Need based research and its dissemination to the peasantry will lead to all round improvement in productivity of crops, egg, milk and overall increase in the farm income on sustainable basis.

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Executive Summary

Established by Govt. of Madhya Pradesh on August 19, 2008 Madhya Pradesh (Ordinance No.4 of 2008 extraordinary Gazette No.507, dated 19th August 2008) and enacted as Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya Act, 2009 (Madhya Pradesh Act No.4 of 2009, dated 12th February 2009), the State Agriculture University (SAU), located in the city of Gwalior, Madhya Pradesh, with its four colleges of agriculture, one college of horticulture, five Zonal Agriculture Research Stations, four Regional Agriculture Research Stations, five sub stations, 23 All India Coordinated Research Projects, and 19 Krishi Vigyan Kendra's spread over 25 districts of its jurisdiction, covering 6 agro-climatic zones of the State. The university represents a well knit and action-oriented net work of research and education centers operating in agriculture and allied fields in the State. Vide notification no. 912-48-इक्कीस-अ-(प्रा.) is also empowered to award degrees as specified by the University Grant Commission (UGC) under section 22 of the UGC act 1956 through its main campus in regular mode with the approval of statutory bodies / councils, wherever required. The overall climate varies from semi arid to sub-humid with hot summer, cool and dry winter and 600 - 1000 mm mean rainfall. The geographical area of the State under the university jurisdiction consists of three types of soils varying from alluvial to medium and heavy black soils.

The mission of the university is to impart education in agriculture and allied sciences, research and extension activities for enhancing productivity, optimization of profit and sustainability of agricultural production systems and improving rural livelihood in the State of Madhya Pradesh. In order to realize the mission, the RVSKVV, Gwalior has the mandate to serve as a centre of higher education, research and technology dissemination in the field of agriculture and allied sciences, to conduct basic and strategic research and to undertake need-based research that leads to sustained crop productivity improvement. The vision of the university aims at steering the policies, strategies, priorities, programs and activities in order to meet the emerging challenges, utilizing opportunities and to play a leading role for the betterment of farming community in the State through quality and cost effective agricultural education, research and extension. The preset document "**Vision- 2035"** takes an overview of challenges and issues and presents a perspective plan.

RVSKVV, Gwalior although established in the year 2008 only, inherit teaching, research and extension establishments for about last over 50 years through its already established colleges

and research centres in different agro-climatic zones of the State which are now in the jurisdiction of this university. Some of the historical landmarks of the university include (i) the establishment of Central experimental farm, Gwalior (1916), Institute of Plant Industry, Indore (1924) and College of Agriculture, Gwalior (1950), (ii) first ever-aerobic technique of composting popularly known as Indore compost developed at Institute of Plant Industry (IPI), now College of Agriculture, Indore by Sir Albert Howard and Yashwant Wad (1931) and later appreciated by Mahatma Gandhi during his visit to IPI, Indore on April 23, 1935, (iii) systematic studies on cultivation and breeding of soybean during late 1960's that triggered the oil seed revolution in having miraculous impact on socio-economic status of farmers and edible-oil-sector in India, and (iv) Madhya Pradesh ranks first in pulses, second in oil seeds and third in cereal production due to adoption of improved crop varieties and matching package of practices developed at various centres of the university.

Through sustained efforts during the past few years this university has been applauded for a significant and far-reaching impact on agricultural education, research and extension. The University has several distinctive features in all the three programs. The notable achievements in education have been substantiated by students' placement in private and public sector organizations of national and international repute.

The major emphasis is being given to crop improvement for diversified farming and making agriculture a profitable business, standardization of potential cropping systems, natural resource management, integrated nutrient management, integrated pest management, nucleus and breeder seed production of major crops, conservation of plant biodiversity and domestication and conservation of medicinal and aromatic plants. The university renders various kinds of general services to improve the quality of education, carrying out research and transfer of technology with a view to enhancing the productivity and profitability of farming community in the region.

The significant contributions of constituent Colleges / Centres of the university are as below:

- First white rust fungal disease resistant variety of mustard, J. Mustard-1 at Morena.
- First variety of coloured cotton, Jawahar Coloured Cotton-1at Khandwa.
- Soybean variety JS 335 at Sehore.
- Technology for water management (watershed) for rain-fed areas and dry land farming at Indore.

Recently, the efforts of RVSKVV scientists have enabled the release of a number of improved varieties of different crops. Some of the improved varieties are gram (JG 6), pigeon pea (TJT 501), wheat (MP 1203), groundnut (JGN 23) and mustard (JM 4) we do hope to embark upon a new era of productivity of these crops in the State during coming years.

Major issues which the university intends to address in future include:

- Reorientation of agricultural education in changing scenario to improve the quality of education,
- Human resource development, including students and faculties,
- Technical strengthening of line departments,
- Sustainable utilization of natural resources with environmental protection,
- Rationalization of cropping system through crop substitution and crop diversification,
- Wasteland development,
- Micro irrigation techniques,
- Promotion of R&D activities in medicinal and aromatic plants,
- Modernizing commercial horticulture,
- Livestock and fodder improvement and management,
- Information technology- reaching the unreached,
- Intensification of KVKs activities,
- Women empowerment and employment oriented trainings,
- Enhancement of seed replacement rate,
- Value addition of farmers' produce,
- Utilization of biotechnological tools to improve plant/crop varieties,
- Soil health management for sustainable crop production,
- Harnessing ITK for developing low input sustainable agriculture (LISA),
- Addressing global warming issues,
- Dry land and rain-fed agriculture,
- Conservation agriculture,
- Precision farming,
- Protected agriculture,
- Bio-industrial agriculture,

- Integrated farming,
- Organic farming,

The main drivers of change and challenges are identified as the possible priority areas of future work for the university. Provision of high quality programs that responds to changing needs of the State and to expectations in higher education to strive for nationally recognized achievements consistent with university mission. Increasing, the production of agriculture and its contribution to economic growth and development, while ensuring sustainable ecosystem management and strategies for adoption to and mitigation of climate change. Planning and efforts are needed for eradicating food insecurity, nutrient deficiencies and unsafe food, in the face of, increasing food prices and high price volatility. Improving livelihood security of population living in rural areas, including small holder farmers (in particular women), in the context of urbanization and changing agrarian structure. The main challenges considering the needs, problems, potential and scope for agriculture development in the State, all the constituent units of the university would need to develop infrastructure, HRD, education, research and extension programs to achieve the goals of Vision 2035.

Agricultural Scenario

The contribution of agriculture to the nation's GDP is declining gradually; the present contribution is around 14 % only. By the year 2035, India's population is likely to be around 1.5 billion while contribution to overall employment is much less and is likely to reduce further considerably. Producing food to meet our future growing needs and to provide employment for buying food remain the key concerns of agriculture. Appropriate strategies are to be worked out to address the emerging issues like soil Stalinization, depleting ground water and its pollution (inclusive of arsenic hazard), nutrient imbalance, emergence of new pests and diseases and land, water and environmental degradation, etc. In the fragile and marginal environments including rain-fed areas, rising biotic pressure, lack of suitable soil management systems and inputs to realize the optimum potential of land have been threatening the sustainability of agriculture. To cope with the needs of reclamation of degraded land, loss of biodiversity, deforestation and diminishing farming efficiency to prevent reduction in productivity, increasing profitability and thereby the prosperity also, a need for an era of "evergreen revolution" is to usher in the coming years.

Madhya Pradesh is the State with large variability in crops, soils and environmental conditions. The various agro-climatic zones are Gird, Malwa plateau, Nimar valley, Vindhyan plateau, Jhabua hills and Bundelkhand zone. The State is rich in biodiversity and about 31 per cent of geographical area is under forests. Of the 50 districts, 23 are drought prone, indicating the need to address the problems encountered in rainfed agriculture on priority basis. The State Agriculture University "Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M. P.)" is responsible for agricultural education, research and extension in 25 revenue districts (Alirajpur, Ashok Nagar, Badwani, Bhind, Bhopal, Burhanpur, Datia, Dewas, Dhar, Guna, Gwalior, Indore, Jhabua, Khandwa, Khargone, Mandsaur, Morena, Neemuch, Rajgarh, Ratlam, Sehore, Shajapur, Sheopur, Shivpuri, Ujjain) of the State.

The State has been contributing significantly to the production of oil seeds and pulses the country being short of production in both and meets nearly 50% of the need through export/import. The productivity of oilseeds and pulses as well as of other rainfed crops is far below the realizable yield under real farm conditions.

The production technology along with the improved varieties is available to at least double the present national productivity of these crops. Special attention is needed to sustain productivity of these rainfed crops to sustain agriculture in the State.

Five agri - export zones were conceptualized for promoting agriculture in the country in order to fetch remunerative returns to the farming community by the Government of India in the State of Madhya Pradesh. Among the crops covered, except wheat and some seed spices, the remaining crops are rainfed. Focused attention on research needs of these crops to increase productivity with internationally acceptable quality produce will be in favour of national economy and in improving household income of growers. The details of various agri export zones are given as follows

Agri export zones in Madhya Pradesh

	AEZ project	**District**
1.	Potato, onion, garlic	Malwa (Ujjain, Indore, Dewas, Dhar, Shajapur, Ratlam, Neemuch and Mandsaur
2	Wheat (Duram)	Three distinct and conceptualized zones: Ujjain zone comprising of Neemuch, Ratlam, Mandsaur and Ujjain; Indore zone comprising of Indore, Dhar, Shajapur and Dewas and Bhopal zone comprising of Sehore, Vidisha, Raisen, Hoshangabad, Harda, Narasingpur and Bhopal
3.	Seed spices	Districts of Guna, Mandsaur, Ujjain, Rajgarh, Ratlam, Shajapur and Neemuch
4.	Lentil and gram	Shivpuri, Guna, Vidisha, Raisen, Hoshangabad, Harda, Narasinghpur and Chhindwara
5.	Oranges	Chhindwara, Hoshangabad and Betul

Source: Agri Export Zones – The Concept. Agri-Export Advantage XIV(IV): 8-10

For efficient and sustainable agriculture, it is imperative to shift from a commodity centered approach to farming system approach. This calls for a multidisciplinary effort. Further, the challenge is not only to offer solution to raise production but also to offer these within a time

frame. This paradigm shift will call for designing new production systems aligned fully with carrying capacity of natural resources endemic to a region. This will require emphasis on efficiency, sustainability, diversification, post harvest management, small farm mechanization, marketing and trade. Such an approach requires forging linkages at regional, national and international levels. In order to infuse these new approaches of working, present research set up will have to be empowered to plan and execute their research. Major changes are needed in the HRD programs to train more manpower in frontier areas and reorient education to develop entrepreneurship. Innovative approaches will have to be adopted to upgrade skills of the farmers and technological empowerment of women engaged in agriculture. Harnessing complimentary and synergies through strong linkages required within institutions / agencies at national and international levels in public, cooperative and private sectors.

Organizational, structural and procedural changes in the institutions devoted to agricultural growth and development are required to address the above referred challenges. This would call for emphasis on prioritization, monitoring and evaluation, performance-oriented personnel policies, adequate financial support, modernization, use of informatics and function empowerment of scientists. These demands for a flexible, responsive and autonomous research system with world trade agreement having brought global perspective to agriculture. It is imperative that research will also need to reorient its focus, besides others, on food quality, consumer preferences, environmental concerns and intellectual property rights.

Location of RVSKVV, Madhaya Pradesh, India

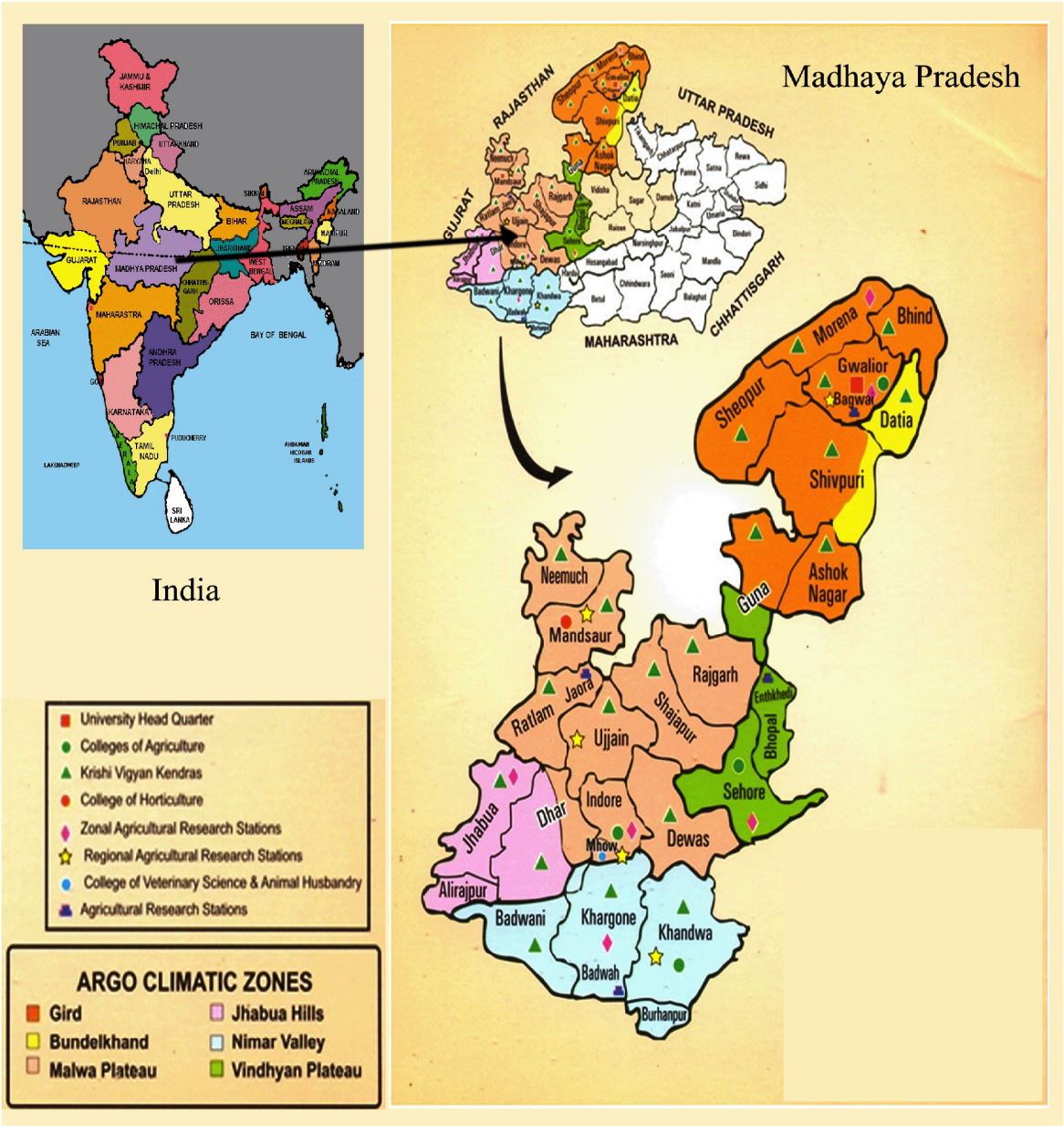

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Fig. :.....

Constituent Colleges of Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.)

College of Agriculture, Gwalior (Estd. 1950)	
College of Agriculture, Sehore (Estd. 1952)	
College of Agriculture, Indore (Estd. 1959)	
College of Agriculture, Khandwa (Estd. 1986)	
College of Horticulture, Mandsaur 2002 (College of Agriculture in 1987 -2001)	

Education, Research and Extension System

RVSKVV is one of the stake holders in National Agricultural Research System (NARS) contributing significantly to promote agriculture in the country, particularly in the State of Madhya Pradesh.

Mandate

To comprehend the mission laid down by the Vishwa Vidyalaya, i.e., to discover new frontiers of science and knowledge, to build up human resources and policy guidance to create a vibrant, responsive and resilient agriculture, the mandate of the institute is as flowing follows:

- to serve as a centre of higher education and research in the field of agriculture and allied sciences, and as an educational hub for developing academic excellence and expertise in agricultural sciences;
- to disseminate technology to farmers, extension personnel and organizations engaged in agricultural development through various extension programs;
- to conduct need-based basic and strategic research that leads to ecologically sound and economically viable crop improvement for sustained agricultural productivity with an additional focus on value addition;
- to serve as a referral point at the State level by providing proficient direction and guidance for agricultural education, research, extension, and technology appraisal and transfer through need based and target oriented innovative approaches and models;
- basic and strategic research on conservation and efficient utilization of natural resources;
- to develop an exhaustive repository of crop germplasm and to ensure its utilization in basic, strategic and applied research;
- to facilitate transfer of research emanated technologies and to conduct impact analysis through socio-economic research;
- to maintain seed flow of improved varieties through breeder seed and quality seed production;
- to act as a repository of information on rain-fed agriculture in the State, provide leadership and co-ordinate network research within University and between the State Agricultural Universities for generating location-specific technologies for rain-fed areas;
- to act as a centre for training in research methodologies in the fields basic to management of rain-fed farming systems;
- to collaborate with relevant national and international agencies in achieving the above objectives;
- to provide consultancy;

The Rajmata Vijayaraje Krishi Vishwa Vidyalaya, although still in its infancy, is making all out efforts with renewed vigor to bring the agriculture in the State to the forefront in a sustainable way, and generating and disseminating improved technology in crop culture and animal productivity to provide livelihood security to the farmers. To achieve the objective of significantly contributing to national agricultural development, efforts are being made to develop linkages and to seek support from all the stake holders of production system. The linkage has been effective in finding out the bottle necks, addressing them and promoting agriculture in the State. In order to enable the youth to acquire deep knowledge and to understand the challenges posed by the prevailing circumstances while acquiring education may go a long way to direct Indian/State agriculture eco-friendly, sustainable and profitable.

Mission

To conduct education, research and extension activities for enhancing productivity, optimization of profit and sustainability of agricultural production systems and improving rural livelihood in the State of Madhya Pradesh

Focus

- On strengthening agricultural education by way of creating the required infrastructural facilities and improving the quality of education and its ramification to job/business oriented growth; On developing technology for conservation agriculture culminating in sustainability, profitability and environment friendly; On standardization and meticulous promotion of organic farming in selected areas to increase farm income and export earnings; On promotion of diversification (crop, variety, input, cultural management) in agriculture; On use of modern tools of science (Bio-technology and nano-technology) for advancing agricultural research, and ultimately leading to enhanced productivity through genetic enhancement or stress (biotic as well as a biotic) mitigation; On standardization/refinement of processing, preservation, packing techniques and value addition to processed products; On conservation of biodiversity, particularly that of aromatic and medicinal plants; On animal health and care; On promotion of farm mechanization to obtain high productivity and farm prosperity; On entrepreneurship development; On developing KVK as knowledge centre;

The Vishwa Vidyalaya has a system in place to provide agricultural education at various levels and competent staff to impart knowledge in traditional and emerging fields (bio-technology and nano-technology) and to pursue research in challenging fields in agriculture. The university presently has 5 different agriculture colleges that are listed here below.

Details of colleges under RVSKVV

S. No.	Name of college with location	Year of establishment	Degree programs offered
1.	College of Agriculture, Gwalior	1950	B.Sc. (Ag.) M.Sc. (Ag.) (1) Agronomy, (2) Entomology (3) Ext. Education (4) Fruit Science (5) Genetics & Plant Breeding (6) Plant Pathology (7) Soil Science & Agril. Chemistry (8) Agricultural Economics & F.M. Ph.D (1) Agronomy (2) Agricultural Economics & F.M. (3) Genetics & Plant Breeding (4) Soil Science & Agril. Chemistry (5) Ext. Education (6) Fruit Science (7) Entomology (8) Vegetable Science (9) Plant Pathology
2.	College of Agriculture, Indore	1959	B.Sc. (Ag.) M.Sc. (Ag.) (1) Agronomy (2) Entomology (3) Ext. Education (4) Vegetable Science (5) Genetics & Plant Breeding (6) Plant Pathology (7) Soil Science & Agril. Chemistry (8) Agricultural Economics & F.M.
3.	RAK College of Agriculture, Sehore	1952	B.Sc. (Ag.) M.Sc. (Ag.) (1) Agronomy (2) Entomology (3) Ext. Education (4) Vegetable Science (5) Genetics & Plant Breeding (6) Plant Pathology (7) Soil Science & Agril. Chemistry (8) Agricultural Economics & F.M.
4.	BM College of Agriculture, Khandwa	1986	B.Sc. (Ag.)
5.	KNK College of Horticulture, Mandsaur	2002 (1987-2001 as College of Agriculture)	B.Sc. (Hort.) M.Sc. (Hort.) (1) Fruit Science (2) Vegetable Science (3) Floriculture & Landscape Architecture (4) Plantation, Spices, Medicinal & Aromatic Crops

Apart from the administrative set up of the Vishwa Vidyalaya, the technical set up takes care of education, research and extension also At present, RVSKVV is offering bachelors and masters degree programs in agriculture, horticulture as different colleges, while doctoral degree program in Soil Science and Agricultural Chemistry, Agronomy, Fruit Science, Vegetable Science, Genetics Plant Breeding, Entomology, Plant Pathology, Extension Education and Agricultural economics & F.M. at Gwalior campus only.

The research work under various disciplines lays special emphasis on standardization of potential cropping systems, development of improved crop varieties, natural resource management, integrated approach on plant nutrient management/pest management, plant (including medicinal and aromatic plants), and animal biodiversity conservation, conservation agriculture, processing and value addition, and farm mechanization.

The various Zonal Agricultural Research Stations and Regional Agricultural Research Stations including Agricultural Research Stations and Farms are listed below.

Zonal Agriculture Research Station located in different agroclimatic zones:

1. Agricultural Research Station, Indore (College Campus)
2. Zonal Agricultural Research Station, Jhabua
3. Zonal Agricultural Research Station, Khargone
4. Zonal Agricultural Research Station, Morena
5. Zonal Agricultural Research Station, Sehore (College Campus)

Regional Agricultural Research Stations:

1. Regional Agricultural Research Station, Gwalior (College Campus)
2. Regional Agricultural Research Station, Khandwa (College Campus)
3. Regional Agricultural Research Station, Mandsaur (College Campus)
4. Regional Agricultural Research Station, Ujjain

Agricultural Research Stations:

1. Fruit Research Station, Entkhedi (Bhopal)
2. Agricultural Research Station, Bagwai (Gwalior)
3. Salt Affected Soils Agricultural Research Station, Badwaha (Khargone),
4. Horticultural Research Station, Jaora (Ratlam)

In addition, the RVSKVV is operating All India Coordinated Research Projects (AICRP) sponsored by the Indian Council of Agricultural Research (ICAR) as listed below. Substantial quantities of nucleus and breeder seed of important crop varieties is being produced by RVSKVV and supplied to continue seed production chain making quality certified seed available to farmers. The research out-come is becoming handy in promoting precision agriculture in the State of Madhya Pradesh.

S. No.	Name of Scheme/Project	Centre
	AICRP (All India Coordinated Research Project, Indian Council of Agricultural Research, New Delhi)	
1.	Arid Legumes (Guar)	Gwalior
2.	Pearl Millets	Gwalior
3.	Weed Control	Gwalior
4.	Wheat Improvement	Gwalior
5.	Cotton Improvement	Indore
6.	Cropping System Research	Indore
7.	Dryland Agriculture	Indore
8.	Dryland Agriculture Research (ORP)	Indore
9.	Oilseed (Safflower)	Indore
10.	Salt Affected Soils	Indore
11.	Sorghum improvement	Indore
12.	Maize	Jhabua
13.	Cotton Improvement	Khandwa
14.	Oilseed (Groundnut)	Khargone
15.	Pigeonpea	Khargone
16.	Opium Res ANIP on medicinal & aromatic plant	Mandsaur
17.	STF (Grape)	Mandsaur
18.	Oilseed (Rapeseed & Mustard)	Morena
19.	Water Management	Morena

20.	Chickpea	Sehore
21.	MULLARP	Sehore
22.	Pigeon pea (Sub Centre)	Sehore
23.	Soybean	Sehore

Extension being a State subject, the Vishwa Vidyalaya owns the responsibility to work hand in hand with the State Department of Agriculture, Madhya Pradesh in passing on the research emanated production technology and disseminating to the end users. The RVSKVV also helps in elevating the knowledge of farmers and keeping them abreast with latest technologies to enable them to move towards precision agriculture. Apart from developing skills in the educational program and the extension program , the Vishwa Vidyalaya is ably supported by active services like (i) integrated agro meteorological advisory, (ii) soil water and plant analysis, (iii) Kisan mobile sandesh and (iv) organization of Kisan Gosthis, field days, Kisan melas, various training programs, exposure visits, animal health camps and conducting on farm demonstration. To work out linkages between the research and end users and to refine the imparted technology, the following 19 KVKs are functional under the RVSKVV set up:-

List of Krishi Vigyan Kendra functional under the RVSKVV set up

1	Krishi Vigyan Kendra, Ashok Nagar
2	Krishi Vigyan Kendra, Badwani
3	Krishi Vigyan Kendra, Bhind
4	Krishi Vigyan Kendra, Datia
5	Krishi Vigyan Kendra, Dewas
6	Krishi Vigyan Kendra, Dhar
7	Krishi Vigyan Kendra, Guna (Aron)
8	Krishi Vigyan Kendra, Gwalior
9	Krishi Vigyan Kendra, Jhabua
10	Krishi Vigyan Kendra, Khandwa
11	Krishi Vigyan Kendra, Khargone
12	Krishi Vigyan Kendra, Mandsaur
13	Krishi Vigyan Kendra, Morena

14	Krishi Vigyan Kendra, Neemuch
15	Krishi Vigyan Kendra, Rajgarh
16	Krishi Vigyan Kendra, Shajapur
17	Krishi Vigyan Kendra, Sheopur (Baroda)
18	Krishi Vigyan Kendra, Shivpuri
19	Krishi Vigyan Kendra, Ujjain

Seed Village Scheme

To provide newly developed crop varieties and upgrade the quality of farmer - saved seed, financial assistance for distribution of foundation / certified seed at 50% cost of the seed for production of certified / quality seeds and training on seed production technology to farmers are being provided under this program. Total 300 farmers (each 0.5 areas) are benefitted in *Kharif* and *Rabi* season. The seed produced in these seed villages are preserved / stored till the next sowing season.

KVK News letter

Each KVK issues the News letters quarterly that highlights and circulates the latest news, techniques and methods available in agriculture and its allied sectors for the benefit of farmers at District level. It also includes the previews month's activities and planning for the next three months of the KVK.

Kisan Mobile Sandesh (KMS)

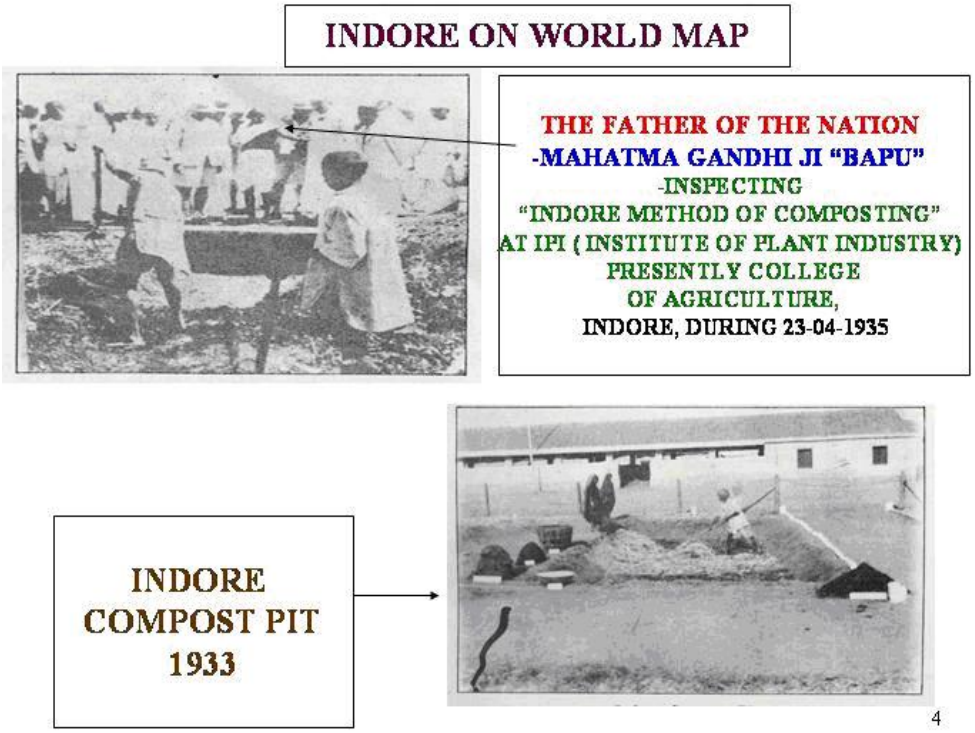
Introduction of Information and Communication Technology (ICT) in the field of agriculture has brought many changes in traditional methods of extension. It enables the dissemination of requisite information at the right time to the right people. This revolution in ICT has made access to the information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

Harnessing Science

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya is committed to delineate the problems of State agriculture and address them in addition to combat challenges emerging out, particularly by globalization of trade and experienced global climatic changes. This calls for strengthening the agricultural education to make competitive human resource available and systematic research on prioritized areas to resolve problems being encountered and to look for new avenues of global trade by developing improved varieties of crops and value addition to agri-products to promote export. At domestic front, continuous genetic enhancement of crop varieties, promotion of better storage, processing and packing, particularly of horti-products is needed. Dissemination of research emanated production technology and packages will continue to remain the future priority. A proactive action on education and research frontiers is the need of the hour and needs to be taken.

Historical Landmarks

- The establishments of Agriculture Farm, Gwalior (1919), Institute of Plant Industry, Indore (1924), College of Agriculture, Gwalior (1950) are the historical landmarks.
- First ever aerobic technique of composting popularly known as Indore compost was developed at Institute of Plant Industry (IPI), now College of Agriculture, Indore by Sir Albert Howard and Yashwant Wad (1931). It was appreciated by Mahatma Gandhi during his visit to IPI, Indore on April 23, 1935.
- Systematic studies on cultivation and breeding of soybean during late 1960s triggered the oilseed revolution. Its miraculous impact on socio-economic status of farmers and edible-oil-sector in India is a landmark.
- Madhya Pradesh ranks first in pulses, second in oil seeds and third in cereal production due to adoption of improved crop varieties and matching package of practices developed at research centers in the State.



Agricultural Education

Human resource development has been one of the primary responsibilities of the Vishwa Vidyalaya. The RVSKVV is offering Bachelors and Masters degree programs in agriculture and horticulture in its constituent colleges, while Doctoral degree program in Soil Science and Agricultural Chemistry, Agronomy, Genetics Plant breeding, Entomology, Plant Pathology, Extension Education, Agricultural Economics & F.M., Fruit Science and Vegetable Science is being offered at University head quarter at Gwalior campus only. In the academic year of 2011-12, a total of 1918 students (1401 boys and 517 girls) pursued their studies and there existed intake capacity of 671 (467 boys and 204 girls) in 2011-2012. With the future growth of RVSKVV in terms of essential subjects and newer proposed constituent colleges, adequate strengthening in terms of staff, infrastructure facilities, equipment, and educational aids will be the key to produce adequate number of qualified persons and in taking State agriculture to new heights. The constituent colleges although laying no stone unturned to impart quality education to the students; there is a need to strengthen the number of qualified staff as several new courses are awaiting initiation. Need-based upgradation of faculty is the bare necessity by way of their exposure/training in State of art laboratories/institutions in the country and abroad. RVSKVV

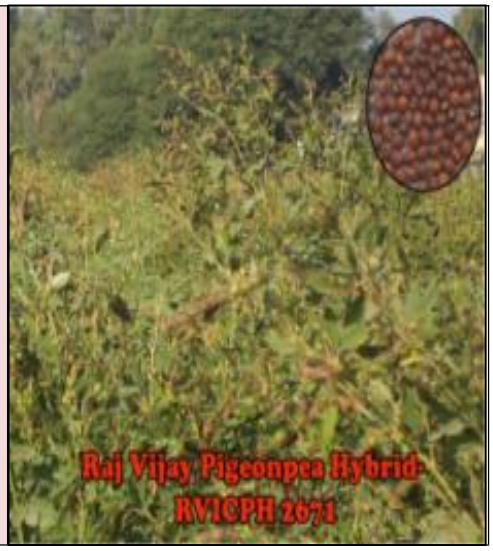
proposes to further develop strong linkages with leading organization in India and abroad for this purpose and plan provide opportunity to the teachers and researchers to avail the facility of upgrading their knowledge and skills through bilateral arrangements under MOUs with other countries. Conductance of regular summer/winter schools shall further add to this endeavour. The Vishwa Vidyalaya should initiate new degree programs in deficit areas like Forestry, Home Science, Agricultural Prosiess Management, Food Processing and Technology, Bachelor of Agri.Buisness Adminstration, etc.,

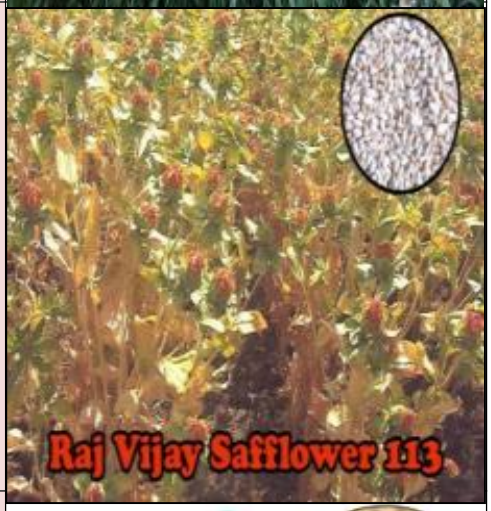
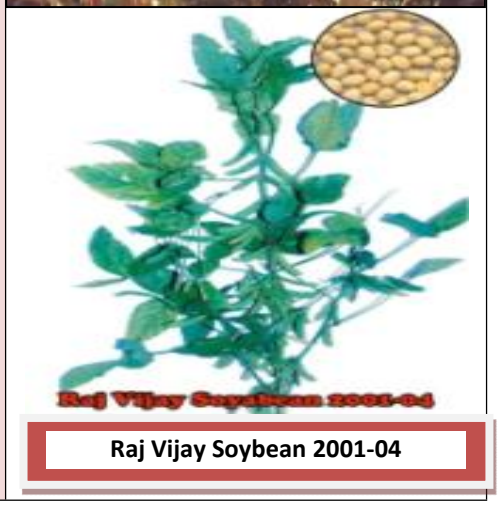
To cater to the education, research and extension needs of the area under the jurisdiction of the Vishwa Vidyalaya, (i) five new agricultural colleges for tribal regions of agro-climatic zones, (ii) College of Food Processing and Technology, (iii) College of Agricultural Engineering and Technology, (iv) College of Agri-business Management Studies are essentially needed and be initiated in a phased manner.

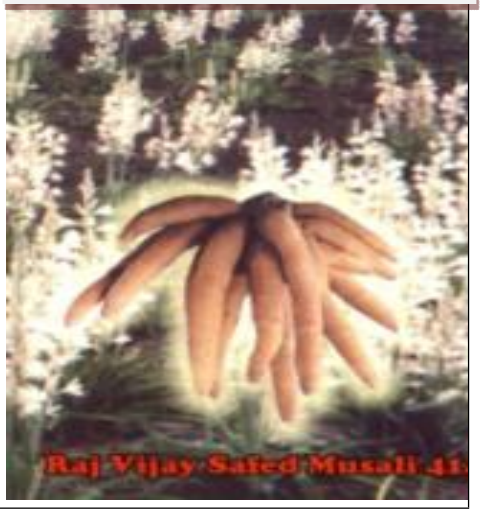
Genetic Improvement of Major Crops

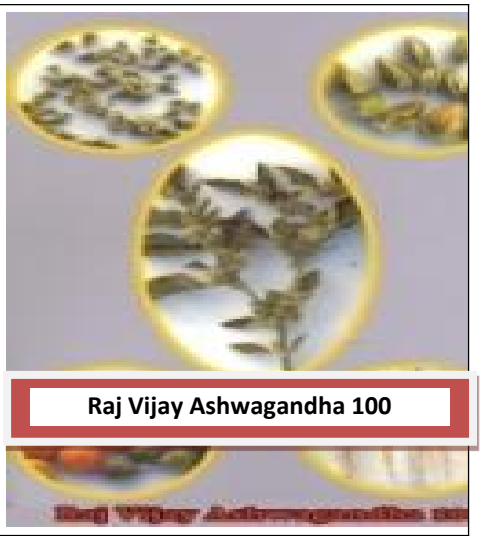
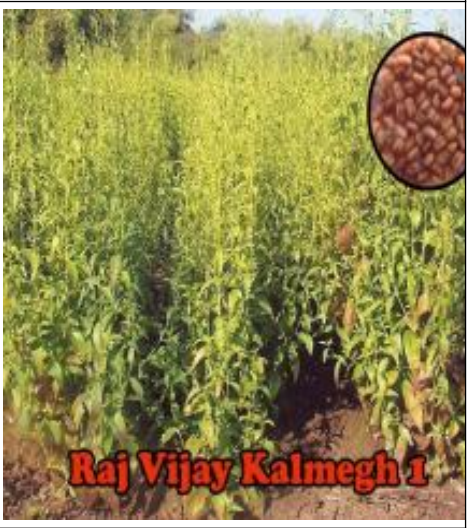
The constituent campuses of the University have legacy of development and popularization of several varieties of important crops grown in the State. The research set up operating at different agricultural colleges has developed various crops grown in the State.

The following varieties of different crops have been released/after establishment of the university in 2008.

Name of Variety:	***Pigeon pea - RVICPH 2671*:**	
Year of release:	2010	
Average yield:	2276-2852 kg/ha	
Recommended area of adoption	Recommended for the medium *Vertisols* of M.P.	

Name of Variety: **Year of release:** **Average yield:** **Recommended area of adoption:**	***Wheat - RVW 4106*:** 2010. 5035 kg/ha. Recommended for late sown irrigated areas of M.P.	
Name of Variety: **Year of release:** **Average yield:** **Recommended area of adoption:**	***Safflower- RVS 113*:** 2010 1600-1800 kg/ha Recommended for rainfed sole and intercropping conditions in sequential cropping system in M.P.	
Name of Variety: **Year of release:** **Average yield:** **Recommended area of adoption:**	***Soybean - RVS 2001-04*:** 2010 2495 kg/ha**.** Recommended for the rainfed areas of M.P.	 Raj Vijay Soybean 2001-04

Name of Variety: **Year of release:** **Average yield:** **Recommended area of adoption:**	***Lentil - RVL 31*:** 2010 1200-1300 kg/ha**.** Recommended for timely sown rainfed areas in M.P.	
Name of Variety: **Year of release:** **Average yield:** **Recommended area of adoption:**	***Gram - RVG 201*:** 2010 2000-2500 kg/ha. Recommended for timely sown rainfed conditions in sequential cropping system	 Raj Vijay Gram 201
Name of Variety: **Year of release:** **Average yield:** **Recommended area of adoption:**	***Safed Musali- RVSM 414*** 2010 1656-2370 kg/ha Recommended for timely sowing under rich humus and well drain soils in raised bed system in M.P.	

Name of Variety: **Year of release:** **Average yield:** **Recommended area of adoption:**	***Ashwagandha - RVA 100*:** 2010 600-700 (Dry root) kg/ha. Recommanded for sowing in IInd fort night of July to Ist week of August in sandy loam and well reclaimed soil in M.P.	
Name of Variety: **Year of release:** **Average yield:** **Recommended area of adoption:**	***Kalmegh - RVK 1*:** 2010 3140 kg/ha in rainfed and 5500-6000 kg/ha in irrigated condition. Recommended for *Kalmegh* growing areas of M.P.	
Name of Variety: **Year of release:** **Average yield:** **Recommended area of adoption:**	***Sarpgandha - RVSP 1*:** 2010 2700-2800 (root) kg/ha. Recommended for *Sarpgandha* growing areas of M.P.	

Name of Variety: **Year of release:** **Recommended area of adoption:**	***Gram - JG 6*:** 2009 Suitable for rainfed farming .	
Name of Variety: **Year of release:** **Recommended area of adoption:**	***Pigeon pea- TJT 501*:** 2009 M.P., Chhatisgarh, Gujrat, Maharashtra and part of Rajasthan and Uttar Pradesh	
Name of Variety: **Year of release:** **Recommended area of adoption:**	***Wheat - MP 1203*:** 2009 Suitable for late soon conditions of M.P., Chhattisgarh, Gujarat and part of Rajasthan	

Name of Variety:	***Groundnut - JGN 23*:**	
Year of release:	**2009**	
Recommended area of adoption:	Recommended for M.P.	

The efforts to develop high yielding varieties, varieties with desirable quality characters, varieties with resistance with abiotic and biotic stress are proposed to be continued with renewed thrust so that newer improved varieties can be made available before earlier popular varieties of crops degenerate.

Crop production

Skewed and imbalanced nutrient management turned out as one of the major factor controlling the yield performance of different crops. Resorting to integrated approach for nutrient management proved to be substantial yield booster for several crops (soybean, chickpea, mustard, lentil, and cluster bean) and is being advocated. The work done at erstwhile IPI, now constituent college at Indore on organic agriculture caught the attention of other nations and advocated the importance of residue recycling/use of organics in agriculture. However, the organic agriculture should have earmarked niche and pockets considering the export advantage and profitability to farmers. This type of benefit is likely to accrue in case of crops covered under AEZs, and aromatic and medicinal crops. General consensus based on experimental findings suggests that for sustainable higher productivity of various crops integrated approach is a better option. Soil test based models for nutrient management in soybean-wheat system worked out

suggests fertilizer economy with concomitant enhancement of productivity thereby increasing system profitability. The research on cropping systems performed revealed the benefits of crop diversification.

Soil testing and residue incorporation for soil health improvement.

Soil and water management research clearly signified the benefits of conservation techniques attempted in dry land agriculture, and constitutes a major bottle neck in sustaining crop productivity. Standardization of promotion of techniques/practices to conserve surface rain water will be receiving continued thrust in future to sustain crop productivity. The practice of conserving rain drop where it falls needs promotion. The State has sizable area under ravines in the Gird Zone, and problematic soils in central Madhya Pradesh and waste land in the State should receive attention to protect it from erosion and ways to use. General deterioration of soil quality/soil health is of major concern and is receiving attention of researchers. However, the issue needs focused attention. It is high time that the below ground microbial community be studied, its biodiversity is conserved and is utilized for improving soil quality and nutrient dynamics in the soil.

A proactive action is needed to conduct research on the productivity performance of crops with global climatic changes. Efforts are also to be made to work out strategy to sustain productivity with increasing green house gases and predicted increase in ambient temperature. In view of this changed cropping patterns and modified agronomic practices are to be identified.

Most of the rainfed crops are productivity loser on account of excessive growth of weeds. The crop-weed competition, particularly in *Kharif* crops, is known to cause enormous yield losses and needs special attention of researchers. Although, isolated approaches to manage weeds have been worked out, there is a need to offer a farmer with tested integrated package with use of herbicide is last option.

Under the ongoing All India Coordinated research projects in operation at different constituent colleges/set ups of RVSKVV, the improved production packages for respective crops have been worked out and recommended. However, there is a need to look for refinement with changed environment.

Crop protection

Integrated pest management has undisputedly proved vital not only for enhancing productivity, but also for curtailing pollution of environment and natural resources like soil and water. Several bio-agents and botanical products have shown their efficiency and eco-friendliness and needs promotion along with cultural management methods, thereby minimizing the use of agro-chemicals. The balance should tilt towards the promotion of natural predators and also microbial agents to manage pests and diseases.

Seed production

Quality seed is the most vital and critical input in crop production. RVSKVV organizes production of nucleus and breeder seed as per the allocation through its 26 farms (cultivated area 736 ha) located in different agro-climatic zones spread over 22 districts. The breeder seed of soybean, pigeonpea, mung, urid, groundnut, cowpea, paddy, sorghum and bajara in *Kharif* and of wheat, gram, maize, pea, lentil, safflower, mustard, and toria in *Rabi* is produced and made available for further multiplication in seed chain. In addition, seeds of hybrid varieties of crops (pigeon pea, maize, bajara, sorghum and castor in substantial quantities is produced. Planting material for guava, anola, citrus and pomgranate is also produced to cater the demand.

Farm mechanization

The increasing paucity and high wages of labour is posing problems for small farmers and do not permit them to do timely operations. Development and popularization of low cost machines like thresher for sunflower, safflower handling devices, water chestnut decorticator, pea peeling machine, chickpea stripping cum shelling machine, tillage equipment, energy saving

dryers and onion storage structure have been successful. More emphasis on development of farm equipments and devices supporting saving cost and time is to be given.

Transfer of technologies

Real fruit of technology developed can he harnessed only when it is transferred and adopted by the end-user. Despite concerted efforts to disseminate the improved production technology, the yield levels of most of the crops are lower than yield harvestable under real farm conditions. For effective transfer of technology with ever-changing clientele profile would require a paradigm shift. Henceforth, rather than emplacing on whole package, one will have to develop several packages suiting to the resourcefulness of the farmer. This needs meticulous clubbing of monetary and non-monetary technology in a prioritized manner. Moreover, use of electronic media (ICT) to be banked upon in future for transfer of technology with increasing computer awareness among farmers. Since the number of farm families in India is large and a good number of them are illiterate, it requires vigorous efforts jointly by all the players of production system. Public-private participation in transfer of technology can make a sea change in enhancing the productivity of crops. The agric product based industry is to be motivated to go for contractual farming with a group of farmers under a defined memorandum of understanding for sharing the benefits.

SWOT Analysis

Since its inception in the year 2008, the university has been growing with respect to the development of infrastructure, education, research and agricultural extension activities. A comparison of the present with the early days gives us great satisfaction in terms of its all-round development and in the dynamic world the university is trying to become well equipped to venture to take on the new responsibility of agricultural development in the State particularly in northern and western regions of the State. The analysis of strengths, weaknesses, opportunities and threats would help in placing agricultural education, research, and extension efforts in right perspective so that we succeed in our pursuit of doing the best. Therefore, an attempt is made to review and analyses our strengths, weaknesses and opportunities so that we may herald a faster growth in the next 25 years and beyond to fulfill the aspirations and expectations of the people of the State of Madhya Pradesh.

Strength:

Setting of this university at Gwalior with its jurisdiction area that is represented by different agro-climatic regions itself is an asset for the State of Madhya Pradesh.

- The constituent units comprising different colleges, Zonal Research Stations, Regional Research Stations and KVKs have good reputation as they have been bestowed with highly qualified staff / faculty members. They have contributed significantly for the benefit of the farming community of the State.
- Due to notable achievements made earlier by the Alumni, specifically that of colleges of Agriculture, Gwalior, Indore, Sehore, Khandwa and College of Horticulture, Mandsaur (now constituent units of RVSKVV), the university has distinguished advantage. Further, more this University has strong linkages with server ICAR international organizations and has also earned international reputation.
- The University has established a good reputation among national and international centres of agricultural education and research, as evidenced by various collaborative programs. Their strength, cooperation and support can be secured for further development of this University.
- With new research and extension responsibilities the university has greater scope to initiate and coordinate research projects with other SAUs / institutions of ICAR and secure greater integration for effective technology generation and dissemination.

- Each college and some zonal/ regional research stations have got some highly specialized, well-developed and fully equipped departments and also have experience of serving as Centre of Advanced Studies. These departments may further be upgraded as College / institute / school depending upon the need and scope of their development.
- The recently revised courses and curricula of undergraduate and post-graduate programs in different faculties and the dynamic approach for needful revision, as and when required, provides a solid background for all-round development of the students.
- The university has about 736 hectares of area for seed production which is a great asset in the service of farmers. However, to enhance the seed replacement rate, efforts are on the way to achieve the set target.

Weaknesses:

- As the university was established only in the year 2008, there is a lack of required infrastructure, etc with respect to university buildings and other infrastructure facilities. There is lack of central evaluation halls and offices, space for records related to finance and academics, etc.
- Lack of standard facilities for sports, equipment, play grounds, etc.
- Non availability of national and international guest houses, student hostels, and farmers (women and men) hostels.
- Lack of colleges for fisheries science, forestry, agricultural engineering, home science, management and food processing and technology.
- Non availability of university level facilities, such as ATIC, communication centre, auditorium, library, playground etc.
- Lack of modernized university instructional and seed production farms.
- Deficiency of technical and supporting staff in all the teaching and research programs.
- Lack of Experiential Learning facilities for students.
- Meagre efforts in basic and strategic research, essential for advancement of science.
- Research emphasis on socio-economic and policy aspects is inadequate.
- Lack of synergy/institutional linkages with line departments of the State and other universities.
- Lack of resources for diagnostic surveys in our research efforts.
- Non availability of sufficient funds for renovation and modernization of

colleges/labs/classrooms/libraries/playgrounds/hostels etc.

- No arrangement for substitution of old/unserviceable equipment.
- Lack of priorities and programs on disaster management, resulting in unsecured investments/profits in agriculture.
- The University scientists have succeeded in evolving technologies for higher production but in respect of quality improvement they are lagging behind. Similarly, to ensure nutrition security and sustainability in agricultural production very little has been done.
- Much needed research priority in the State of Madhya Pradesh on small and marginal farmers for rain-fed agriculture is not getting momentum.
- Wide variation in rainfall (500 – 1500 mm) in the State and its erratic distribution causes rainy season crops to suffer due to oxygen or moisture stress while most of the post rainy season crops suffer due to moisture stress. No research priorities to reduce kharif and rabi fallow areas.
- In black soil regions of Malwa and Nimar, low infiltration rate of soils due to high clay content (40 to 60% clay), poor internal and surface drainage, excessive runoff from sloppy lands, water logging on flat lands, high degree of plasticity and stickiness, swell shrink nature of soils associated with shrinkage cracks, high N and S losses, high P fixing capacity of soil and low fertility status are main problems.
- The light textured soils of northern parts of the State have low CEC, poor fertility status, low clay content and high infiltration rate.
- Poor organic carbon status coupled with low fertilizer consumption in dry lands/rain-fed areas in the State results in relatively poor response of crops to applied nutrients, instability in crop yields, less use of improved seeds and technologies and low cropping intensity.
- Deterioration of soil health and imbalance status of soil nutrients due to intensive farming.
- Increasing frequency of moisture deficit and prevalence of high temperature during reproductive growth of the crop.
- Occurrence of new diseases/insect pests and increasing intensity of prevalent biotic stresses in changing cropping scenario.
- Limited availability of early maturing HYVs having tolerance to abiotic stresses like drought, temperature, etc. and biotic stresses.
- Shortage of optimum region/agro-climatic zone specific IFS module for sustainable livelihood

security.

- Low seed replacement rate particularly in high volume low profit crops.
- Limited application of bio-technological tools and trained staff in managing the new agricultural problems.
- Lack of recommended technologies for cultivation of vegetables, spices, flowers, fruits etc.
- Genetic erosion of land races in vegetables and spices.
- Non-availability of proper markets for flowers, medicinal plants and other high value crops.

Opportunities:

- With the globalization of markets, there are ample opportunities for high demand of new products. There is a growing demand for highly trained manpower in specialized subjects.
- Increasing awareness of the hazards the Indian agriculture is likely to face in the next century on account of stagnation in yield, unabated growing pollution, continuous use of chemicals and pesticides with harmful residues, depleting resources and many other adversities.
- Since the RVSKVV, is a multi campii university and has colleges of agriculture/horticulture under different agro-climatic zones where different farming systems, social customs and farming communities prevail. The University provides exceptional opportunity to work in varying situations to determine solutions of agriculture related problems.
- Different regions in the jurisdiction of RVSKVV are rich in agri-biodiversity having many species of plants and animals not found elsewhere. This provides an ample opportunity for bio-diversity conservation in the State.
- The Information Communication Technology (ICT) in agriculture is another potential area which can be catered / disseminated effectively through computer and internet services and other means by different KVKs located in each district of the State.
- Nearly 50% of arable lands in the State of Madhya Pradesh are either degraded or on the verge of degradation with sizable area under waste lands which can be utilized for agriculture after its proper management.
- There is an opportunity to enhance the cropping intensity in irrigated as well as rain-fed areas (at present very low).
- What are opportunities in graduate, PG and Ph.D program, rational education, Distance education and why ?
- Due to globalization of agriculture new areas have emerged for production, processing and

services sector. The progress and growth demands for future research in these areas. There is tremendous scope for identifying AEZs and suitable commodity crops for export purpose which would add to the prosperity of the farming community in the State.

- The diversification of agriculture will provide plenty of opportunities to the scientists, farmers and industries to move towards prosperity and self-employment in the agriculture sector.
- New areas in the filed of agriculture and allied sector are to be tackled through long-term research on NRM, biotechnology, energy management, marketing, processing related to crops, fruits, milk, egg, meat, fish, etc.
- There is every possibility for the transfer of improved package of practices to ultimate beneficiaries (socio agriculture entrepreneurship) in the State for obvious reasons.

Threats:

- Due to ever increasing population and growing urbanization, the agriculture in the State is likely to be adversely affected in coming years. More food has to be produced from shrinking cultivated areas, degraded lands and decreasing volume of irrigation water. The university scientists will face many challenges and constraints in solving newer framer's problems.
- Farming no more profitable/ lucrative business. Farmer does not want his son to be a farmer. In general, average age of the farmers appears to be above 45 years. Supply of electricity and irrigation water is decreasing.
- With the increasing dominance of the industrial sector and a handful of influential industrialists, there is a continuous threat to agriculture being affected with effluents and pollutants which will prove hazardous to crops, trees, ground water, animals and human health.
- Scientists are likely to face many diversified and much more complex type of challenges in view of gradually increasing global warming/climate change effects.
- The university has limited resources and infrastructures at its outreach research stations in the State which are essential for conducting location specific research. Hence, new research Centres will have to be created which require sufficient funds and hard work. In the absence of the requisite facilities the scientists will have to work in cooperation with farmers for testing and verification of technologies developed by them.
- The development of difficult areas like ravines in northern parts of the State and Jhabua hills, Nimar valley requires dedication and missionary spirit contrary to the existing environment and life style of the scientists and staff where every one wants to move towards urban / big

city areas. As a result, the work suffers in different ways.

- For commercialization of agriculture in the State, huge investment and capital will be required which is beyond the reach of the farmers residing in rural areas. Unless and until the university resources are increased and utilized with commitment and devotion these objectives will be difficult to achieve.

Challenges and Issues

Challenges:

In general, some of the challenges, which deserve our serious attention, are as follows:

- New faculties/ infrastructure/human resource development to upgrade teaching, research and extension requirements
- Quality of education
- Job and business oriented education
- Organic farming, soil and plant health
- Natural resource management (recycling of wastes and waste water in agriculture, resource conservation technologies, etc.)
- Stagnant crop productivity
- System wise production technology
- Diversification of agriculture to enhance farm income
- Plant improvement
- Post harvest processing and value addition
- Use of bio-technology and nano-technology in agriculture
- Sustainability of agricultural production.
- Use of GIS and remote sensing in agriculture
- Bio-fuels
- Climate change/global warming
- Biotic and abiotic stresses
- Farm mechanization and development of equipment
- Quality improvement and standardization of farm produce in conformity with international standards
- Maintenance of dynamic relationship between agriculture and environment
- Terms of trade in agriculture; reducing cost of cultivation plus enhancing fertility plus value addition to ensure farm prosperity
- Rural livelihood security and making agriculture a profitable business

Issues:

(1). Education related:

(a) Infrastructure development for students related activities

(b) Increase in number and value of scholarships/fellowships for UG/PG students

(c) Establishment of experiential learning units in all constituent colleges of the university

(d) Establishment of niche area of excellence and centre of excellence for promoting academic excellence in critical or emerging new areas at PG and Ph.D level.

(e) Improvement in employment/placement opportunities to agriculture stream students.

(f) Creation of more incentives, awards and prizes for talented students / faculty members of the university.

(g) Enhancing employment opportunities in agriculture by further modifying the course curriculum in global perspective.

(h) The university should play a role as dynamic promoter of changes in agricultural research and education.

(i) Infrastructure development for quality education

(j) Knowledge backup for protection of natural resources and climate changes

(k) Encouraging investment from private sector in higher agricultural education and research

(l) Requirement of agricultural graduates, post-graduates and Ph.D and their specialization as per need.

(m) Agricultural Technology parks for empowering students and farmers to link production and post harvest processing along with marketing.

(n) Increased role of private sector in imparting agricultural education.

(o) Linking of the University with educational institutions and research organization in India and abroad.

(p) Setting up vocational training centres as per need of farmer and the industry.

(q) Increased budgetary support from Govt. of M.P. and GOI. (ICAR).

(r) Starting new colleges in the field of agriculture ad allied sector considering the demand/requirement, specifically in less developed districts.

(s) Strengthening and modernization of existing constituent colleges of the university.

(2). Research related:

Though all the research and developmental organizations of the region are making sincere efforts, still many of the issues remained unresolved. Some of the major issues which need to be addressed in long term are as under:

(a) Food security
(b) Sustainability of agricultural production
(c) Low productivity and unstable yield in rain-fed areas
(d) Climate change and global warming
(e) Ecological balance and environmental insecurity
(f) Rapid loss of agro-biodiversity
(g) Shifting of agriculture to marginal lands due to urbanization and industrialization
(h) Dwindling investment in agricultural research and technology development
(i) Promotion of private sector funding in basic and strategic research.
(j) Poor linkages
(k) Farmer's distress and shift in poverty mix and food basket due to decreasing size of land
(l) Long term policy of research for sustainable agriculture
(m) Agricultural trade, marketing and globalization

Some of the important researchable issues of the region, which deserve immediate attention, are as given below:

• Chickpea: Lack of availability of good quality seed of high yielding varieties.

• Soybean: Occurrence of occasional epidemics of pest and diseases.

• Oil seeds: Severe alternaria and necrosis disease in sunflower. White rust, alternaria blight and pests like aphid and painted bug in mustard and aphids in safflower. Poor crop establishment and plant stand in sesame and niger.

• Cotton: Drought with scanty and uneven rainfall during the grand crop growth period, cultivation in shallow soils with low moisture retention capacity

• Sugarcane: Low adoption of improved production technology, early shoot borer in drought affected areas.

• Fruits: Spongy tissue and fruit fly in mango, seed borer in sapota, and tea mosquito in cashew are major problems. There is lack of available varieties suitable for processing and export.

• Weeds: *Parthenium hysterophorus* in cropped and non-cropped areas. Increased infestation of invasive weed (*Chromolaena odorata*) in the plantation crops, forestry, grasslands. Weed problem, specifically in kharif crops.

• Mechanization: Small size of farm holdings, high cost of farm machinery, and inadequate finance for farm mechanization, devising small and cost effective power operated implements which can be afforded by small and marginal farmers and good for cane and potato cultivation in heavy soils, etc.

• Livestock: Up gradation of nondescript and low productive livestock population, short supply of sufficient number of breedable bulls, trained manpower.

• Fisheries: Lack of awareness about fish culture, non availability of quality seed material, providing processing, storage, transport, and value added hygienic fish marketing, formulation of cheap and quality fish feed.

• Inadequate supply, non-availability of good quality seeds and planting material.

• Dependency on rainfall and frequent crop failures.

• Increasing the double cropped area in rain-fed areas.

• Low yields due to poor crop management in irrigated areas.

• Weak extension link and improper plant protection.

• NRN: Large area under ravinous lands and salt effected soils, large area fallow kharif and rabi seasons, less availability and poor quality of irrigations water etc.

• Inadequate supply of irrigation water, shortage of water during summer, excess of water and spoilage of land resulting in water logged conditions in canal areas.

• Inadequate supply of organic matter resulting in deterioration in soil health.

• Lack of availability of inputs and credit facilities, inadequate communication

• Imbalanced fertilizer use and spurious fertilizers

• Standardization of parameters and techniques for export oriented vegetables are needed.

• Package of practices and processing for medicinal and aromatic plants needs to be developed.

• Well equipped processing units, markets, transportation facilities, and skilled manpower to handle horticulture produce are lacking.

(3). Extension related:

(a) Developing Krishi Vigyan Kendras as knowledge resource centres.

(b) Assessment, application, refinement and feedback for the researchers.

(c) "On Farm Testing" identifying technologies in terms of location specific.

(d) "Front Line Demonstration" on various technologies which have been tested in OFT or proven already.

(e) Low yields due to poor crop management in irrigated areas.

(f) Weak extension link and improper plant protection

(g) Creation and strengthening Training Academy, Farmers' hostels, etc.

(h) Mobile soil and plant clinic vans equipped with latest equipment and analytical facilities for on spot advisory services (diagnosis and treatments) at each KVK.

(i) Market demand driven extension activities to make farming a profitable business.

(j) Creation of specialized centres for training and demonstration for various technologies/ entrepreneurship at different KVKs.

(k) Establishment of agro-technological information centre (ATIC).

(l) Agro-technological parks.

(m) Entrepreneurship development and vocational training.

(n) Post harvest Processing and value addition parks.

(o) Empowering farm women.

(p) Lack of co-ordination and collaboration among different change agencies Slow rate of transfer of technology.

(q) Non adoption of recommended varieties and package of practices

Strategy and Framework

The ever-increasing requirement of food, feed, fuel and fibre with burgeoning population has exerted a tremendous pressure on land and water resource, plant, animal and micro-organisms biodiversity. It has become imperative to enhance the productivity of crops and sustain it on shrinking land and water resources with utmost care for maintaining quality of natural resources without harming the environment. The attention is not only needed to enhance the productivity and quality of crop produce or value addition to it, but also on preservation of

rights on natural and created biodiversity, export avenues, and turning out to be globally competitive to enable export of commodities produced / processed / value added. So it becomes joint responsibility of policy makers, researchers and farmers. Every one of them will have to be proactive and system needs to be in place. The Convention on Biological Diversity (CBD) in 1993, and The Geographical Indication of Goods (Registration and Protection) Act, 1999 has provided safeguard to us, however, creation of awareness and proactive individuals should play positive role.

To take the Indian agriculture ahead, effort are necessary for rapid spread of needful technology and thoughtful continuous research. To meet the requirement, there has to be efficient and educated manpower, which can only come out from agricultural universities. This is feasible only when the task is accomplished by knowledgeable teachers. Hence, the seats of human resource developments like agricultural universities are to be strengthened adequately. RVSKVV, which came into being in 2008, is still in infancy and needs strengthening with respect of infrastructure, staff, teaching aids and advance equipment and other research facilities, farm mechanization and other aspects. It is also proposed to expand teaching sphere from awarding graduate and post graduate degrees to run diploma courses so that qualified technical staff in agriculture sector may be made available.

Following strategies are proposed to be adopted to accomplish the vision and goals:

- **Education Development**
  - Improve efficiency of infrastructure and financial reviews
  - Considerable strengthening by establishing various offices at University head quarter including university campus buildings, research farm and instructional farms, etc. University campus plan has to be completed in phased manner. Master plan already approved.
  - Renovation of old buildings, college campus including laboratories, farm, boundary walls / fencing, etc. Efforts for funds from Govt. of MP and ICAR will be helpful
  - New laboratories in different departments, constructions / modernization of seminar rooms and classrooms, play grounds, roads, auditorium, gymnasium, sports equipments, etc at different constituent colleges
  - Prioritize demand-driven and resource based education program with focus and

emerging market opportunities

- Harness synergies of all the stakeholders in developing improved technologies knowledge and informations
- Develop and pilot effective delivery system and evolve institutional models to link education, research and development system with farmers and other stakeholders in the value chain for accelerated adoption, value addition and processing through efficient marketing, information and communication technology and e-education
- An increase in educational seats at 5% (as per State government norms) is expected. To accommodate these students and for creating facilities in tribal regions, opening of new colleges in a phased manner will be necessary. Five Agricultural Colleges, College of Processing and Technology, College of Agri-Engineering and Technology, College of Agri-business Management Studies, Centre for Rainfed Farming, Centre for Seed Technology and Centre for Advanced Studies, Niche Area of Excellence, etc. need to be established.
- New Krishi Vigyan Kendras at tehsil level, establishment of ATIC are proposed to strengthening of extension program
- Use of e-media for teaching and learning will be strengthened.
- Equipment/facilities for modernization of farms.

- **Human Resource Development**
  - Appointment of adequate and qualified staff (all categories) as per norms for deficit staff in existing system and newly proposed establishment for quality education, research and extension.
  - Starting new Departments/Colleges/Centres for specialized skill development as per demand in market such as Master degree in Agri. Business Management, Diploma/ Degree in organic farming, Degree program in Post Harvest Processing /Food Technology, Agri Engg., Vocational education in seed production, Horticulture nursery and others as per need.
  - Training of foreign students for Degree/ Diploma programs.
  - Collaboration with National/ International institutions for education.

- Setting up facilities for academic excellence in critical areas.
- Provision in Act of SAUs for PPP/ private college of agriculture, horticulture, agri. engineering etc. and development of guidelines for execution considering the demand of trained students.
- Development of guidelines and setting up facilities for collaboration with agro-industries.
- More emphasis on faculty up-gradation and development in new areas through exposure visits / training in State of art laboratories / organizations / institution in the country and abroad under bilateral programs of State / Central Government, participation / conduct of summer / winter courses for effective implementation of new / revised curricula / new subjects like nano technology, bio diversity, etc.

- **Harnessing the Potentials of Genetic Resources**
  - Molecular and conventional breeding for high yield, early maturity, resistance to biotic and abiotic stresses, quality food grade characters, and other specialty character to develop improved varieties of crops.
  - Collection, evaluation, characterization, documentation and conservation of species diversity and their utilization for improvement in seed yield
  - Production of nucleus and breeder seed for further multiplication in seed chain to produce certified seed
  - Conservation of biodiversity of medicinal and aromatic plants
  - Standardization and development of appropriate root stalks of mango/citrus/guava /pomegranate , etc for better adopted root system and high density orchards
  - Crop improvement and rapid propagation techniques for horticultural crops
  - Development of export quality roses /bulbous plants and other flowers

- **Crop Production and Protection**
  - Strengthening of research on conservation agriculture to protect soil, water and environmental pollution

- Standardization of crop production utilization integrated approach (IPNS/IWM/IPM for changing/emerging cropping systems
- Use of nano-technology in plant nutrition and pest management for enhancing effectiveness and reducing the input quantity
- Standardization and promotion of integrated farming approach for better livelihood security
- Study and utilization of underground microbial community in integrated crop management
- Standardization of techniques for organic production
- Development of technique for soil quality management
- Standardization of production and protection techniques for grape and other dry land fruits
- Identification of production techniques for medicinal and aromatic plants
- Fodder production and conservation techniques
- Working out models on forecasting of pest/disease incidence
- Molecular identification of races/ variants of major diseases and pests of crops and standardization of IPM techniques
- Studies on host plant resistance- mechanism and sources
- Testing of botanicals and bio-agents for management of pests and diseases and use of indigenous technical knowledge in their combination
- Development and use of advance technology for weather forecasting
- Research on climate resilient agriculture

- **Value addition and Marketing**
  - Establishment of production units for bee keeping, vermicomposting, bio-fertilizers and bio-agents with standardization of techniques for maximisation of production
  - High-tech horticulture
  - Quality seed and seedling production of vegetables and spices
  - Development of pre and post harvest technologies for value addition
  - Standardization and promotion of low cost poultry and animal feed
  - Standardization and promotion of collective marketing and linkage strengthening

- Setting up infrastructure/ facilities for training on marketing related issues
- Export promotion

- **Natural Resources Management**
  - Strengthening research on Water-Management including micro-irrigation and establishing sub centres in all the zones
  - Strengthening research on soil health management including reclamation of saline and alkaline soils, establishing sub station/ centres in different zones
  - Development of technology for use of ravinous areas.
  - Strengthening research on dry land agriculture.
  - Studies on climate change and establishment of automatic weather station to facilitate appropriate analysis of weather parameters.
  - Research on watershed management to make the system economically viable at micro-level
  - Studies on ground water storage/recharge
  - Research on soil-water-plant and nutrient relationship

Annexure 1: Strategic Framework

Goal	Approach	Performance measure
University campus development – administrative block, auditorium & symposium halls including dining halls, PG block, site development, provision for amenities (banks, post office, dispensary, etc.), central library, computer centre and communication centre	Work to be initiated in XII plan and be completed in next 5 to 10 years in a phased manner, as per availability of funds. Time schedule and monitoring of construction work will strictly be followed	Availability and functioning of respective offices
Construction of ATIC (agriculture technology information centre), scientists hostel, farmers hostel and international guest house.	Work to be initiated during XII plan and to be completed in a phased manner, by proper monitoring and within time-frame	Availability and functioning of respective offices in buildings

Modernisation of library (e-library), modernisation of class rooms / laboratories equipping them with audio-visual teaching aids at each constituent college/unit	Work to be accomplished in a phased manner by proper monitoring and within time-frame.	Availability of desired infrastructures with proposed facilities and their utilization
Construction of central evaluation offices and examination halls, facilitating colleges with latest farm implements/machines, crop cafeteria, addition of new laboratories for UG, PG and PhD courses and extension and renovation of guest houses at each college	Work to be initiated in XII plan and to be completed in next 10 years in phased manner, by proper monitoring and within time-frame	Availability of desired infrastructures with proposed facilities and their utilization
Strengthening of existing research centres both in terms of staff and infrastructure, and establishing new special/critical area of research	Work to be initiated in XII plan and to be completed in phased manner, by proper monitoring and within time-frame.	Formation of technical program fulfilling the research needs of the farming community
Modernization of farms in terms of staff, equipment, machinery and tools godowns, seed processing plants, fencing, boundary wall, irrigation, road and electricity facilities for achieving better and quality production, targets of processing and value addition	Work to be started during XII plan and to be performed in phased manner, by proper monitoring and within time-frame.	Making agriculture farms available for education extension and research
Creation of indoor and outdoor sports facilities, gymnasium with standard equipment	Work to be initiated in XII plan and to be completed in phased manner by proper monitoring and within time-frame.	Availability of desired infrastructures with proposed facilities and their utilization
Creation of facilities of auditorium, conduction of seminars, lectures, symposium, and work shop regularly in each constituent college	Work plan to be prepared in a phased manner. Participation of students, scientist, professors, and other stake holder exchange of views and formulation of strategic policies by proper monitoring and within time-	Availability of desired infrastructures with proposed facilities and their utilization

	frame.	
Addition of hostels for boys and girls at each of the five colleges and new colleges as per growing need	Work to be initiated in XII plan and completed in a phased manner by proper monitoring and within time-frame.	Availability of desired infrastructures with proposed facilities and their utilization
Creation of new agriculture colleges, agricultural engineering college, college of home science, food processing and technology institute, agriculture science academy and vocational education centre and management in institute etc. as per future need	Work to be initiated during XII plan onwards whenever grant is made available, work to be performed & completed in a phased manner, by proper monitoring and within time-frame.	Functioning of new colleges
Opening of new departments (Food science and technology, biotechnology, forestry, agri-journalsiom) , new courses including diploma courses	To be done in phased manner after developing and timely execution of plan	Functionality of new departments
Opening of new UG and PG programs and diploma in buisness administration in agriculture, bachelor of agri.buisness adminstration, MBA in agriculture	Work to be initiated during XII plan onwards whenever grant is made available, work to be performed & completed in a phased manner by proper monitoring and within time-frame.	Functionality of diploma courses
Creation of (i) research centre for water technology, (ii) research centre for medicinal and aromatic plants, (iii) seed technology and processing unit, (iv) gene bank and cold storage facility (v) bio-technology centre (vi) ravines / wasteland management centre, soil health management, centre for HRD, countinuous education centre, etc.	Work to be initiated during XII plan period and completed in a phased manner, by proper monitoring and within time-frame.	Creation and utilization of facility

Appointment of adequate and qualified staff (all categories) as per norms for newly proposed establishments as above and of deficit staff for strengthening existing establishments	A continuous process in the direction of HRD and improving education. To be accomplished starting from deficit staff, particularly in teaching	Improved image of the organisation by performance of students in different fields
Strengthening linkages and collaborations with other organizations of repute in India and abroad in the field of education, research and extension	Efforts to work out formal and informal level by the university authorities and senior officials	Visibility on account of exchange of information, knowledge sharing and utilization of complementary facilities and manpower in research and education
Creation of facilities for research on climate change / global warming , integrated farming systems	Long term efforts have to be made with respect to climate and time	Coordination with all stake holders, exchange of information, knowledge and utilization of complementary facilities and manpower in research and education
Molecular and conventional breeding for high yield, early maturity, resistance to biotic and abiotic stresses, quality food grade characters, and other speciality character to develop improved varieties of crops	Breeding of varieties using conventional and molecular tools to introgression desired traits in improved varieties	Enhancement in productivity and utilization of crop varieties for value addition
Production of nucleus and breeder seed	Maintaining desired purity of seed to be used for further multiplication	Enhancement in seed replacement rate culminating in improved productivity
Conservation of biodiversity of various crop plants of agricultural importance as per need.	The material can be used to produce better varieties of crops	Better yield and adoption of these crops, quality ingredients etc.

Standardization and development of appropriate root stalks of mango/citrus/guava /pomegranate , etc for better adopted root system and high density orchards	To improve and promote quality fruit production	Availability of quality fruits for domestic consumption, export and further processing and value addition
Development of export quality roses /bulbous plants and other flowers	Attempt to meet the quality standard necessary for export	Increase export of cut flowers and planting material and availability of produce for value addition
Use of nano technology in plant nutrition and pest management for enhancing effectiveness and reducing the input cost and quantity	To utilize effectiveness and targeted use of nano encapsulated active ingredients in crop management	Reduced cost, more effectiveness and minimized environmental hazards
Management of soil resources including management of waste land, *i.e*., ravines, salt affected and other degraded soils	To be initiated immediately, ensuing execution as continuous progress and which is to be accomplished as soon as possible	Concerted working with government institutions and farming community
Use of biotechnological tools in agriculture	To be a accomplished as a continuous process	Coordination with international/central bio-technology laboratories
Study and utilization of underground microbial community in integrated crop management	To isolate effective microbes and utilize them in integrated crop management and to document microbial diversity	Effective crop management, reduced chemical input and cleaner environment
Standardization of techniques for organic farming	Involving botanicals and bio-agents for IPNS and IPM and to target export of produce, value added product and promote crop residue recycling and	Minimized use of agrochemicals/pesticides, cleaner environment, improvement in soil quality

	organic manure use	
Molecular identification of races/ variants of major diseases and pests of crops and standardization of IPM techniques	Utilization of knowledge in better management and rational use of pesticides	Targeted and effective management of pests and diseases in eco-friendly manner
Testing of botanicals and bioagents for management of pests and diseases and use of indigenous technical knowledge	Use of natural products to take the advantage of naturally occurring predators and pathogens for pest management	Indigenously processed/multiplied natural botanicals and bioagents and use of ITK for cleaner environment and at lower cost enhancing cost competitiveness
Working out models on weather forecasting	To utilize generated data on climatic parameters and relate with pest/disease incidence to work our forecasting models	Pre warning to farmers on possible incidence of pest and diseases
Setting up facilities for value addition to crop produce, horticulture crops, post harvest technology, quality seed production, processing of crop residue and animal waste for recycling	To enhance the value of produce, quality of planting material and soil quality restoration	Higher income, better soil quality and cleaner environment
Secondary agriculture requirement trained and skilled workers in agriculture	To conduct certificate course for entrepreneurship development as a continuous process	Job oriented farmer with entrepreneurship skills to perform agricultural field work
Market analysis and intelligence gathering	To keep updated on agric-market trends to take advantage in profit making	More profit on disposal of produce when prices are higher
Strengthening of Krishi Vigyan Kendra for centre of excellence for different programs (specialized centre), and entrepreneurship	Work to be initiated during XII plan onwards whenever grant is made available, work to be performed &	Training of staff, students, farmers and other stake holders at KVK centres of

development	completed in a phased manner. Strict monitoring of progress of work	excellence.
Use of ICT in transfer of research emanated production technology	To use all the extension methods including that of ICT for dissemination of information	Enhanced productivity, appropriate use of agrochemicals and improved income of farmers

ICAR Guidelines for NEP-2020

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

आज़ादी का अमृत महोत्सव

कृषि शिक्षा प्रणाली में नई शिक्षा नीति-2020 के लिए कार्यान्वयन की कार्यनीति

Implementation Strategy for National Education Policy-2020 in Agricultural Education System

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शिक्षा प्रभाग
भारतीय कृषि अनुसंधान परिषद
कृषि अनुसंधान भवन-II, पूसा, नई दिल्ली -110 012

Education Division
Indian Council of Agricultural Research
Krishi Anusandhan Bhavan-II, Pusa, New Delhi-110 012
www.icar.gov.in

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डिजाइन व प्रोडक्शनः पुनीत भसीन, अशोक शास्त्री

डा. सतेन्द्र कुमार सिंह, परियोजना निदेशक, कृषि प्रबंध निदेशालय द्वारा भारतीय कृषि अनुसंधान परिषद, नई दिल्ली के लिए प्रकाशित तथा मैसर्स चन्दु प्रेस, 469, पटपड़गंज इंडस्ट्रियल एस्टेट, दिल्ली 110 092 से मुद्रित।

नरेन्द्र सिंह तोमर
NARENDRA SINGH TOMAR

सत्यमेव जयते

कृषि एवं किसान कल्याण,
ग्रामीण विकास और पंचायती राज मंत्री
भारत सरकार
कृषि भवन, नई दिल्ली

MINISTER OF AGRICULTURE & FARMERS WELFARE,
RURAL DEVELOPMENT AND PANCHAYATI RAJ
GOVERNMENT OF INDIA
KRISHI BHAWAN, NEW DELHI

संदेश

भारत की ''नई शिक्षा नीति 2021'' का उद्देश्य समग्र और बहु-विषयी दृष्टिकोण के माध्यम से भारतीय शिक्षा प्रणाली में भी कई परिवर्तनों का प्रस्ताव किया गया है। इन परिवर्तनों में कृषि शिक्षण, अनुसंधान तथा विस्तार प्रणालियों को केन्द्रित रखते हुए संस्थागत ढांचे को बहु-विषयक अनुसंधान-गहन उच्च शिक्षा संस्थाओं में रूपांतरण करना, पाठ्यक्रम का पुर्नगठन करना, डिग्रियों/डिप्लोमा/प्रमाणपत्र प्रणाली, क्रेडिट बैकिंग प्रणाली को लागू करना तथा उच्चतर शिक्षा संस्थानों, विश्वविद्यालयों, उद्योग जगत तथा अन्य हितधारकों के बीच साझेदारी को सुदृढ बनाना शामिल है।

इसके अंतर्गत कृषि विश्वविद्यालय/महाविद्यालयों को बहु-विषयक (मल्टी डिसिप्लिनरी) विश्वविद्यालयों, तथा उच्चतर शिक्षा संस्थानों के समूहों/ज्ञान केन्द्रों (नॉलेज हब्स) में रूपांतरित करना शामिल है। कृषि विज्ञान की सम्बंध विधाओं के शैक्षिणिक कार्यक्रमों में सशक्त समावेश शामिल होंगे। भारतीय कृषि अनुसंधान परिषद-कृषि विश्वविद्यालय प्रणाली के अंतर्गत एकल धारा (सिंगल स्ट्रीम) विश्वविद्यालयों को कृषि पर ध्यान केन्द्रित करते हुए बहु-विषयक बनाने की आवश्यकता है। राष्ट्रीय शिक्षा नीति-2020 की सिफारिशों के अनुसार, भारतीय कृषि अनुसंधान परिषद की पाठ्क्रम विकसित करने और कृषि शिक्षा के लिए अकादमिक मानक निर्धारित करने हेतु व्यावसायिक मानक निर्धारक निकाय (प्रॉफेशनल स्टैंडर्ड सेटिंग बॉडी) के रूप में विशेष भूमिका होगी।

मुझे प्रसन्नता है कि भारतीय कृषि अनुसंधान परिषद् द्वारा कृषि शिक्षा प्रणाली में नई शिक्षा नीति - 2020 के लिए कार्यान्वयन की कार्यनीति का प्रकाशन कियाजा रहा है। इस अवसर पर मैं परिषद को हार्दिक बधाई व शुभकामनाएं देता हूँ।

(नरेन्द्र सिंह तोमर)

Office : Room No. 120, Krishi Bhawan, New Delhi-110 001 Tel.: 23383370, 23782691 Fax : 23384129
Resi. : 3, Krishna Menon Marg, New Delhi-110 001, Ph. : 011-23794697 / 98, Fax : 011-23794696

भाकृअनुप
ICAR

कैलाश चौधरी
KAILASH CHOUDHARY

कृषि एवं किसान कल्याण
राज्य मंत्री
भारत सरकार
MINISTER OF STATE FOR AGRICULTURE
& FARMERS WELFARE
GOVT. OF INDIA

संदेश

भारतीय कृषि अनुसंधान परिषद् देशभर में कृषि शिक्षा की गुणतत्ता के लिए प्रतिबद्ध है। नई राष्ट्रीय शिक्षा नीति - 2020 के अंतर्गत कृषि विश्वविद्यालयों के अतुलनीय योगदान को और अधिक मजबूत बनाने और कृषि क्षेत्र को अधिक रोजगारोन्मुख बनाने की दिशा में एक उत्तम प्रयास है। इस शिक्षा प्रणाली का उद्देश्य श्रेष्ठ मानव विकसित करना है, जिनमें तार्किक सोच और कार्य करन की योग्यता हो, करूणा एवं सहानुभूति, साहस तथा अनुकूलनशीलता, वैज्ञानिक मनोवृत्ति और सृजनात्मक कल्पना शक्ति हो और साथ ही सुदृढ़ नैतिक संस्कार एवं मूल्य हों। नई शिक्षा नीति का प्रयोजन संविधान द्वारा परिकल्पित एक न्यायसंगत, समावेशी तथा बहुलवादी समाज का निर्माण करने के लिए प्रवृत्त, उतपादक तथा योगदान करने वाले नागरिक तैयार करना हैं। यह राष्ट्रीय शिक्षा नीति - 2020 भारतीय लोकाचार पर आधारित एक ऐसी शिक्षा प्रणाली की कल्पना करती है जो सभी को उच्च गुणवत्तापूर्ण शिक्षा प्रदान करके हमारे देश को एक न्यासंगत एवं जीवंत ज्ञान आधारित समाज में रूपांतरित करने में प्रत्यक्ष योगदान करती है और इस प्रकार भारत को ज्ञान की वैश्विक महाशक्ति बनाती है।

मुझे हर्ष है कि भारतीय कृषि अनुसंधान परिषद द्वारा कृषि शिक्षा प्रणाली में नई शिक्षा नीति - 2020 के लिए कार्यान्वयन की कार्यनीति को सभी संबंधित हितधारकों के साथ विचार-विमर्श करके तैयार किया गया है और इसका प्रकाशन किया जा रहा है। इस अवसर पर सम्पूर्ण कृषि जगत को मेरी हार्दिक बधाई।

शुभकामनाओं सहित।

(कैलाश चौधरी)

Office : 199Q, Krishi Bhawan, New Delhi-110 001. Tel. : +91-11-23782343, 23388165 Fax: 23074190

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शोभा करांदलाजे
SHOBHA KARANDLAJE

राज्य मंत्री
कृषि एवं किसान कल्याण
भारत सरकार

MINISTER OF STATE FOR AGRICULTURE
& FARMERS WELFARE
GOVT. OF INDIA

संदेश

भारत में कृषि विश्वविद्यालयों को किसानों की समस्याओं के समग्र समाधान करने की आवश्यकता है। भारत की पहली राष्ट्रीय कृषि शिक्षा नीति फसल विज्ञान, मत्स्यपालन, पशुचिकित्सा और डेयरीपालन के अनुसंधान पर केंद्रत कृषि विश्वविद्यालयों के लिए अकादमिक क्रेडिट बैंक और डिग्री प्रोग्राम के कई प्रवेश निकास विकल्प लाएगी। राष्ट्रीय शिक्षा नीति-2020 कृषि शिक्षा और उसकी सम्बद्ध विधाओं (डिसिप्लिन्स) के बीच संयाजनों को मजबूत करने का आह्वान करती है। स्टैंड-अलोन कृषि विश्वविद्यालयों को बहु-विषयक संस्थान बनने की आवश्यकता है जो समग्र, बहु-विषयक शिक्षा प्रदान करते हों, व्यावसायिक अथवा सामान्य कृषि शिक्षा प्रदान करने वाले संस्थानों का उद्देश्य वर्ष 2030 तक निर्बाध रूप से दोनों की शिक्षा प्रदान करने वाले संस्थानों/समूहों के रूप में व्यवस्थित और क्रमिक तौर पर विकसित होना होगा, जिसका अभिप्राय है कि उन्हें कृषि पर ध्यान केंद्रित रखते हुए बहु-विषयक अनुसंधान-गहन संस्थानों में बदलना होगा।

राष्ट्रीय शिक्षा नीति देश में कृषि शिक्षा प्रणाली को मजबूत करेगी। राष्ट्रीय कृषि शिक्षा नीति की विशेषताओं के निष्पादन के लिए रणनीति के प्रकाशित होने पर मैं सभी को बधाई देती हूँ। नई कृषि शिक्षा नीति के कार्यान्वयन हेतु ये दस्तावेज देश में कृषि शिक्षा से जुड़े सभी लोगों के लिए मद्दगार साबित होगा।

(शोभा करांदलाजे)

Delhi Office : Room No. 332, 'A' Wing, Krishi Bhawan, Dr. Rajendra Prasad Road, New Delhi-110 001
Tel. : +91-11-23383975/76 **Fax :** +91-11-23383971, **E-mail :** mos.shobha.agri@gmail.com
Residence : 101, Narmada Apartments, Dr. B. D. Marg, New Delhi-110 001

भाकृअनुप
ICAR

त्रिलोचन महापात्र, पीएच.डी.
सचिव एवं महानिदेशक

TRILOCHAN MOHAPATRA, Ph.D.
SECRETARY & DIRECTOR GENERAL

भारत सरकार
कृषि अनुसंधान और शिक्षा विभाग एवं
भारतीय कृषि अनुसंधान परिषद
कृषि एवं किसान कल्याण मंत्रालय, कृषि भवन, नई दिल्ली 110 001

GOVERNMENT OF INDIA
DEPARTMENT OF AGRICULTURAL RESEARCH & EDUCATION
AND
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
MINISTRY OF AGRICULTURE AND FARMERS WELFARE
KRISHI BHAVAN, NEW DELHI 110 001
Tel.: 23382629; 23386711 Fax: 91-11-23384773
E-mail: dg.icar@nic.in

FOREWORD

The New Education Policy-2020 (NEP-2020) of India provides an opportunity and has opened the gateway to introduce various changes in the education system, including higher agricultural education. Pursuant to the decision of implementation of NEP-2020 by the Central Govt., a national level Committee was constituted by the ICAR to develop an implementation strategy to comply with various provisions of NEP-2020. In this direction, several meetings and consultations were held to deliberate with various stakeholders, and based on the principles and philosophy of NEP-2020, a road map and Implementation Strategy for NEP-2020 in Agricultural Education System has been prepared. The Report presents the implementation strategies of NEP-2020 in the agricultural education system of the country regulated and supported by Indian Council of Agricultural Research. The proposed changes include transformation in institutional structure as new form of multidisciplinary research-intensive Higher Education Institutions (HEis), suitably revising course curricula, modifying academic structure of degrees/diplomas/certificate system, introduction of credit banking system, partnerships among HEis, universities, industry and other stakeholders while continuing the focus on teaching, research and extension systems. Most uniquely, the Report addresses the issue of sufficient fund flow to implement the NEP-2020 by keeping a provision so that AUs get qualified for receiving funds under Rashtriya Uchchatar Shiksha Abhiyan (RUSA) scheme being operated by the Ministry of Education, Government of India. I hope, the Implementation Strategy suggested by the Committee shall lead to a complete overhaul, and re energise the higher agricultural education system to overcome the challenges currently being faced in India and thereby, deliver high quality higher education with equity and inclusion.

It is my pleasure to acknowledge the guidance and the directions from Shri Narendra Singh Tomar Ji, Hon'ble Minister of Agriculture and Farmers Welfare, Government of India in timely convening the Vice-chancellors meeting to discuss the road map for implementation of the NEP-2020 in Agricultural Universities and in finalization of this report. The support and motivation of Shri Parshottam Rupala Ji, Han 'ble Minister of Fisheries, Animal Husbandry and Dairying (the then Hon'ble Minister of State for Agriculture and Farmers Welfare), Shri Kailash Chaudhary Ji, Hon 'ble Minister of State for Agriculture and Farmers Welfare, and Ms. Shobha Karandlaje Ji, Hon'ble Minister of State for Agriculture and Farmers Welfare, Government of India paved the way for wider discussion with students, teachers and Vice-Chancellors and timely completion of this report.

The Council is grateful to Dr. Tej Pratap, Vice-Chancellor GBPUA&T, Pantnagar, the Chairman of the Committee, for his guidance to align and contextualise the Report keeping in mind the overall goals and objectives of NEP-2020. The Council expresses its sincere thanks and gratitude to all the distinguished Committee Members for their deep indulgence and contributions to prepare the precious Report. I compliment Dr. R.C. Agrawal, Deputy Director General (Agricultural Education), ICAR and the National Convenor and his team for overall coordination of the meetings and bringing out this crisp Report timely.

Dated the 25th August, 2021
New Delhi

(T. MOHAPATRA)

भाकृअनुप
ICAR

PREFACE

A year ago, Government of India announced one of its most transformative public policy initiative-The National Education Policy (NEP)-2020. The policy envisions a complete overhaul and re-energising of the higher education system. The two main thrust of this policy regarding higher education system are: to end the fragmentation of higher education by transforming higher education institutions (HEI) into large multidisciplinary universities and colleges; and to reorient the academic structure in ways that includes vocational education in higher education at entry level. It is intended to provide opportunity to large number of students to undertake higher education of varying types; a certificate course, a diploma, a degree or a post graduate degree or Ph D. Also, students have been given much more freedom to complete their education both in terms of years as well as courses.

Agriculture Education in India is guided by National Agriculture Research and Education System (NARES) led by ICAR. There are set guidelines about academic system and academic standards that the system comprising of agriculture, horticulture and forestry, veterinary and fisheries universities, colleges and institutions of ICAR follow. There are central and state agriculture universities and deemed universities as well as colleges, departments within general universities who impart agriculture education. Implementing NEP within this system thus poses several challenges.

Two most important challenge are: (i) academic restructuring of course curricula so as to bring it in line with the NEP guidelines, and (ii) restructuring of universities and institutions to meet the requirements of large multidisciplinary universities. Issues of adequate number of quality faculty and high-quality research outputs to enhance institutional ranking are other challenges which each institution will face. Each institution related to agriculture education will have to prepare its Institutional Development Plan, say Institutional IDP-2035, presenting a vision of transformation process and its final shape. Finally, success of the implementation strategy hinges on ensuring availability of adequate funds and that each institution works out innovative ways of accessing different sources, public, private as well as generating its own resources.

Under the NEP-2020, ICAR has been designated as the Professional Standards Setting Body (PSSB) of Agriculture Education. As follow up to this, on Sep 9, 2020, ICAR set up a ten-member committee of Vice Chancellors of Agricultural,

Veterinary and Fisheries universities, as well as ICAR officials to formulate a strategy for implementing NEP in agriculture education in the country. The Committee gathered views of different stakeholders through wide ranging deliberations with vice-chancellors, students, Deputy Director Generals of ICAR, as well as held deep discussions amongst themselves. More information came in through these deliberations about institution specific as well as new ideas to meet the challenges. Gathered information helped the committee in making a better analysis of present situation and likely future scenarios. All this input has been used to formulate NEP-2020 implementation strategy in higher agricultural education. After approval of the strategy another major follow up task will be to redesign the course curricula by the Deans' Committee.

While thinking of the progress of implementation of NEP-2020, the first year of the NEP-2020 was challenging given that COVID-19 made all farm universities move to on line mode of education. It was already proposed in NEP-2020 to integrate on line mode with off line mode in due course but COVID-19, in one sense, forced the sudden change and institutions were successful in adopting on line teaching, exams and even admissions in some cases. There is hope that with a strategy for nation-wide smooth transition of farm education, agricultural education in India will be fully transformed to meet the future challenges.

However, as a note of caution we would like to state that the implementation of any policy requires enormous political will and leadership, bureaucratic support and coordination. There has to be a sense of acceptability that promotes participation among stakeholders. While the last year helped advance efforts on two counts i.e., preparing the strategy at the national level and implementing on line teaching on the ground, few bigger challenges waiting for redressal, that we wish to mention here.

One major challenge in implementing this strategy, as we see, is the absence of legislative backing and statutory support to NEP-2020. It may run the risk of inordinate delays and undermining its implementation. As agriculture education is supposed to be a state subject, unlike general education, in this context we also see a strong role of the state governments.

As all state agricultural universities are under state governments, and therefore unless state governments are brought on board for implementing the NEP-2020, farm universities will not be able to decide and implement key provisions of the

NEP implementation strategy (this document). The universities themselves will not be able to do this. In our view, unless the Ministry of Agriculture and Ministry of Education agree on a plan to bring states on board, as well as involve nation level bodies entrusted with NEP-2020 implementation, the bottleneck to implementation will remain strong.

Second major challenge, we see, is to ensure that farm universities and other institutions, implementing NEP-2020 are empowered to take complete ownership and assume leadership in the implementation of the NEP-2020. It is absolutely essential. The nature of policy implementation requires empowerment at the ground level and the NEP-2020 is no different. Here again, it is the states who would need to take the first steps to revise Acts and Statutes, bringing them in line with the NEP-2020 guidelines. As stakeholders, Central Govt, state Govts and the institutions, every one

need to take their roles and responsibilities seriously, ICAR and universities alone will not be able to do it.

On behalf of the committee, we hope that all stakeholders find this strategic framework for implementing NEP in agriculture education institutions useful. We present our best wishes to all stakeholders for successful implementation of NEP in their respective institutions.

(TEJ PARTAP)

Vice Chancellor, GB Pant University of Agriculture and technology,
Pantnagar
August 25,2021.

(RC Agrawal)

Member Secretary and Deputy Director General (Agril. Education)
Indian Council of Agricultural Research, New Delhi-110 012

"कृषि शिक्षा प्रणाली में राष्ट्रीय शिक्षा नीति-2020 के लिए कार्यान्वयन रणनीतियाँ" विकसित करने के लिए विशेषज्ञों की समिति

	डॉ तेज प्रताप Dr.Tej Pratap	कुलपति , गोविंद बल्लभ पंत कृषि एवं प्रौद्योगिकी विश्वविद्यालय, पंतनगर , उधमसिंह नगर उत्तराखंड (अध्यक्ष) Vice-Chancellor, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Udham Singh Nagar, Uttarakhand (Chairman)
	डॉ.बी. एस. ढिल्लों Dr. B.S. Dhillon	कुलपति, पंजाब कृषि विश्वविद्यालय, लुधियाना, पंजाब (सदस्य) Vice-Chancellor, Punjab Agricultural University, Ludhiana, Punjab (Member)
	डॉ ए. के. सिंह Dr A.K. Singh	निदेशक, भाकृअनुप- भारतीय कृषि अनुसंधान संस्थान, नई दिल्ली (सदस्य) Director, ICAR- Indian Agricultural Research Institute, New Delhi (Member)
	डॉ. वी. प्रवीण राव, Dr. V. Praveen Rao	कुलपति, प्रोफेसर जयशंकर तेलंगाना राज्य कृषि विश्वविद्यालय, प्रशासनिक कार्यालय, राजेंद्रनगर, हैदराबाद, तेलंगाना (सदस्य) Vice-Chancellor, Professor Jayashankar Telangana State Agricultural University, Administrative Office, Rajendranagar, Hyderabad, Telangana (Member)
	डॉ. आर.सी. श्रीवास्तव Dr. R. C. Srivastava	कुलपति, डॉ. राजेंद्र प्रसाद केंद्रीय कृषि विश्वविद्यालय, बिहार (सदस्य) Vice-Chancellor, Dr. Rajendra Prasad Central Agricultural University, Bihar (Member)

	डॉ गोपाल कृष्ण Dr Gopal Krishna	निदेशक, भाकृअनुप - केंद्रीय मत्स्य शिक्षा संस्थान, पंच मार्ग, यारी रोड, अंधेरी पश्चिम, मुंबई (सदस्य) Director, ICAR – Central Institute of Fisheries Education, Panch Marg, Yari Road, Andheri West, Mumbai (Member)
	डॉ. सी . बालचंद्रन Dr. C. Balachandran	कुलपति, तमिलनाडु पशु चिकित्सा और पशु विज्ञान विश्वविद्यालय, चेन्नई, तमिलनाडु (सदस्य) Vice-Chancellor, Tamil Nadu Veterinary and Animal Sciences University, Chennai, Tamil Nadu (Member)
	डॉ. (श्रीमती) पंकज मित्तल Dr. (Mrs) Pankaj Mittal	महासचिव, एसजी कार्यालय, भारतीय विश्वविद्यालय संघ (एआईयू), नई दिल्ली (सदस्य) Secretary General, SG Office, Association of Indian Universities (AIU), New Delhi (Member)
	डॉ आशीष मोतीराम पाटूरकर Dr. Ashish Motiram Paturkar	कुलपति, महाराष्ट्र पशु और मत्स्य विज्ञान विश्वविद्यालय, नागपुर, महाराष्ट्र (सदस्य) Vice-Chancellor, Maharashtra Animal & Fishery Sciences University, Nagpur, Maharashtra (Member)
	डॉ. आरसी अग्रवाल Dr. R.C Agrawal	उप महानिदेशक (कृषि शिक्षा), भारतीय कृषि अनुसंधान परिषद, नई दिल्ली (सदस्य संयोजक) Deputy Director General (Agril. Education), Indian Council of Agricultural Research, New Delhi, (Member Convener)

कार्यान्वयन रणनीति से संबंधित किसी भी जानकारी के लिए, कृपया सदस्य सचिव से ईमेल आईडी: ddg.edu@icar.gov.in, दूरभाष: +91-11-25841760 पर संपर्क करें।

For any information related to the implementation strategy, please contact the Member Secretary at the email id : ddg.edu@icar.gov.in, Tel: +91-11-25841760

विषय वस्तु

क. कार्यकारी सारांश

भारत की नई शिक्षा नीति-2020 (एनईपी-2020) ने उच्चतर कृषि शिक्षा प्रणाली सहित, भारत की शिक्षा प्रणाली में कई परिवर्तनों का प्रस्ताव किया है। राष्ट्रीय शिक्षा नीति-2020 (एनईपी-2020) के विभिन्न प्रावधानों की अनुपालना करने के लिए एक कार्यान्वयन कार्यनीति विकसित करने के लिए भाकृअप द्वारा राष्ट्रीय स्तर की एक समिति का गठन किया गया है। इस दिशा में, सभी हितधारकों के साथ विचार-विमर्श करने के लिए कई बैठकें आयोजित की गई थी और राष्ट्रीय शिक्षा नीति-2020 के सिद्धांतों और दर्शन के आधार पर एक योजना (रोड मैप) तैयार की गई है जिसमें राष्ट्रीय शिक्षा नीति-2020 के विभिन्न प्रावधानों की अनुपालना करने के लिए निम्नलिखित गतिविधियां प्रस्तावित हैं:

1. राष्ट्रीय शिक्षा नीति-2020 के अंतर्गत कृषि विश्वविद्यालयों का पुनर्गठन

- नीति के मुख्य बल के अनुसार, कृषि विश्वविद्यालयों/महाविद्यालयों को 3000 अथवा इससे अधिक छात्रों वाले बड़े बहु-विषयक (मल्टी डिसिप्लिनरी) विश्वविद्यालयों, महाविद्यालयों तथा उच्चतर शिक्षा संस्थानों के समूहों/ज्ञान केन्द्रों (नॉलेज हब्स) में रूपांतरित करके उच्चतर कृषि शिक्षा के विखंडन को समाप्त करने की सिफ़ारिश की गई है। कृषि शिक्षा की बहु-विषयकता के कैनवस में बुनियादी विज्ञानों, सामाजिक विज्ञानों तथा कृषि विज्ञानों की सम्बद्ध विधाओं के शैक्षणिक कार्यक्रम शामिल होंगे। इसलिए, भारतीय कृषि अनुसंधान परिषद- कृषि विश्वविद्यालय प्रणाली के अंतर्गत एकल धारा (सिंगल स्ट्रीम) विश्वविद्यालयों को कृषि पर ध्यान केन्द्रित रखते हुए वर्ष 2030 तक बहु-विषयक संस्थानों की ओर बढ़ने की आवश्यकता है।
- सार्वजनिक और प्राइवेट कार्यक्षेत्र दोनों में बहुत से सहबद्ध महाविद्यालय मौजूद हैं। राष्ट्रीय शिक्षा नीति-2020 के अनुसार, उन्हें उच्चतर शिक्षा के नए मानदंडों के अंतर्गत लाए जाने की आवश्यकता है। प्रस्तावित नीति के अनुसरण में, 2035 तक "सहबद्धता" को समाप्त करने के लिए विश्वविद्यालयों के साथ समन्वय में कार्य करने के लिए सामूहिक कदमों का प्रस्ताव किया गया है।
- उपलब्ध विशेषज्ञता और संसाधनों का लाभ उठाते हुए, भारतीय कृषि अनुसंधान परिषद के मानद विश्वविद्यालयों को बहु-विषयक अनुसंधान-गहन विश्वविद्यालयों में रूपांतरित करने के लिए आवश्यक कदम उठाए जाएंगे।

2. कृषि शिक्षा का शैक्षणिक पुनर्गठन

- बहुत से प्रवेश और निकासों की एक नवोन्मेषी प्रणाली के साथ और प्रमाणपत्र, डिप्लोमा, स्नातक-पूर्व डिग्री सामान्य अथवा डिग्री अनुसंधान तथा एक या दो वर्ष

की मास्टर्स की डिग्री प्रदान करने के विकल्पों के साथ शैक्षणिक कार्यक्रम ढांचे का पुनर्गठन किया जाना प्रस्तावित है। स्नातक-पूर्व और स्नातकोत्तर कार्यक्रमों की आवासीय आवश्यकताओं में छूट प्रदान की जाएगी ताकि इनसे बाहर जाने वाले / इनमें प्रवेश लेने वाले बिना किसी समय-सीमा के ऐसा कर सकें।

- राष्ट्रीय शिक्षा नीति के प्रावधानों के अनुसरण में स्नातक-पूर्व पाठ्यक्रम का पुनर्गठन करने के लिए भारतीय कृषि अनुसंधान परिषद द्वारा एक संकायाध्यक्ष (डीन) समिति गठित की जाए। मांग के आधार पर, विश्वविद्यालय स्नातक-पूर्व स्तर पर प्रवेश हेतु संख्या में वृद्धि कर सकते हैं ताकि प्रमाणपत्र/डिप्लोमा के साथ कुछेक छात्रों के छोड़ जाने से डिग्री ले कर उत्तीर्ण होने वाले छात्रों की संख्या बाधित न हो। साथ ही, वर्ष 2025 तक इस पुनर्गठित चार-वर्षीय स्नातक-पूर्व कार्यक्रम को कार्यात्मक बनाने के लिए कृषि विश्वविद्यालयों को समय दिया जाए। कृषि में एक वर्ष प्रमाणपत्र और दो वर्ष के डिप्लोमा पाठ्यक्रम के लिए प्रवेश हेतु पाठ्यक्रम और प्रवेश के पृथक मानदंड ईज़ाद किए जाएँ।
- स्नातकोत्तर कार्यक्रमों में, बहु-विषयक दृष्टिकोण को अपनाया जाना प्रस्तावित है जिसमें छात्र की इच्छा के अनुसार प्रमुख और गौण विषयों को चुनने का विकल्प हो। वांछित अनुभव प्राप्त करने के लिए तथा बहुत से संस्थानों/ विश्वविद्यालयों में संकाय की कमी का समाधान करने के लिए पीएच.डी. छात्रों के लिए अध्यापन असिस्टेंटशिप को प्रोत्साहित किया जाएगा।
- 2021-22 के शैक्षणिक सत्र से वार्षिक आधार पर न्यूनतम 10% सीटों की वृद्धि के साथ कृषि विश्वविद्यालयों में सकल नामांकन अनुपात (जीईआर) को बढ़ाने के लिए नीतिगत निदेश सूचीबद्ध किए गए हैं; स्नातक-पूर्व/ स्नातकोत्तर/ पीएच.डी. के लिए सभी कृषि विश्वविद्यालयों में छात्रों के दाखिले के लिए राष्ट्रीय परीक्षण एजेंसी (एनटीए) के माध्यम से भारतीय कृषि अनुसंधान परिषद द्वारा आयोजित साझी प्रवेश परीक्षा के अंकों का प्रयोग किया जा सकता है। स्नातक-पूर्व प्रवेश परीक्षा का आयोजन क्षेत्रीय भाषाओं में किया जाए और शिक्षा मंत्रालय के निदेशों के अनुसार एकेडेमिक बैंक ऑफ क्रेडिट्स (एबीसी) की अनुपालना की जाए।

3. कृषि शिक्षा के विनियमन में भाकृअप की भूमिका

- राष्ट्रीय शिक्षा नीति-2020 की सिफ़ारिशों के अनुसार, भारतीय कृषि अनुसंधान परिषद पाठ्यक्रम विकसित करने और कृषि शिक्षा के लिए अकादमिक मानक निर्धारित करने के लिए व्यावसायिक मानक निर्धारक निकाय (प्रॉफेशनल) स्टैंडर्ड सेटिंग बॉडी) के रूप में कार्य करेगी। प्रस्तावित सामान्य शिक्षा परिषद (जीईसी) के सदस्य के रूप में, भारतीय कृषि अनुसंधान परिषद कृषि विज्ञानों में अकादमिक

पाठ्यक्रम संचालित करने वाले सार्वजनिक और प्राइवेट दोनों प्रकार के संस्थानों में देश भर में एकसमान अकादमिक ढांचा तैयार करने के लिए आवश्यक कदम उठाएगी।

- जीईसी के सदस्य के रूप में, राष्ट्रीय उच्चतर शिक्षा विनियामक परिषद(एनएचईआरसी) के रूप में अधिनियमित किए जाने वाले एकल विनियामक निकाय, जो प्रस्तावित भारतीय उच्चतर शिक्षा आयोग का प्रथम स्तर(वर्टिकल) होगा, के माध्यम से भारतीय कृषि अनुसंधान परिषद कृषि शिक्षा के विनियमन में योगदान कर सकेगी।
- राष्ट्रीय शिक्षा नीति-2020 के अनुसार राष्ट्रीय प्रत्यायन परिषद (एनएसी) एक मेटा प्रत्यायन निकाय के रूप में कार्य करेगी और उपयुक्त संख्या में संस्थानों को मान्यता-प्राप्त प्रत्यायनकर्ता के रूप में कार्य करने का काम सौंपेंगी।
- राष्ट्रीय प्रत्यायन परिषद (एनएसी) द्वरा उपयुक्त संख्या में संस्थानों को मान्यता-प्राप्त प्रत्यायनकर्ता (एक्क्रीडेटर) के रूप में कार्य करने का काम दिया जाएगा। इस परिदृश्य में, भारतीय कृषि अनुसंधान परिषद के एनएईएबी को कृषि शिक्षा प्रदान करने वाले विश्वविद्यालयों/ महाविद्यालयों के प्रत्यायन के लिए एक प्रत्यायनकर्ता के रूप में मान्यता प्रदान की जाए।
- वैश्विक गुणवत्ता मानकों को बनाए रखकर "देश में ही अंतर्राष्ट्रीयकरण" (इंटरनेशनलाइज़ेशन एट होम) का लक्ष्य प्राप्त करने के लिए तथा और बड़ी संख्या में अंतर्राष्ट्रीय छात्रों को आकर्षित करने के लिए, विदेश से आने वाले छात्रों के स्वागत और उनको सहायता प्रदान करने से संबंधित सभी मामलों का समन्वय करने के लिए एक अंतर्राष्ट्रीय छात्र कार्यालय स्थापित किया जाएगा।
- उच्च गुणवत्तापूर्ण विदेशी संस्थाओं के साथ अनुसंधान/अध्यापन के सहयोग और संकाय/छात्रों का आदान-प्रदान सुगम बनाया जाएगा तथा विदेशों के साथ प्रासंगिक, परस्पर लाभप्रद समझौता ज्ञापनों पर हस्ताक्षर किए जाएंगे।
- गुणवत्तापूर्ण शिक्षा की उपलब्ध वैकल्पिक विधियों के साथ, हमें शिक्षा की परंपरागत तथा व्यक्तिगत विधियों के अनुपूरण/उन्हें समृद्ध बनाने की आवश्यकता है।
- ई-शिक्षण के विद्यमान मंचों जैसे स्वयं, दीक्षा, स्वयंप्रभा आदि का लाभ उठाने तथा कृषि और सम्बद्ध विज्ञानों में ई-पाठ्यक्रम विकसित करने के लिए आवश्यक कदम उठाए जाने चाहिए।
- महामारी की वर्तमान स्थिति में ऑनलाइन कक्षाएं आयोजित करने के लिए दो-तरफा वीडियो और आडियो इंटरफ़ेस जैसे उपकरण विशेष रूप से आवश्यक हैं तथा उनकी पहुँच पूरे विश्व में होती है।

ख. राष्ट्रीय शिक्षा नीति-2020 के अंतर्गत कृषि शिक्षा की अवधारणा

1. रिपोर्ट की पृष्ठभूमि

भारत की राष्ट्रीय शिक्षा नीति-2020 (एनईपी-2020) में भारत की शिक्षा प्रणाली में उच्चतर कृषि शिक्षा प्रणाली सहित कई परिवर्तनों का प्रस्ताव किया गया है। यह रिपोर्ट भारतीय कृषि अनुसंधान परिषद (आईसीएआर) द्वारा विनियमित और समर्थित देश की कृषि शिक्षा प्रणाली में राष्ट्रीय शिक्षा नीति-2020 (एनईपी-2020) के कार्यान्वयन की कार्यनीतियों को प्रस्तुत करती है। इन परिवर्तनों में शिक्षण, अनुसंधान तथा विस्तार प्रणालियों को शामिल करते हुए कृषि शिक्षा पर फोकस को जारी रखते हुए संस्थागत ढांचे को बहु-विषयक अनुसंधान-गहन उच्च शिक्षा संस्थाओं, पाठ्यक्रम, डिग्रियों/डिप्लोमा/प्रमाणपत्र प्रणाली, क्रेडिट बैंकिंग प्रणाली, उच्चतर शिक्षा संस्थानों, विश्वविद्यालयों, उद्योग जगत तथा अन्य हितधारकों के बीच साझेदारी के एक नए रूप में रूपांतरित करना शामिल है। राष्ट्रीय शिक्षा नीति-2020 भारत में उच्चतर शिक्षा प्रणाली के समक्ष इस समय प्रस्तुत चुनौतियों से निबटने के लिए उच्चतर शिक्षा प्रणाली का सम्पूर्ण कायापलट और इसे पुनरूरजीकृत करने और इस प्रकार न्याय-साम्यता (इक्विटी) एवं समावेशन के साथ उच्च-गुणवत्तापूर्ण उच्चतर शिक्षा प्रदान करने की कल्पना करती है।

राष्ट्रीय शिक्षा नीति-2020 ने वर्तमान उच्चतर शिक्षा प्रणाली, जिसमें कृषि शिक्षा प्रणाली भी शामिल है, में निम्नलिखित प्रमुख परिवर्तनों की सिफ़ारिश की है:

क. प्रत्येक जिले में अथवा उसके निकट ऐसे न्यूनतम एक बहु-विषयक विश्वविद्यालय/ महाविद्यालय के साथ और भारत भर में और अधिक संख्या में उच्चतर शिक्षा संस्थानों के साथ जो स्थानीय/भारतीय भाषाओं में शिक्षा/ कार्यक्रम प्रस्तुत करते हों, बहु-विषयक विश्वविद्यालयों/महाविद्यालयों की दिशा में आगे बढ़ना;

ख. और अधिक बहु-विषयक स्नातक-पूर्व शिक्षा की दिशा में बढ़ना;

ग. संकाय और संस्थागत स्वायत्तता की ओर बढ़ना;

घ. छात्रों के अनुभवों में वृद्धि करने के लिए पाठ्यक्रम, अध्यापन-शास्त्र, आकलन और छात्र सहायता में सुधार करना;

ङ योग्यता-आधारित नियुक्तियों और अध्यापन, अनुसंधान और सेवा के आधार पर कैरियर की प्रगति के माध्यम से संकाय और संस्थागत नेतृत्व के पदों की सत्यनिष्ठा को सिद्ध करना;

च. विश्वविद्यालयों और महाविद्यालयों को सहकर्मियों (पीयर्स) द्वारा समीक्षा किए गए अनुसंधान हेतु निधियाँ उपलब्ध करवाने के लिए एक राष्ट्रीय अनुसंधान फ़ाउंडेशन की स्थापना;

छ. उच्च योग्यता प्राप्त स्वतंत्र बोर्डों, जिनके पास शैक्षणिक तथा प्रशासनिक स्वायत्तता हो, द्वारा उच्चतर शिक्षा संस्थानों का अभिशासन (गवर्नेंस);

ज. उच्चतर शिक्षा के लिए एकल विनियामक द्वारा "हल्का लेकिन कठोर विनियमन;

झ. बहुत से उपायों के माध्यम से जिनमें उत्कृष्ट सार्वजनिक शिक्षा के लिए और अधिक अवसर, वंचित तथा समाज के कमजोर वर्ग के छात्रों को प्राइवेट/परोपकारी विश्वविद्यालयों द्वारा छात्रवृत्तियाँ, ऑनलाइन शिक्षा तथा खुला दूरस्थ शिक्षण (ओडीएल) शामिल हैं, बढ़ी हुई पहुँच, न्याय-साम्यता (इक्विटी) तथा समावेशन; और विकलांगता से पीड़ित छात्रों की सभी अवसंरचना और शिक्षण सामग्री तक पहुँच और इसकी उपलब्धता हो।

राष्ट्रीय कृषि अनुसंधान और शिक्षा प्रणाली (एनएआरईएस) में राष्ट्रीय शिक्षा नीति-2020 के कार्यान्वयन के लिए, भारतीय कृषि अनुसंधान परिषद ने दिनांक 26 अगस्त, 2020 को माननीय कृषि और किसान कल्याण मंत्री, भारत सरकार श्री नरेंद्र सिंह तोमर की अध्यक्षता में एक वेबिनार का आयोजन किया था। श्री परषोत्तम रूपाला तथा श्री कैलाश चौधरी, माननीय कृषि और किसान कल्याण राज्य मंत्री, भारत सरकार; डॉ॰ त्रिलोचन महापात्र, सचिव(डेयर) तथा महानिदेशक (भाकृअप), कृषि विश्वविद्यालयों के कुलपति और उनके अधिकारी, भाकृअप के शिक्षा प्रभाग के अधिकारी; राष्ट्रीय शिक्षा नीति - 2020 की मुख्य टीम से विशिष्ट आमंत्रित तथा एसोसिएशन ऑफ इंडियन यूनिवर्सिटीज़ (एआईयू), विश्वविद्यालय आयोग तथा इंडियन एग्रीकल्चरल यूनिवर्सिटीज़ एसोसिएशन (आईएयूए) के प्रतिनिधियों ने इस वेबिनार में प्रतिभागिता की तथा राष्ट्रीय शिक्षा नीति-2020 और भाकृअप की भूमिका पर अपने विचार साझा किए। माननीय कृषि और किसान कल्याण मंत्री ने सलाह दी कि उच्चतर कृषि शिक्षा प्रणाली के अंतर्गत राष्ट्रीय शिक्षा नीति-2020 के कार्यान्वयन से संबंधित सभी मुद्दों पर विचार-विमर्श करने के लिए विशेषज्ञों की एक समिति गठित की जाए और भाकृअप द्वारा विनियमित तथा समर्थित राष्ट्रीय कृषि अनुसंधान और शिक्षा प्रणाली (एनएआरईएस) में इसके कार्यान्वयन के लिए एक योजना (रोडमैप) तैयार की जाए। भारतीय कृषि अनुसंधान परिषद को गुणवत्तापूर्ण मानव संसाधन विकास को संभव बनाने के लिए देश में उच्चतर कृषि शिक्षा को विनियमित, सहायता प्रदान करने तथा समन्वय करने का अधिदेश दिया गया है।

तद्नुसार, दिनांक 09 सितंबर, 2020 के कार्यालय आदेश संख्या ईडीएन.5/14/2020-ईक्यूआर/ईडीएन के माध्यम से निम्नलिखित राष्ट्रीय स्तर की समिति का गठन किया गया था:

क्र.सं.	नाम	पदनाम
1.	डॉ॰ तेज प्रताप	कुलपति, गोविंद बल्लभ पंत यूनिवर्सिटी ऑफ एग्रीकल्चर एंड टेक्नोलॉजी, पंतनगर, उधमसिंह नगर-263145 उत्तराखंड (अध्यक्ष)
2.	डॉ॰ बी॰एस॰ ढिल्लों	कुलपति, पंजाब कृषि विश्वविद्यालय, लुधियाना, पंजाब (सदस्य)
3.	डॉ॰ ए॰के॰सिंह	निदेशक, भाकृअप-भारतीय कृषि अनुसंधान संस्थान, नई दिल्ली (सदस्य)
4.	डॉ॰ वी॰ प्रवीण राव	कुलपति, प्रोफेसर जयशंकर तेलंगाना स्टेट एग्रीकल्चरल यूनिवर्सिटी, प्रशासनिक कार्यालय, राजेंद्रनगर, हैदराबाद-500030, तेलंगाना (सदस्य)
5.	डॉ॰ आर॰सी॰ श्रीवास्तव	कुलपति, आरपीसीएयू, समस्तीपुर, बिहार (सदस्य)
6.	डॉ॰गोपाल कृष्ण	निदेशक, भाकृअप- केंद्रीय मात्स्यिकी शिक्षा संस्थान, पंच मार्ग, यारी रोड, अंधेरी पश्चिम, मुंबई 400061 (सदस्य)
7.	डॉ॰ सी॰ बालचंद्रन	कुलपति, टीएएनयूवीएएस, चेन्नई, तमिलनाडु (सदस्य)
8.	डॉ॰ (श्रीमती) पंकज मित्तल	महासचिव, महा सचिव कार्यालय, (सदस्य), एसोसिएशन ऑफ इंडियन यूनिवर्सिटीज़ (एआईयू), नई दिल्ली (सदस्य)
9.	डॉ॰आशीष मोतीराम पातुरकर	कुलपति, एमएएफएसयू, नागपुर, महाराष्ट्र (सदस्य)
10.	डॉ॰ आर॰सी॰अग्रवाल	उप महानिदेशक (कृषि शिक्षा) भाकृअप-, नई दिल्ली (संयोजक सदस्य)

विशेष आमंत्रित

1. डॉ॰ जी॰ वेंकटेशवरलु, सहायक महानिदेशक (ईक्यूए एंड आर),शिक्षा प्रभाग, भाकृअप, नई दिल्ली
2. डॉ॰ एस॰ के॰ सांख्यान, प्रधान वैज्ञानिक, कृषि शिक्षा प्रभाग, भाकृअप, नई दिल्ली
3. डॉ॰ प्रभात कुमार, राष्ट्रीय समन्वयक, सीएएएसटी तथा घटक-2, एनएएचईपी, भाकृअप, नई दिल्ली

विचारार्थ विषय

1. शिक्षा/अनुसंधान/विस्तार की वर्तमान स्थिति में उच्चतर कृषि शिक्षा की अपेक्षाओं का आकलन करना तथा इनकी सिफ़ारिश करना तथा राष्ट्रीय शिक्षा नीति-2020 के अंतर्गत कृषि शिक्षा को चिकित्सा और कानूनी शिक्षा की श्रेणियों में शामिल करने के लिए सुझाव।

2. राज्य कृषि विश्वविद्यालयों में कृषि शिक्षा के संवैधानिक प्रावधान के मुद्दों, जो राज्य सूची के अंतर्गत है, पर विचार-विमर्श करना।

3. राष्ट्रीय शिक्षा नीति-2020 की सिफ़ारिशों के साथ आगे बढ़ने के लिए भाकृअप के लिए रोडमैप का सुझाव देना।

4. समिति द्वारा वांछित और कोई बिन्दु।

2. राष्ट्रीय शिक्षा नीति-2020 (एनईपी-2020) के सिद्धान्त

शिक्षा प्रणाली का उद्देश्य ऐसे अच्छे मानव विकसित करना है जिनमें तार्किक सोच और कार्य करने की योग्यता हो, करुणा और सहानुभूति, साहस तथा अनुकूलनशीलता, वैज्ञानिक मनोवृत्ति और सृजनात्मक कल्पना-शक्ति हो और इसके साथ सुदृढ़ नैतिक संस्कार और मूल्य हों। इसका उद्देश्य हमारे संविधान द्वारा परिकल्पित एक न्यायसंगत, समावेशी तथा बहुलवादी (प्लूरल) समाज का निर्माण करने के लिए प्रवृत्त, उत्पादक तथा योगदान करने वाले नागरिक तैयार करना है।

एक अच्छा शैक्षणिक संस्थान वह संस्थान है जिसमें प्रत्येक छात्र अपने को स्वागत और देखभाल के योग्य महसूस करे, जहां एक सुरक्षित और प्रेरणादायक शिक्षण का वातावरण विद्यमान हो, जहां व्यापक शिक्षण अनुभव उपलब्ध करवाए जाते हों, और जहां शिक्षण के लिए अनुकूल अच्छी भौतिक अवसंरचना और उपयुक्त संसाधन सभी छात्रों को उपलब्ध हों। ऐसे गुण मन में बैठाना प्रत्येक शैक्षणिक संस्थान का लक्ष्य होना चाहिए। तथापि, साथ-साथ ही, सभी संस्थानों तथा शिक्षा के सभी चरणों में निर्बाध संघटन और समन्वय भी अवश्य होना चाहिए।

यह राष्ट्रीय शिक्षा नीति-2020 भारतीय लोकाचार पर आधारित एक ऐसी शिक्षा प्रणाली की कल्पना करती है जो सभी को उच्च-गुणवत्तापूर्ण शिक्षा प्रदान करके इंडिया अर्थात भारत को एक न्याय-संगत तथा जीवंत ज्ञान आधारित समाज में रूपांतरित करने में प्रत्यक्ष योगदान करती है और इस प्रकार भारत को ज्ञान की वैश्विक महाशक्ति बनाती है। इस नीति में प्रस्ताव है कि हमारे संस्थानों के पाठ्यक्रम और अध्यापन-शास्त्र छात्रों में मौलिक कर्तव्यों और संवैधानिक मूल्यों के प्रति आदर का एक गहन भाव, अपने देश से जुड़ाव और बदलते विश्व में अपनी भूमिकाओं और जिम्मेदारियों के प्रति एक सचेत जागरूकता अवश्य विकसित करें।

राष्ट्रीय शिक्षा नीति-2020 की व्यवस्था में उच्चतर कृषि शिक्षा प्रणाली तथा व्यक्तिगत संस्थानों का मार्गदर्शन करने वाले मौलिक सिद्धान्त निम्नानुसार हैं:

- शैक्षणिक और गैर-अकादमिक दोनों क्षेत्रों में प्रत्येक छात्र के समग्र विकास को बढ़ावा देने के लिए अध्यापकों और माता-पिता को सुग्राहीकृत करके **प्रत्येक छात्र की विशिष्ट योग्यताओं को मान्यता देना, उनकी पहचान करना और उनका पोषण करना**;

- **लचीलापन,** ताकि शिक्षार्थियों में अपने शिक्षण के प्रक्षेपण पथ (ट्राजेक्टरी) और कार्यक्रमों को चुनने की योग्यता हो और इस प्रकार वे अपनी प्रतिभाओं और रुचियों के अनुसार जीवन में अपने मार्ग स्वयं चुन सकें;
- **कला और विज्ञान के बीच,** पाठ्यक्रम और पाठ्येतर गतिविधियों के बीच, व्यावसायिक और शैक्षणिक धाराओं आदि के बीच कोई बहुत सख्त अलगाव न हो ताकि शिक्षण के विभिन्न क्षेत्रों के बीच हानिकारक अनुक्रमों और साइलोज़ को समाप्त किया जा सके;
- एक बहु-विषयक विश्व के लिए विज्ञानों, सामाजिक विज्ञानों, कला, मानविकी और खेलों के बीच **बहु-विषयक तथा समग्र शिक्षा** ताकि सब प्रकार के ज्ञान की एकता और अखंडता सुनिश्चित की जा सके;
- रटना सीखने और परीक्षाओं के लिए ज्ञानार्जन करने की बजाय **अवधारणा की समझ पर ज़ोर;**
- तर्क-संगत निर्णय लेने और नवोन्मेष के लिए सृजनात्मक तथा विवेचनात्मक सोच;
- करुणा, दूसरों के लिए आदर, शिष्टता, लोकतान्त्रिक भावना, सेवा का भाव, वैज्ञानिक मनोवृत्ति, स्वाधीनता, ज़िम्मेदारी, बहुलवाद (प्लूरलिस्म), समानता, न्याय तथा सार्वजनिक संपति के लिए स्वच्छता और आदर जैसे **आचार-विचार एवं मानव तथा संवैधानिक मूल्य;**
- अध्यापन और शिक्षण में **बहु-भाषावाद तथा भाषा की शक्ति को बढ़ावा देना;**
- सम्प्रेषण, सहयोग, टीम कार्य तथा अनुकूलनशीलता जैसे **जीवन-कौशल;**
- **सारांशित (सम्मेटिव) आकलन जो आज की 'कोचिंग संस्कृति" को बढ़ावा देता है, के स्थान पर नियमित रचनात्मक आकलन पर ध्यान केन्द्रित करना**
- **अध्यापन और शिक्षण में प्रौद्योगिकी का व्यापक उपयोग,** भाषा की सीमाओं को हटाना, दिव्यांग छात्रों के लिए पहुँच को बढ़ाना तथा शैक्षणिक आयोजना और प्रबंधन
- सभी पाठ्यक्रमों, अध्यापन-शास्त्र तथा नीति में **विविधता के लिए आदर और स्थानीय विषय-वस्तु (संदर्भ) के लिए आदर;**
- यह सुनिश्चित करने के लिए कि सभी छात्र शिक्षा प्रणाली में प्रगति कर सके, **पूर्ण न्याय-संगति तथा समावेश** शिक्षा से जुड़े सभी निर्णयों की आधार-शिला होनी चाहिए।
- शुरुआती बचपन में देखभाल और शिक्षा से स्कूली शिक्षा और उससे आगे उच्चतर शिक्षा तक **शिक्षा के सभी चरणों पर पाठ्यक्रम में तालमेल**

- **अध्यापक और संकाय शिक्षण प्रक्रिया के केंद्र के रूप में-** उनकी भर्ती, सतत व्यावसायिक विकास, सकारात्मक कार्य परिवेश और सेवा की शर्तें;
- स्वायत्तता, अच्छे शासन, और सशक्तिकरण के माध्यम से नवोन्मेष और लीक से हट कर सोच को प्रोत्साहित करते हुए लेखा परीक्षा तथा सार्वजनिक प्रकटीकरण के माध्यम से **शिक्षा प्रणाली की सत्य-निष्ठा, पारदर्शिता तथा संसाधनों की दक्षता सुनिश्चित करने के लिए एक "हल्का लेकिन कठोर" विनियामक ढांचा;**
- उत्कृष्ट शिक्षा और विकास के लिए **एक सह-शर्त के रूप में उत्कृष्ट अनुसंधान;**
- अनवरत अनुसंधान के आधार पर प्रगति की सतत समीक्षा तथा शिक्षा विशेषज्ञों द्वारा नियमित आकलन;
- भारत और इसकी समृद्ध, विविध, प्राचीन और आधुनिक संस्कृति और ज्ञान प्रणालियों और परम्पराओं की **सुदृढ़ता और उन पर गर्व;**
- **शिक्षा एक सार्वजनिक सेवा है,** गुणवत्तापूर्ण शिक्षा तक पहुँच अवश्य ही प्रत्येक बच्चे का मूलभूत अधिकार होना चाहिए।
- **एक मजबूत, जीवंत सार्वजनिक शिक्षा प्रणाली में पर्याप्त निवेश** तथा वास्तविक परोपकारी और सामुदायिक सहभागिता को प्रोत्साहन और सुगमता।

3. कृषि शिक्षा को रूपांतरित करने के लिए राष्ट्रीय शिक्षा नीति-2020 का विज़न

3.1 राष्ट्रीय शिक्षा नीति-2020 कृषि शिक्षा और सम्बद्ध विधाओं (डिसिप्लिन्स) के बीच संयोजनों को मजबूत करने का आह्वान करती है। स्टैंड-अलोन कृषि विश्वविद्यालयों को बहु -विषयक संस्थान बनने की आवश्यकता है जो समग्र, बहु-विषयक शिक्षा प्रदान करते हों, व्यावसायिक (एक विषय की) अथवा सामान्य कृषि शिक्षा प्रदान करने वाले संस्थानों का उद्देश्य वर्ष 2030 तक निर्बाध रूप से दोनों की शिक्षा प्रदान करने वाले संस्थानों/समूहों के रूप में व्यवस्थित और क्रमिक तौर पर विकसित होना होगा, जिसका अभिप्राय है कि उन्हें कृषि पर ध्यान केन्द्रित रखते हुए बहू-विषयक अनुसंधान-गहन संस्थानों में बदलना होगा।

3.2 राष्ट्रीय शिक्षा नीति-2020 में कहा गया है कि सामान्य शिक्षा के साथ समन्वित कार्यक्रमों के माध्यम से कृषि और पशु-चिकित्सा विज्ञानों में पेशेवरों की तैयारी को बढ़ाना होगा। सबसे महत्वपूर्ण है कि राष्ट्रीय शिक्षा नीति-2020 ने निर्दिष्ट किया है कि **" कृषि शिक्षा का डिज़ाइन पेशेवर विकसित करने की दिशा में सुदृढ़ करना होगा"** जो घट रही लाभप्रदता तथा/अथवा उत्पादकता परंतु किसानों की बढ़ी हुई आर्थिक आकांक्षाओं, जलवायु परिवर्तन, खाद्य आत्म-निर्भरता आदि के महत्वपूर्ण मुद्दों का संज्ञान लेते हुए

स्थानीय भाषा, परंपरागत ज्ञान और उभरती प्रौद्योगिकियों को समझने की क्षमता रखते हों और उसका प्रयोग कर सकें।

3.3 एक और महत्वपूर्ण मानदंड जिसकी कल्पना राष्ट्रीय शिक्षा नीति-2020 में कृषि शिक्षा प्रदान करने वाले कृषि शिक्षा विश्वविद्यालयों और महाविद्यालयों के लिए की गई है, वह यह है कि कृषि शिक्षा को स्थानीय समुदायों को प्रत्यक्ष तौर पर अवश्य लाभ पहुंचाना चाहिए।

3.4 इसलिए, विद्यमान संस्थानों को स्वयं को पुन: खोजने की आवश्यकता है और एक चरणबद्ध ढंग से पर्याप्त निधियों, कानूनी तौर पर सक्षम बनाए जाने और स्वायत्ता प्रदान किए जाने पर उनका ढांचा कई प्रकार के क्रमिक विकास से गुजरेगा। इसके परिणामस्वरूप, विश्वविद्यालयों को संस्थागत उत्कृष्टता, उनके स्थानीय समुदायों के साथ जुड़ाव और जबाबदेही के प्रति प्रतिबद्धता का प्रदर्शन करना होगा।

3.5 जैसा कि एनईपी-2020 में परिकल्पना की गई है, प्रत्येक कृषि विश्वविद्यालय/ उच्च कृषि शिक्षा संस्थान को कार्यनीतिक संस्थागत विकास योजना (आईडीपी) तैयार करनी है, जिसमें एनईपी-2020 दस्तावेज में सभी उच्च शिक्षा संस्थानों द्वारा उठाए जाने वाले सूचीबद्ध कदमों की मदों सहित परन्तु असीमित, सामाजिक-आर्थिक दृष्टि से वंचित समूह (एसईडीजी) से सहभागिता बढ़ाने के संबंध में कार्रवाई करने के लिए विशिष्ट योजनाएं शामिल हो। आईडीपी के आधार पर, विश्वविद्यालय अपने चरणबद्ध विकास के कार्यकलापों की योजना बनाएगा, स्वयं की प्रगति का मूल्यांकन करेगा और आईडीपी में निर्धारित लक्ष्यों को प्राप्त करेगा। इस प्रकार से आईडीपी और अधिक निधियन प्राप्त करने और उच्च रेंक प्राप्त करने हेतु एक महत्वपूर्ण मापदंड होगा। समग्र आयोजना और एक स्पष्ट विजन के लिए, एनईपी-2020 में सुझाव दिया गया है कि आईडीपी बोर्ड के सदस्यों, संस्थागत प्रमुखों अर्थात् डीन, निदेशक, एचओडी, संकाय, विद्यार्थियों और कर्मचारियों की संयुक्त सहभागिता से तैयार की जानी चाहिए।

4. भारत में कृषि शिक्षा प्रणाली की बृद्धि एवं विकास

4.1 भारत में औपचारिक कृषि अनुसंधान एवं शिक्षा की शुरूआत, इंपीरियल एग्रीकल्चर रिसर्च इंस्टिट्यूट (आईएआरआई) और कानपुर, नागपुर, कोयम्बतूर, पुणे और साबोर में कृषि महाविद्यालयों की स्थापना के साथ 20वीं शताब्दीं के आरंभ में हुई। वर्ष 1923 में, दो वर्षीय स्नातकोत्तर पाठ्यक्रम वाले आईएआरआई के डिप्लोमा ऑफ एसोशिएटशिप की शुरूआत की गई। स्वतंत्रता के तुरंत बाद, भारत सरकार ने डॉ. एस. राधाकृष्णन की

अध्यक्षता में एक विश्वविद्यालय शिक्षा आयोग का गठन किया। इस आयोग की सिफारिशों ने भारत में उच्च शिक्षा के भविष्य के निर्माण में अत्यधिक सहायता की और भारत में कृषि संबंधी विश्वविद्यालयों की स्थापना के लिए आधार तैयार किया।

4.2 यूएसए के लैंड ग्रांट कॉलेज के पैटर्न पर देश के विभिन्न राज्यों में कृषि विश्वविद्यालयों की स्थापना के लिए पहली और दूसरी संयुक्त इंडो-अमेरिकन टीम की सिफारिश की गई। एक ऐतिहासिक निर्णय में, भारतीय कृषि अनुसंधान संस्थान, नई दिल्ली को वर्ष 1958 में भारत के पहले मानद विश्वविद्यालय के रूप में घोषित किया गया। इसने कृषि क्षेत्र में एम.एससी. और पी.एचडी. की डिग्रियों के लिए स्नातकोत्तर शिक्षा प्रदान करना आरंभ किया। यह भारत में उच्च कृषि शिक्षा की पहचान एवं आधुनिकीकरण की शुरूआत थी।

4.3 इसी का अनुकरण करते हुए, वर्ष 1960 में पंतनगर में पहले कृषि विश्वविद्यालय की स्थापना की गई। इसके बाद, 60वें दशक के आरंभ और मध्य में भुवनेश्वर, लुधियाना, हैदराबाद, जबलपुर और बैंगलोर में राज्य कृषि विश्वविद्यालयों (एसएयू) की स्थापना की गई। आज भारत में 74 कृषि विश्वविद्यालय हैं, इनमें से 3 केन्द्रीय कृषि विश्वविद्यालय, 63 राज्य कृषि विश्वविद्यालय (एसएयू), 4 मानद विश्वविद्यालय और 4 कृषि संकायों सहित केन्द्रीय विश्वविद्यालय हैं। जबकि कई कृषि विश्वविद्यालयों में अनेक महाविद्यालय, विषय-वस्तु-क्षेत्र और डिग्री कार्यक्रम हैं, परंतु पशुचिकित्सा विश्वविद्यालय, बागवानी विश्वविद्यालय और मात्स्यिकी विश्वविद्यालय जैसे एकल विषय-वस्तु-क्षेत्र वाले विश्वविद्यालय भी हैं।

4.4 जबकि कृषि विश्वविद्यालयों की उपर्युक्त सभी श्रेणियां आईसीएआर अग्रणीत एनएआरईएस के अधिकार-क्षेत्र में आती हैं, तब कई राज्यों में सरकारी और निजी कृषि महाविद्यालय भी हैं। ये या तो कृषि विश्वविद्यालयों से या सामान्य विश्वविद्यालयों से सम्बद्ध हैं। वे कृषि महाविद्यालय, जो सामान्य विश्वविद्यालयों से सम्बद्ध हैं, वे एनएआरईएस के अंतर्गत आने वाले कृषि विश्वविद्यालयों के 4-वर्षीय डिग्री पाठ्यक्रम की तुलना में तीन-वर्षीय डिग्री पाठ्यक्रम (बी.एससी. 3 वर्ष) उपलब्ध करवा रहे हैं।

4.5 आईसीएआर द्वारा समन्वित और निर्देशित यह प्रणाली देश में अन्य विश्वविद्यालयों से भिन्न है। सामान्य और तकनीकी विश्वविद्यालयों की तुलना में, कृषि विश्वविद्यालयों का फोकस अलग है, चूंकि यहां शिक्षण, अनुसंधान और विस्तार कार्यकलापों का एकीकरण है। यह उनके उद्देश्यों में स्पष्ट रूप से दर्शाया गया है, जिनकी सूची नीचे दी गई है:

- कृषि और समवर्गी विज्ञानों में उच्च शिक्षा प्रदान करना;

- अनुसंधान अध्ययनों के माध्यम से वैज्ञानिक प्रगति को बढ़ावा देना;
- राज्य सरकारों के विस्तार पदाधिकारियों के लिए एक मॉडल के रूप में सेवाएं प्रदान करने के लिए विस्तार कार्यक्रमों का आयोजन करना (आमतौर पर एक राज्य या उसका भाग)।
- कृषि विकास के संबंध में समग्र नेतृत्व प्रदान करना

4.6 उपर्युक्त उद्देश्यों को प्राप्त करने के लिए, सभी कृषि विश्वविद्यालयों (एयू), जिनमें एसएयू, सीएयू (केन्द्रीय कृषि विश्वविद्यालय) और मानद विश्वविद्यालय (डीयू) शामिल हैं, में विश्वविद्यालय प्रशासन और प्रबंधन के सभी स्तरों पर एकीकृत शिक्षण, अनुसंधान और विस्तार की व्यवस्था है विशेषकर:

- शिक्षा, अनुसंधान और विस्तार कार्यक्रमों के विकास में बहुविध विषय-वस्तु टीम वर्क के साथ महाविद्यालयों, अनुसंधान केन्द्रों, अखिल भारतीय समन्वित अनुसंधान परियोजना (एआईसीआरपी) केन्द्र, कृषि विज्ञान केन्द्र (केवीके) और निदेशालयों का एकीकृत प्रशासन और पूरकता।
- किसानों और खेती की सेवा के दर्शन के साथ कार्य करना, जो उन कार्यक्रमों पर बल देते हैं जो सीधे और तत्काल उनकी समस्याओं को हल करने से संबंधित हैं।
- उत्पादन प्रौद्योगिकी और समवर्गी व्यावसायों में अपनाने हेतु, कक्षा में विद्यार्थियों, विस्तार कामगारों, किसानों, और ग्रामीण युवाओं को नई जानकारी और सूचना का तीव्रता के साथ समप्रेषण।

4.7 आईसीएआर मॉडल अधिनियम

इस तथ्य को ध्यान में रखते हुए कि प्रभावी कामकाज के लिए कृषि विश्वविद्यालयों की विशिष्ट आवश्यकताएं हैं, आईसीएआर ने वर्ष 1966 में कृषि विश्वविद्यालयों के लिए एक मॉडल अधिनियम तैयार किया, जिसका प्रमुख उद्देश्य सम्पूर्ण देश में विभिन्न प्रावधानों को लागू करने के लिए एक कानूनी आधार के सृजन हेतु मार्गदर्शी दस्तावेज उपलब्ध करवाना है, जिसे राज्य भी अपना सकते हैं।

उच्च कृषि शिक्षा ने पिछले कुछ दशकों में गुणवत्ता और मात्रात्मक दृष्टि से अत्यधिक विस्तार किया है और आवश्यकताओं को पूरा करने के लिए आईसीएआर ने वर्ष 1984, 1994 और 2009 में मॉडल अधिनियम को संशोधित किया है।

ग. एनईपी-2020 के तहत कृषि विश्वविद्यालयों का पुनर्गठन

विश्वविद्यालयों का अपेक्षित आकार (शेप) और इन विश्वविद्यालयों के कार्यों की स्थिति का विश्लेषण यह दर्शाता है कि कृषि विश्वविद्यालयों को निम्नलिखित प्रमुख चुनौतियों का सामना करना पड़ता है:

(i) जीईआर को बढ़ाने के लिए, भारत की कृषि शिक्षा प्रणाली को, प्रत्येक विश्वविद्यालय के भीतर अपनी वर्तमान क्षमताओं से बहुत अधिक स्तर तक व्यापक विस्तार करने की आवश्यकता होगी। साथ ही, हमारी वर्तमान प्रवेश प्रणाली, प्रवेशों में शुद्ध योग्यता की ओर बढ़ गई है और इसकी सीमाएं अब ऐसे विद्यार्थियों की कम संख्या के रूप में दिखाई दे रही है, जो स्नातक के बाद एक व्यवसाय के रूप में कृषि का विकल्प चुनना चाहते हैं। वास्तव में, उनमें से कइयों की पृष्ठभूमि कृषि-क्षेत्र वाली नहीं हो सकती है और उनका कोई पारिवारिक फार्म नहीं है। इस प्रकार से, कृषि-क्षेत्र की पृष्ठभूमि वाले ग्रामीण विद्यार्थियों को आकर्षित करने/प्रवेश देने के सम्बध में वर्तमान प्रवेश प्रक्रिया अनुपयुक्त लगती है। अत: कृषि विश्वविद्यालय, बढ़ती हुई संख्या और कृषि-क्षेत्र की पृष्ठभूमि वाले युवाओं को प्रवेश में स्थान देने की दोहरी चुनौती का सामना करते हैं।

(ii) गुणवत्ता मानकों के संदर्भ में, कृषि शिक्षा की गुणवत्ता के न्यूनतम मानकों को परिभाषित किए जाने की आवश्यकता होगी और कार्यनीतियों की योजना बनानी होगी और यह सुनिश्चित करना होगा कि सभी हितधारकों द्वारा, आईसीएआर संचालित अधिकार क्षेत्र के भीतर और बाहर, इनका अनुपालन किया जाता है। आईसीएआर द्वारा संचालित न किए जाने वाले अधिकतर संस्थानों की निचली सीमा अपरिभाषित रहती है। भारतीय कृषि अनुसंधान परिषद वर्तमान में कृषि शिक्षा के लिए पीएसएसबी के रूप में सम्पूर्ण कृषि शिक्षा को संचालित और मॉनिटर नहीं करती है।

(iii) कृषि विश्वविद्यालय प्रणाली को अनुसंधान योजनाओं के संबंध में अपनी पहचान को बनाए रखने की चुनौतियों का सामना करना पड़ता है। यद्यपि बाजार अनुसंधान की उपयुक्तता का निर्णय करता है, खाद्य सुरक्षा की सुविधा उपलब्ध करवाने और सम्पूर्ण राष्ट्र में कृषि समुदायों के आर्थिक हित में कृषि विश्वविद्यालयों द्वारा अदा की गई भूमिका सरकार, उद्योग एवं जनता की आवश्यकता के अनुरूप होनी चाहिए। इस प्रकार अनुसंधान योगदान रेटिंग में कैसे सुधार लाया जाए, यह प्रत्येक विश्वविद्यालयों के समक्ष चुनौती बनी हुई है। इसका राज्य और निजी प्रणाली दोनों द्वारा निवेश करने की इच्छा पर सीधा असर पड़ता है।

(iv) विश्वविद्यालयों को, कल की दुनिया के लिए प्रासंगिक बने रहने के लिए भविष्य की प्रौद्योगिकियां सृजित करने हेतु अपने आपको साधन-सम्पन्न बनाने की आवश्यकता होगी। यह, किसानों को उनके संबंधित क्षेत्रों में समस्याओं का समाधान देने के लिए अत्याधुनिक अनुसंधान और अनुप्रयुक्त अनुसंधान के बिना नहीं हो पाएगा। कृषि विश्वविद्यालयों को वैज्ञानिक उत्कृष्टता, ऐसे कुछेक वैज्ञानिकों को हायर करने पर बल देना चाहिए जो विश्व में उपलब्ध उत्कृष्ट प्रतिभा से मेल खाता हो और वैज्ञानिक समुदाय का एक ऐसा पूल बनाना चाहिए जो, क्षेत्र के किसानों के साथ उनकी समस्याओं पर काम करने के अनुकूल हो।

(v) कृषि विश्वविद्यालयों से स्नातक करने वाले विद्यार्थियों की संख्या में बढ़ोतरी के साथ, 80:20 की समस्या से कैसे निपटा जाए, जिसका अर्थ है- 20% बेहतर प्लेसमेंट और 80% अल्प रोजगार/असंगत (मिसप्लैस्ड) रोजगार/रोजगार रहित। इसका अर्थ है, एनईपी के तहत परिकल्पित प्रमाण-पत्र और डिप्लोमा पाठ्यक्रमों के माध्यम से सही कौशल और ज्ञान प्रदान करना। इनसे सामान्य अनुभव प्रमाण-पत्र की अपेक्षा नहीं है, परन्तु उनके द्वारा आजीविका कमाने के लिए कौशल और विश्वास सृजन के उपाय करना है। इसलिए, पुरानी मानसिकता के साथ इस पाठ्यक्रमों की योजना बनाने से कोई समाधान निकलने वाला नहीं है। इस पहलु पर भी कृषि विश्वविद्यालयों द्वारा लीक से हटकर गहराई से सोचने की जरूरत है।

5. संस्थागत पुनर्गठन और समेकन

उच्च शिक्षा से संबंधित एनईपी-2020 का मुख्य बल एचईआई के न्यूनतम 3000 विद्यार्थियों वाले बड़े बहु विषय-वस्तु क्षेत्र के विश्वविद्यालयों, महाविद्यालयों और एचईआई समूहों/ज्ञान केन्द्रों में रूपान्तरण द्वारा उच्च शिक्षा के विखंडन को समाप्त करना है। एनईपी-2020 ने इस तथ्य की ओर ध्यान आकर्षित किया है कि विश्वव्यापी विश्वविद्यालय का अर्थ है एक उच्च शिक्षण का बहुविषय-क्षेत्र वाला संस्थान जो पूर्व स्नातक, स्नातक और पीएच. डी कार्यक्रम उपलब्ध करवाता है और उच्च–गुणवत्तायुक्त शिक्षण और अनुसंधान के क्षेत्र में कार्यरत है। देश में एचईआई के वर्तमान जटिल नामकरण जैसे 'मानद विश्वविद्यालय', 'संबद्ध विश्वविद्यालय', 'संबद्ध तकनीकी विश्वविद्यालय', 'एकात्मक विश्वविद्यालय' को, मापदंडों के अनुसार मानदंडों को पूरा करने पर केवल विश्वविद्यालय द्वारा बदल दिया जाएगा। एनईपी-2020 एक विश्वविद्यालय या महाविद्यालय के लिए एक नई वैचारिक धारणा/समझ की कल्पना करता है और विश्वविद्यालय को उच्च शिक्षा के बहु-विषयक संस्थान के रूप में परिभाषित करता है जो उच्च गुणवत्ता वाले शिक्षण, अनुसंधान और सामुदायिक जुड़ाव के साथ स्नातक और स्नातक कार्यक्रम प्रदान करता है। यह विद्वानों

और समकक्ष व्यक्तियों के सक्रिय समुदायों के निर्माण में मदद करेगा, हानिकार साइलो को समाप्त कर देगा, छात्रों को कलात्मक, रचानत्मक और विश्लेषणात्मक विषयों के साथ-साथ खेल सहित विषयों में अच्छी तरह से गोल करने में सक्षम करेगा, क्रॉस-डिसिप्लिनरी अनुसंधान सहित विषयों में सक्रिय अनुसंधान समुदायों का विकास करेगा और उच्च शिक्षा में सामग्री और मानव दोनों की संसाधन दक्षता में वृद्धि करेगा।

स्नातकोत्तर शैक्षिक कार्यक्रम पर बल देने के साथ अनुसंधान पर जोर देने वाले विश्वविद्यालय को अनुसंधान-गहन विश्वविद्यालय के रूप में वर्गीकृत किया जाएगा। वर्तमान कृषि विश्व_विद्यालय शिक्षण पर अधिक बल दे रहे हैं परन्तु उन्हें महत्वपूर्ण अनुसंधान कार्यक्रम के साथ शिक्षा और अनुसंधान विश्वविद्यालयों या अनुसंधान गहन विश्वविद्यालयों के रूप में वर्गीकृत किया जा सकता है। शिक्षण पर मुख्य ध्यान देने वाले संस्थानों/ विश्वविद्यालयों/ महाविद्यालयों को शिक्षा केंद्रित संस्थानों के रूप में वर्गीकृत किया जाना है। डिग्री प्रदान करने वाले महाविद्यालय (एसी) उच्च शिक्षा के एक बड़े बहु-विषयक संस्थान को संदर्भित करेंगे, जो स्नातक डिग्री प्रदान करता है और मुख्य रूप से स्नातक शिक्षण पर केंद्रित है, हालांकि यह उस तक सीमित नहीं होगा।

उपरोक्त को ध्यान में रखते हुए समिति निम्नलिखित कदमों की सिफारिश करती है:

- कृषि विश्वविद्यालयों का विस्तार करने की आवश्यकता होगी, ताकि वे शिक्षण अनुसंधान के बहु विषयक संस्थान बन सके। आज अधिकतर विश्वविद्यालय बहु विषय-क्षेत्रों की भिन्न-भिन्न डिग्री के साथ बहु-विषयक शिक्षा और अनुसंधान वि_श्वविद्यालयों की श्रेणी में आते हैं इसलिए, इनमें से कई शिक्षा और अनुसंधान के उच्च स्तरों को विकसित करने और प्राप्त करने का विकल्प चुन सकते हैं, जिससे उनके छात्रों की संख्या 3000 सीमा से अधिक हो जाएगी।

- कृषि शिक्षा के बहु विषयक फलक का विस्तार करने के लिए बुनियादी विज्ञान, सामाजिक विज्ञान, कृषि विज्ञान, इंजीनियरिंग और भाषाओं के समवर्गी विषय-क्षेत्रों के शैक्षणिक कार्यक्रमों के शामिल किए जाने के साथ विश्वविद्यालयों का विस्तार किया जाए। ये अलग-अलग विश्वविद्यालयों द्वारा अपनी क्षमता के अनुसार चुने जाने वाले सुझावात्मक विकल्प हैं और वे जनता और निजी स्रोतों/हितधारकों/ भागीदारों से और सहायता प्राप्त करने का प्रबंध कर सकते हैं।

- प्रत्येक विश्वविद्यालय के लिए यह आवश्यक है कि वह अपने भविष्य का जिसे सं_स्थागत विकास योजना (आईडीपी) कहा जाता है, ब्लूप्रिंट तैयार करने का काम करे

और इसका उपयोग विभिन्न स्रोतों से धन प्राप्त करने/आकर्षित करने के साथ-साथ नियोजित विकास और बढ़ोतरी के लिए करे।

एनईपी-2020 ने संकेत दिया है कि एक विश्वविद्यालय में छात्रों की न्यूनतम संख्या 3000 होनी चाहिए, इसलिए विश्वविद्यालयों को 3000 के न्यूनतम लक्ष्य को प्राप्त करने के लिए पहले छात्र संख्या बढ़ाने पर ध्यान देना चाहिए और फिर आगे जाना चाहिए। जैसा कि पहले के खंड में बताया गया है, विश्वविद्यालयों द्वारा छात्र नामांकन में दिखावटी (एक्सा पोनेंशियल) बढ़ोतरी की आवश्यकता महसूस की गई है और इसलिए 10,000 या अधिक विद्यार्थियों वाले और अधिक कृषि विश्वविद्यालयों की योजना बनाई जाए।

6. बहु-विषयक कृषि विश्वविद्यालय बनाना

एनईपी-2020, वर्ष 2030 तक बहु-विषयक संस्थानों के रूप में विकसित होने और समय के साथ एकल स्ट्रीम वाले एचईआई को चरणबद्ध तरीके से समाप्त करने का आह्वान करती है। इस प्रकार सभी कृषि विश्वविद्यालयों को सक्रिय बहु-विषयक संस्थान बनने की ओर बढ़ना होगा। महाविद्यालयों के पास सक्रिय बहु-विषयक कृषि विश्वविद्यालयों का हिस्सा बनने का विकल्प है। एकल-स्ट्रीम विश्वविद्यालय, या तो विभिन्न सुझाए गए क्षेत्रों में महाविद्यालयों विभागों, विषयों को जोड़ेंगे, जो उन्हें एकल स्ट्रीम से रूपांतरित होने में मदद करेंगे, जो कि वे वर्तमान में बहु-विषयक संस्थान में हैं या बस स्वयं किसी अन्य संस्थान का हिस्सा बन जाते हैं। इसलिए, समिति निम्नानुसार सिफारिश करती है:

एकल स्ट्रीम कृषि विश्वविद्यालय, अर्थात् कृषि, बागवानी, वानिकी, पशु चिकित्सा और मात्स्यिकी शिक्षा का या तो मूल विश्वविद्यालय के साथ विलय करना होगा या 2030 तक उसका बहु-विषयक विश्वविद्यालयों में विस्तार करना होगा। यदि एकल स्ट्रीम विश्वविद्यालय एक ही परिसर में स्थित है, तो राज्य सरकारों द्वारा उन्हें एकल बहु-विषयक विश्वविद्यालयों में समेकित करने के लिए आवश्यक कदम उठाए जा सकते हैं। एकल स्ट्रीम कृषि विश्वविद्यालयों को बहु-विषय-क्षेत्र के कृषि विश्वविद्यालयों में रूपांतरित करने के लिए एनईपी 2020 की सिफारिशों को लागू करने हेतु आईसीएआर को सामान्य शिक्षा परिषद द्वारा प्राधिकृत करने की आवश्यकता है।

7. विश्वविद्यालयों और महाविद्यालयों की ''संबद्धता प्रणाली'' को समाप्त करना

एनईपी के अनुसार, 2035 तक संबद्धता प्रणाली को चरणबद्ध तरीके से समाप्त किया जाना है। यूजी पाठ्यक्रमों को उपलब्ध कराने वाले कई महाविद्यालय सार्वजनिक और निजी

दोनों डोमेन में बड़ी संख्या में मौजूद हैं। उन्हें उच्च शिक्षा के नए मानदंडों के तहत लाने की आवश्यकता होगी।

- कुछ राज्यों में कृषि/वानिकी/पशु चिकित्सा विज्ञान उपलब्ध करवाने वाले सरकारी महाविद्यालय या तो केन्द्रीय विश्वविद्यालय या राज्य सामान्य विश्वविद्यालय से संबद्ध हैं। ऐसे मामलों में, संबंधित विश्वविद्यालयों के साथ इन्हें एकीकृत करने के लिए राज्य द्वारा कदम उठाने की आवश्यकता होगी। इससे विश्वविद्यालयों को बड़ा और बहु-विषयक बनाने में मदद मिलेगी।

- निजी कृषि महाविद्यालय, जो एसएयू से संबद्ध हैं, वे एनईपी 2020 के दिशा-निर्देशों के आधार पर स्नातक डिग्री प्रदान करने वाले स्वायत्त महाविद्यालयों के रूप में विकसित हो सकते हैं। संबंधित राज्य कृषि विश्वविद्यालयों को उनके संबद्ध महावि_ द्यालय प्रबंधन और राज्य सरकारों को, तद्नुसार आगे बढ़ने के लिए जोर देना चाहिए।

8. आईसीएआर के मानद विश्वविद्यालयों को बहु-विषयक शिक्षा और अनुसं_धान विश्वविद्यालयों में परिवर्तित करना

- एनईपी-2020 के अनुसार, 'मानद विश्वविद्यालय' को नियमों के अनुसार मानदंड पूरा करने पर 'विश्वविद्यालय' द्वारा प्रतिस्थापित किया जाएगा। इसलिए, समिति सिफारिश करती है कि आईसीएआर-एयू प्रणाली के तहत एकल स्ट्रीम वाले मानद विश्वविद्यालयों को कृषि पर बल देते हुए 2030 तक बहु-विषयक संस्थानों की ओर बढ़ने की आवश्यकता है। भारतीय कृषि अनुसंधान संस्थान (आईएआरआई), भारतीय पशु चिकित्सा अनुसंधान संस्थान (आईवीआरआई), राष्ट्रीय डेयरी अनुस_ संधान संस्थान (एनडीआरआई) और आईसीएआर के तहत केन्द्रीय मत्स्य शिक्षा संस्थान (सीआईएफई) नामक 4 मानद विश्वविद्यालय (डीयू) हैं। इनमें से कुछ संस्थान तो लगभग 100 वर्षों से शिक्षा प्रदान कर रहे हैं। आईसीएआर के 4 मानद विश्वविद्यालयों में अनुसंधान शिक्षण और विस्तार के लिए उत्कृष्ट बुनियादी ढांचे हैं, और इन्हें अनुसंधान गहन विश्वविद्यालयों में परिवर्तित किया जा सकता है।

- ''इन मानद विश्वविद्यालयों (डीयू) को एनईपी-2021 में परिकल्पित डॉक्टोरल, मास्टर और स्नातक डिग्री कार्यक्रमों के साथ बहु-विषयक विश्वविद्यालयों में विस्तार करने की अनुमति दी जा सकती है'' और आईसीएआर के तहत इन मानद विश्वविद्यालयों की मौजूदा प्रणाली को बनाए रखने की आवश्यकता है।

9. कृषि विश्वविद्यालयों में सकल नामांकन अनुपात (जीईआर) बढ़ाना

एनईपी-2020 ने यह पाया है कि हालांकि कृषि विश्वविद्यालयों में देश के सभी विश्वविद्यालयों का लगभग 9% हिस्सा शामिल है, कृषि और संबद्ध विज्ञानों में नामांकन उच्च शिक्षा के सम्पूर्ण नामांकन का 1% से कम है। इसने यह भी सिफारिश की है कि बेहतर कुशल स्नातकों और तकनीशियनों, नवीन अनुसंधान और प्रौद्योगिकियों और पद्धतियों से जुड़े बाजार-आधारित विस्तार के माध्यम से कृषि उत्पादकता बढ़ाने के लिए कृषि और संबद्ध विषयों की क्षमता और गुणवत्ता दोनों में सुधार किया जाना चाहिए। जीईआर को बढ़ाने के लिए, समिति निम्नलिखित कार्यनीतियों का प्रस्ताव करती है:

- सभी कृषि विश्वविद्यालय, पहले कदम के रूप में, छात्र नामांकन बढ़ाने का लक्ष्य रखेंगे, ताकि 3000 के आंकड़े को पार किया जा सके। गुणवत्ता बनाए रखने को ध्यान में रखते हुए, बुनियादी ढांचे के विकास और संकाय उपलब्धता दोनों की योजना बनानी होगी और पहले इसे क्रियान्वित करना होगा।

- वे विश्वविद्यालय जो पहले से ही 3000 के आंकड़े से ऊपर है, उन्हें जीईआर की दिखावटी (एक्सपोनेंशियल) वृद्धि के लिए योजना बनानी चाहिए जैसे कि 2025 तक 5000, 2030 तक 10,000 और 2040 तक 25000। भारत को आने वाले दशकों में इनके स्तर के कुछ कृषि विश्वविद्यालयों की आवश्यकता है।

- कृषि विश्वविद्यालयों को विदेशी छात्रों की जरूरतों को पूरा करने की स्वतंत्रता प्रदान की जानी चाहिए, जैसा कि सामान्य विश्वविद्यालयों में पद्धति विद्यमान है। कई निजी विश्वविद्यालयों ने अपने नामांकन और वित्त को बढ़ाने के लिए अफ्रीका और एशिया के संभावित देशों के छात्रों की तलाश में इस प्रावधान का सफलतापूर्वक उपयोग किया है। आईसीएआर ऐसे विदेशी छात्रों के प्रवेश की सिफारिश करने तक अपनी भूमिका को सीमित कर सकता है, जिनकी इसके द्वारा छात्रवृत्ति से सहायता की जाती है। इसलिए विदेशी छात्रों की दो श्रेणियां होंगी, आईसीएआर छात्रवृत्ति धारक छात्र और ऐसे छात्र जो सीधे अपने दम पर (स्व-वित्तपोषण) या उनकी सरकार या किसी अन्य निधियन एजेंसी द्वारा सहायता प्राप्त हैं।

- इस प्रकार यूजी और पीजी में विदेशी छात्रों के प्रवेश के लिए विनियमों के मामले में, कृषि विश्वविद्यालयों में यूजीसी के समान नियम लागू करते हुए, अन्य सामान्य विश्वविद्यालयों के साथ समान अवसर होने चाहिए।

- वर्तमान में विभिन्न स्थानों पर सभी नहीं, बल्कि केवल कुछ एसएयू में कई घटक महाविद्यालय हैं, जो लगभग 60 छात्रों के प्रवेश के साथ केवल एक शैक्षणिक कार्यक्रम उपलब्ध करवाते हैं। संसाधनों का कुशलतापूर्वक उपयोग करने और जीईआर को बढ़ाने के लिए अन्य संबंधित शैक्षणिक कार्यक्रमों को शामिल करने के लिए महाविद्यालयों का विस्तार किया जा सकता है। बीएससी (कृषि) उपलब्ध कराने वाला एक महाविद्यालय बागवानी में यूजी कार्यक्रम और इसके विपरीत (वाइस वर्सा), आसानी से शुरू कर सकता है। इसके अलावा, नए स्थान पर एक नया महाद्य विद्यालय शुरू करने के बजाए, मौजूदा महाविद्यालयों को कृषि शिक्षा पर जोर देते हुए अन्य धाराओं में उच्च शिक्षा के समूह/केन्द्र के रूप में विकसित किया जा सकता है।

- कुछ विश्वविद्यालयों ने सीमित संख्या में प्रवेश के साथ केवल पीजी और पीएचडी उपलब्ध कराने वाले पीजी महाविद्यालय स्थापित किए हैं। उपलब्ध जनशक्ति और शिक्षण संसाधनों के साथ, ये पीजी महाविद्यालय संस्थान को समग्र और जीवंत बनाते हुए यूजी कार्यक्रम शुरू कर सकते हैं।

- वर्तमान में, विभिन्न महाविद्यालयों में डिप्लोमा कार्यक्रम/प्रमाणपत्र पाठ्यक्रम चलाए जा रहे हैं। व्यावसायिक और उच्च शिक्षा का एकीकरण जैसा कि एनईपी-2020 में दिया गया है, सभी कृषि विश्वविद्यालयों द्वारा तत्काल उठाया जाने वाला और सबसे महत्वपूर्ण कदम है। शैक्षणिक कार्यक्रम की रूपरेखा पर कहीं और की गई चर्चा, एनईपी-2020 के दिशा-निर्देशों के अनुरूप, प्रमाण पत्र और डिप्लोमा पाठ्क्रमों को कैसे एकीकृत किया जाएगा, यह दर्शाती है।

- समिति सिफारिश करती है कि आईसीएआर राज्य सरकारों को कृषि/वानिकी/पशु चिकित्सा/ मत्स्य पालन विश्वविद्यालय जैसे नए एकल विषयक विश्वविद्यालयों को खोलने से रोकने के लिए तुरंत एडवायजरी जारी कर सकती है। इसके बजाय, राज्यों को अवंसरचना एवं संकाय के संबंध में वर्तमान फार्म विश्वविद्यालयों का सशक्ति_करण करने पर अपने प्रयासों को फोकस करना चाहिए जो उनके विस्तार में सहायक होगा।

10. प्रगति की ओर अग्रसर : कृषि शिक्षा का शैक्षणिक पुनर्गठन

एनईपी-2020 ने प्रस्ताव दिया है कि प्रमाण-पत्र, डिप्लोमा, यूजी की सामान्य डिग्री अथवा अनुसंधान में डिग्री तथा एक या दो वर्ष की मास्टर डिग्री प्रधान करने के विकल्प सहित

अनेक प्रवेश एवं निकास द्वारों की एक नवोन्मेषी प्रणाली के साथ शैक्षणिक कार्यक्रम संरचना में सुधार किया जाए।

- वर्तमान में, सभी एसएयू द्वारा चार-वर्षीय यूजी कार्यक्रम चलाया जा रहा है जिसमें एक व्यापक परामर्श प्रक्रिया के साथ वर्षों से पांच संकायाध्यक्ष समितियों की सिफारिशों के आधार पर सतत रूप से सुधार किया जा रहा है। इस क्षेत्र की आवश्यकता के आधार पर, एक-वर्षीय विद्यार्थी ग्रामीण उद्यमी जागरूकता विकास योजना (स्टूडेंट रेड्डी) विकसित किया गया है और सभी यूजी कार्यक्रमों के अंतिम वर्ष में इसे उपलब्ध कराने को अनिवार्य बनाया गया है। विद्यार्थियों को ग्रामीण कार्य के अनुभव से परिचित कराने तथा उद्यमियता विकास हेतु विद्यार्थियों को सक्षम बनाने के उद्देश्य के साथ स्टूडेंट रेड्डी कार्यक्रम को इस प्रकार से डिज़ाइन किया गया है कि इसमें ग्रामीण कृषि संबंधी कार्य अनुभव (आरएडब्ल्यूई), प्रायोगिक लर्निंग, व्यावहारिक प्रशिक्षण, संयंत्र में प्रशिक्षण तथा विद्यार्थी अनुसंधान का समेकन हो। इसके अतिरिक्त, यूजी कार्यक्रम, एनईपी-2020 की निम्नलिखित सिफारिशों को पूरा करते हैं :

- चार-वर्षीय स्नातक डिग्री कार्यक्रम
- पसंद के आधार पर क्रेटिट सिस्टम
- शैक्षणिक कार्यक्रमों में उद्यमिता का समेकन

तथापि, एनईपी के लिए आवश्यक है कि वर्तमान शैक्षणिक कार्यक्रम का पुनर्गठन किया जाए। निम्नलिखित विकल्प हैं:

i. पुराने विचारों के साथ, कुछ नए परिवर्तनों सहित यथासंभव पुराने मानदंडों को बनाए रखना

ii. एनईपी ढांचे के भीतर आने की भावना हेतु कॉस्मेटिक परिवर्तनों के साथ शैक्षणिक पुनर्गठन

iii. नई सोच के साथ शैक्षणिक पुनर्गठन जिसमें वर्तमान शैक्षणिक प्रणाली में नववोन्मेषी पूर्णरूपेण सुधार किया जाए।

एनईपी के आदेशों के समायोजन हेतु अवसर प्रदान करने के लिए प्रथम विकल्प उपयुक्त प्रतीत होता है। तथापि, यह एनईपी के संभावित परिणामों के विभिन्न स्तरों पर सम्पूर्ण प्रणाली के पूर्णरूपेण सुधार की कोई गारंटी नहीं देता है। **विकल्प;** के लिए कार्यान्वयन की कार्यनीति में समझौतों, संभावित परिणामों में कमी के समायोजनों का मिश्रण होगा।

दूसरा विकल्प सर्वाधिक आसान है जब बैंडवैगन पर चढ़ना आवश्यक हो किन्तु परामर्श दिए गए संरचनात्मक परिवर्तनों के लिए संस्थाओं द्वारा किसी सहायता की संभावना न हो। यह स्पष्ट है कि परिणाम, आकांक्षाओं से बहुत कम होंगे और इसकी एनईपी के तहत संभावना नहीं है।

तीसरा विकल्प हमें एनईपी के वांछित परिणामों के साथ-साथ असहज परिवर्तनों के संबंध में कार्य करने के लिए बाध्य करेगा अर्थात् अनेक गुणा बढ़ी हुई जीईआर, विद्यार्थियों के लिए अनेक निकास एवं प्रवेश वाली प्रणाली, फार्म एवं कृषि-व्यवसाय संबंधी गतिविधियों में कुशल युवाओं की बड़ी आबादी और इसके अलावा वे विश्वविद्यालय जिनकी किसानों एवं सरकारों द्वारा देश में सराहना की जाती है और विश्व भर में अपने अग्रणी अनुसंधान परिणामों, शैक्षणिक उत्कृष्टता एवं विशिष्ट विस्तार सेवाओं के लिए जाने जाते हैं जो विश्व भर में कहीं दिखाई नहीं देते हैं। विश्वविद्यालयों द्वारा परिकलित सुविचारित आईडीपी, निधियन एवं गुणवत्तापूर्ण अभिशासन तथा प्रबंधन प्रणालियों की आवश्यक स्तरों पर संभावनाएं विद्यमान होना इस मार्ग की कठिन बाधाएं हैं।

समिति ने तीसरे विकल्प के लिए कार्यनीति का चयन प्रस्तावित किया है। इस कार्यनीति के सुझाए गए कदम इस प्रकार हैं;

- चार-वर्षीय डिग्री कार्यक्रम का इस प्रकार से पुनर्गठन करें; एक विश्वविद्यालय में दिया जाने वाला एक वर्षीय प्रमाणपत्र पाठ्यक्रम एवं द्विवर्षीय डिप्लोमा कोर्स। एक विद्यार्थी एकवर्षीय प्रमाणपत्र प्रदान किए जाने के लिए किसी भी पाठ्यक्रम का चयन कर सकता है। टैस्ट पास करने बाद, डिप्लोमा का चयन करने की छूट होगी। इसी प्रकार से, टैस्ट स्कोर एवं उपलब्ध सीट के आधार पर डिप्लोमा विद्यार्थियों के पास डिग्री कोर्स से निकास या उसमें प्रवेश का विकल्प होगा। प्रारम्भ में, 4 वर्ष की वर्तमान यूजी डिग्री जारी रहनी चाहिए।
- प्रमाणपत्र पाठ्यक्रमों/डिप्लोमा कोर्स की पहचान और उन्हें इस प्रकार से डिजायन करने की आवश्यकता होगी कि वे हितधारकों की मांग के अनुसार हों। इन प्रमाणपत्र एवं डिप्लोमा पाठ्यक्रमों को आकर्षक बनाने के लिए, उन्हें विद्यार्थियों को कैरियर बनाने के अवसर प्रदान करने चाहिएं। सम्पूर्ण यूजी कार्यक्रम के पुनर्गठन की आवश्यकता है ताकि पहले वर्ष के पाठ्यक्रमों को स्टैंड अलोन के रूप में सक्षम किया जा सके जिसमें वांछित पहलू (जैसे कि मशरूम उत्पादन, पौधशाला प्रबंधन, मधुमक्खी पालन आदि) के संबंध में व्यावहारिक प्रशिक्षण/आनुभविक शिक्षा का एक घटक हो। इसी प्रकार से, उन विद्यार्थियों को ऐच्छिक पाठ्यक्रम उपलब्ध कराए जा सकते हैं जो डिप्लोमा के साथ कार्यक्रम से बाहर निकलना चाहते हैं।
- समिति का प्रस्ताव है कि इस संबंध में एनईपी-2020 के प्रावधानों के अनुपालन में यूजी पाठ्यक्रम के पुनर्गठन हेतु भाकृअप द्वारा एक संकायाध्यक्ष समिति का गठन किया जाए।

संकायाध्यक्ष समिति द्वारा विचारणीय मुद्दों में शामिल हैं ;

- प्रमाणपत्र पाठ्यक्रम संरचना, क्षेत्र, कोर्स की समाप्ति पर टैस्ट तथा प्रमाणपत्र एवं डिप्लोमा में प्रवेश हेतु मानदंड
- क्या दो स्ट्रीम के प्रमाणपत्र पाठ्यक्रमों पर विचार किया जा सकता है, एक उनके लिए जिन्हें बी.एससी. में प्रवेश दिया गया है (योग्यता के आधार पर, जैसा कि अभी होता है) और दूसरा प्रमाणपत्र पाठ्यक्रम जो उन विद्यार्थियों के लिए डिजाण्न किया गया है जिन्हें खेती की पृष्ठभूमि को महत्व देते हुए भिन्न मानदडों के अनुसार प्रवेश दिया जाएगा। इस प्रमाणपत्र पाठ्यक्रम में, सीमित संख्या में डिप्लोमा में और उससे भी अधिक सीमित संख्या में डिग्री कोर्स में प्रवेश दिया जाएगा जो टैस्ट में योग्यता के आधार पर होगा। क्या यह उन अभ्यर्थियों के लिए 3 साल की डिग्री हो सकती है जिनके पास स्नातकोत्तर डिग्री या अन्य डिग्री छात्रों के साथ सामान्य 4 साल की डिग्री का विकल्प नहीं है।
- प्रथम वर्ष पूरा होने के बाद छात्र की एक स्ट्रीम से दूसरी स्ट्रीम में अंतर-स्थानांतरण तथा कृषि विश्वविद्यालयों में पॉलीटेक्निक के दो वर्षीय डिप्लोमा पाठ्यक्रम के बाद छात्रों के कृषि विश्विद्यालयों के विभिन्न कार्यक्रमों में प्रवेश की व्यवस्था के बारे में संभावनाएं।
- एक साल के प्रमाण पत्र तथा दो वर्ष के डिप्लोमा की मान्यता से सम्बंधित सभी पहलुओं के साथ के साथ-साथ विभिन्न विषयों, व्यावहारिक प्रदर्शन, इंटर्नशिप आदि की आवश्यकता प्राप्त करने के लिए विभिन्न क्षेत्रों द्वारा आवश्यक कृषि और संबद्ध क्षेत्रों में कुशल मानव संसाधन के प्रकार का आकलन।
- विश्वविद्यालय के समर्थन से शिक्षा के दौरान/बाद में छात्रों के लिए पीपीपी मोड के द्वारा उनके शिक्षा के क्षेत्र में अभ्यास तथा व्यवसाय शुरू करने के अवसर प्राप्त करने के लिए तंत्र विकसित करना।

मांग के आधार पर, विश्वविद्यालय यूजी में प्रवेश हेतु विद्यार्थियों की संख्या में बढ़ोतरी कर सकते हैं ताकि प्रमाणपत्र/डिप्लोमा प्राप्त करने वाले कुछ विद्यार्थियों के बाहर निकलने से, डिग्री प्राप्त करने वाले पास आउट विद्यार्थियों की संख्या में बाधा न पड़े।

कृषि शिक्षा, सामान्य शिक्षा से भिन्न है जैसा कि खंड 4 में भी परिलक्षित होता है, इसलिए 4 वर्षीय बी.एससी. एवं 2 वर्षीय एम.एससी. डिग्री की वर्तमान पद्धति जारी रहनी चाहिए

डिग्री प्रदान करने वाले कृषि विश्वविद्यालयों को कुल क्रेडिट में से कम से कम 50 प्रतिशत में शिक्षा प्रदान करनी चाहिए। कृषि विश्वविद्यालयों में पाठ्यक्रमों के लिए क्रेडिट के एकेडेमिक बैंक का

कार्यान्वयन किया जाना चाहिए। डिग्री प्रदान करने वाले कृषि विश्वविद्यालयों की पूर्व अनुमति, किसी अन्य कृषि विश्वविद्यालय से कोई भी कोर्स करने से पहले प्राप्त की जानी चाहिए।

पशुचिकित्सा विज्ञान के विद्यार्थियों के मामले में, यूजी कार्यक्रम के विनियमों को भारतीय पशुचिकित्सा परिषद (वीसीआई) द्वारा तैयार और विनियमित किया जाता है। भाकृअप के पास पशुचिकित्सा और पशु विज्ञान के पीजी कार्यक्रम हैं। इस प्रकार से, केवल स्नातकोत्तर कार्यक्रम तैयार करते समय पशुचिकित्सा विज्ञानों पर विशेष ध्यान देने की आवश्यकता है। क्या बी.वी. एससी. एवं ए.एच. के साढ़े पांच वर्ष के कार्यक्रम के पुनर्गठन की कोई आवश्यकता है, यह निर्णय वीसीआई के विचारार्थ छोड़ देना चाहिए। वीसीआई भी पीएसएसबी में से एक है एवं सामान्य शिक्षा परिषद का सदस्य है और यह आशा की जाती है कि वह एनईपी की सिफारिशों पर विचार कर रहा होगा तथा तद्नुसार अपने यूजी कार्यक्रम की पुन:स्थापना करेगा।

पीएच.डी. विद्यार्थियों को विषयों पर ध्यान दिए बिना अपने डॉक्टोरल कार्यक्रम में शिक्षण/शिक्षा शास्त्र/संचार कौशल या चयनित पीएच.डी. अनुसंधान संबंधी विषयों में क्रेडिट-आधारित पाठ्यक्रम लेने की आवश्यकता होगी। पाठ्यक्रम के डिजायन एवं संरचना को विश्वविद्यालयों के निर्णय पर छोड़ दिया गया है। तथापि, पीएच.डी. स्कॉलर को वास्तविक शिक्षण के लिए भी निर्धारित न्यूनतम घंटों का समय देना होगा। इसके लिए विश्वविद्यालय, प्रत्येक पीएच.डी. विद्यार्थी को अनिवार्य रूप से टीचिंग असिटेंटशिप प्रदान करेंगे।

एनईपी-2020 के अनुसार, ऑन-लाइन एवं इन-क्लास मोड दोनों के लिए विद्यार्थी-मूल्यांकन के मानकों सहित विश्वविद्यालयों द्वारा पाठ्यक्रम एवं शिक्षा शास्त्र को डिजायन किया जाएगा। भाकृअप – एयू प्रणाली में, सामूहिक रूप से तथा समय-समय पर संकायाध्यक्ष समितियों और कृषि में व्यापक विषयवस्तु समितियों (बीएसएमए) के माध्यम से ऐसा किया जा रहा है। यह समिति सिफारिश करती है कि इन गतिविधियों को भाकृअप द्वारा एक पेशेवर मानक निर्धारण बॉडी (पीएसएसबी) के रूप में लेने की आवश्यकता है।

11. भाकृअप-कृषि विश्वविद्यालय प्रणाली का अंतरराष्ट्रीयकरण

भारत में, कृषि विज्ञानों में विकसित मानव संसाधन एवं वैज्ञानिक विशेषज्ञता को अंतरराष्ट्रीय स्तर पर मान्यता मिली है तथा कई विकासशील और विकसित देशों ने भाकृअप-एयू प्रणाली में उपलब्ध सुविधाओं का लाभ उठाने में गहरी दिलचस्पी दिखाई है।

एनईपी-2020 उन छात्रों के लिए संस्थानों/क्रेडिट अंतरण के आसानी से परिवर्तन में सहायता प्रदान करता है जो भारत के भीतर या विदेशों में संस्थानों के बीच स्थानान्तरित होने

के इच्छुक हैं। यह विदेशी संस्थानों या वहां से भारत में क्रेडिट-अंतरण प्रणाली तथा साथ ही अनुसंधान के लिए योजना बना रहा है।

एनईपी-2020, विदेशी विश्वविद्यालयों के साथ अनुसंधान और / या शिक्षण सहयोग, विदेशों के गुणवत्तापूर्ण संस्थानों के साथ विद्यार्थियों के आदान-प्रदान कार्यक्रमों को प्रोत्साहित करता है। इसे प्रोत्सहित करने के लिए, विदेशी विश्वविद्यालयों में अर्जित क्रेडिट (केवल वे क्रेडिट जो कृषि संबंधी या मूलभूत विज्ञान विषयों में अर्जित किए गए हैं, मानविकी एवं ललित कलाओं में नहीं) को डिग्री प्रदान करने के लिए गिनने की अनुमति है। शिक्षा का अंतरराष्ट्रीयकरण करने के संबंध में एनईपी की उपरोक्त सभी सिफारिशों के लिए प्रावधान करने के लिए एनएआरईएस प्रणाली को अपने विनियमों की समीक्षा करने की आवश्यकता है।

वर्तमान में, कई स्कीमों के तहत अनेक अंतरराष्ट्रीय विद्यार्थी, विशेष रूप से अफ्रीका एवं एशिया से, इन उच्च कृषि शिक्षण संस्थानों में नामांकित हैं। भाकृअप/डेयर, कृषि विश्वविद्यालयों के साथ एक भागीदारी मोड में कार्य कर रहा है और उसने इन योजनाओं के समन्वयन एवं कार्यान्वयन के माध्यम से मानव संसाधन के विकास में महत्वपूर्ण योगदान दिया है। तथापि, वैश्विक मांग का पूरा लाभ उठाने के लिए अधिकांश कृषि विश्वविद्यालयों को बुनियादी एवं स्टाफ के लिए निवेश की आवश्यकता होगी और केन्द्र तथा उसके साथ-साथ तत्संबंधी राज्यों द्वारा निधियन हेतु कृषि विश्वविद्यालयों को अपने आईडीपी तैयार करने के लिए विकल्प है। वर्तमान में, अनेक कृषि विश्वविद्यालयों के पास अंतरराष्ट्रीय विद्यार्थियों को शैक्षणिक कार्यक्रम उपलब्ध कराने के लिए स्पष्ट नीति या पद्धतियां/पर्याप्त प्रावधान नहीं हैं। यह देखा गया है कि अनेक इच्छुक विद्यार्थी, विशेष रूप से अफ्रीका एवं एशिया से, कृषि में उच्च शिक्षा प्राप्त करने के लिए भारत और भारतीय संस्थाओं की ओर देख रहे हैं। इन विद्यार्थियों की यह रूचि मुख्य रूप से इसलिए है क्योंकि उनके यहां फसल पद्धति एवं जलवायु संबंधी परिस्थितियां समान है और शिक्षा पर होने वाला खर्च, विकसित देशों की तुलना में तर्क-संगत भी है।

इस पृष्ठभूमि में, कृषि शिक्षा के अंतरराष्ट्रीयकरण को प्राथमिकता देते हुए, पीएसएसबी के रूप में भाकृअप को विधियां तैयार करने की आवश्यकता होगी और प्रत्येक विश्वविद्यालय को और अधिक संख्या में अंतरराष्ट्रीय विद्यार्थियों को आकर्षित करने के लिए प्रयास करने चाहिए।

तथापि, ऐसा होने के लिए पहले कदम के रूप में, भाकृअप के तहत आने वाले कृषि विश्वविद्यालयों को, शिक्षा एवं अनुसंधान हेतु विदेशी सहयोग के संबंध में डेयर द्वारा लगाए गए प्रतिबंधों से मुक्त करने की आवश्यकता है। पूर्ववर्ती सेक्शन में कहीं यह बताया गया है कि विदेशी विश्वविद्यालयों के साथ सहयोग करने और विदेशी विद्यार्थियों को

प्रवेश देने, संयुक्त डिग्री तथा क्रेडिट अंतरण आदि के लिए नियम बनाने आदि के संबंध में वैसी ही आज़ादी मिलनी चाहिए जैसी सामान्य विश्वविद्यालयों को उपलब्ध है।

11.1 प्रत्येक विश्वविद्यालय द्वारा अंतरराष्ट्रीय विद्यार्थियों के लिए एकल खिड़की प्रणाली विकसित करने की आवश्यकता है।

निम्नलिखित शैक्षणिक, आवास, स्वास्थ्य देखभाल, वीजा की सुविधा और अन्य सेवाएं लागू की गई हैं:

- भाकृअप-एनएआरईएस, विश्वविद्यालयों को राष्ट्रीय एवं अंतरराष्ट्रीय विश्वविद्यालयों/संगठनों के साथ दोहरी डिग्री, समेकित एवं सैंडविच कार्यक्रम आरम्भ करने की अनुमति देने का प्रावधान करता है।
- क्रेडिट अंतरण, विनियमों के अतिरिक्त, मेजबान विश्वविद्यालयों को विदेशी विद्यार्थियों के लिए अभिमुखी कार्यक्रमों, उपचारात्मक, पाठ्यक्रमों तथ उपयुक्त आवास सुविधाओं के रूप में सुविधाएं भी सुनिश्चित करनी चाहिएं।
- विदेशी विद्यार्थियों को कक्षा के भीतर एवं बाहर सहज बनाने के लिए, विश्वविद्यालयों को विशेष कक्षाएं आयोजित कर भाषा की बाधा को दूर करने के लिए विशेष प्रयास करने चाहिएं।
- कृषि विश्वविद्यालयों एवं महाविद्यालयों को पाठ्यक्रमों के विकास एवं प्रदायगी, संयुक्त अनुसंधान **एवं/या** स्टाफ और विद्यार्थियों के आदान-प्रदान सहित विभिन्न गतिविधियों के लिए विदेशी संस्थाओं के साथ सुदृढ़ संबंध बनाने चाहिएं।

12. विद्यार्थी विकास

एनईपी-2020 की सिफारिश के अनुसार, विभिन्न माध्यमों/उपायों के द्वारा विद्यार्थियों को वित्तीय सहायता उपलब्ध कराई जाएगी। यह उल्लेख करना हर्ष का विषय है कि भाकृअप, अनेक छात्रवृत्तियां उपलब्ध कराता है नामत: यूजी एवं पीजी विद्यार्थियों के लिए राष्ट्रीय प्रतिभा छात्रवृत्ति (एनटीएस); मास्टर डिग्री करने वाले विद्यार्थियों के लिए भाकृअप पीजी छात्रवृत्ति तथा पीएच.डी. करने वाले विद्यार्थियों के लिए भाकृअप जेआरएफ / एसआरएफ प्रदान करता है। इसी प्रकार से, अनेक कृषि विश्वविद्यालय अच्छा शैक्षणिक प्रदर्शन करने वाले तथा एससी, एसटी, ओबीसी और अन्य सामाजिक एवं आर्थिक रूप से वंचित समूहों (एसईडीजी) के अंतर्गत आने वाले विद्यार्थियों को वित्तीय सहायता प्रदान करते हैं। इस परिप्रेक्ष्य में, यह समिति मेधावी विद्यार्थियों को निम्नलिखित वित्तीय सहायता उपलब्ध करवाने की सिफारिश करती है:

- पीएच.डी. कार्यक्रम करने वाले छात्रों को राष्ट्रीय प्रतिभा छावृत्ति प्रदान की जा सकती है (यूजी एवं पीजी की तर्ज पर)।

- पीएच.डी. विद्यार्थियों को टीचिंग असिस्टेंटशिप प्रदान की जा सकती है।
- योग्यता के आधार पर, पीएच.डी. विद्यार्थियों के लिए, विश्वविद्यालय अध्येतावृत्ति (फैलोशिप्स) का प्रावधान।

यह समिति कृषि विश्वविद्यालयों के बीच विद्यार्थियों के आदान-प्रदान कार्यक्रम की भी सिफारिश करती है जो विद्यार्थियों को अन्य विश्वविद्यालयों में अपनी रूचि के अनुसार आनुभविक लर्निंग की सुविधा तथा उपलब्ध इनक्यूबेशन सुविधाओं का लाभ उठाने का अवसर प्रदान करेगा।

कुछ मानदंडों के आधार पर एक सप्ताह में कुछ घंटों के लिए कृषि विश्वविद्यालयों में संचालन के तहत विभिन्न परियोजनाओं में यूजी/पीजी/पीएच.डी. के विद्यार्थियों की परियोजना एसोसिएटशिप का प्रावधान करने के लिए दिशानिर्देश प्रस्तुत करने के लिए समिति का गठन किया जाए है।

13. संकाय विकास

- एनईपी-2020 का मानना है कि एचईआई की सफलता में सर्वाधिक महत्वपूर्ण कारक, इसके संकाय की गुणवत्ता और उसका कार्य है। उच्च शिक्षा के लक्ष्यों को प्राप्त करने में संकाय के महत्व को समझते हुए, भाकृअप ने पोस्ट–डॉक्टरल अध्येतावृत्तियों, नेताजी सुभाष अंतर्राष्ट्रीय अध्येतावृत्तियों के माध्यम से, संकाय को पेशेवर विकास अवसर उपलब्ध करवाने के लिए और प्रगत संकाय प्रशिक्षण केन्द्रों (सीएएफटी), ग्रीष्मकालीन एवं शीतकालीन स्कूल आदि के माध्यम से प्रशिक्षण कार्यक्रम उपलब्ध कराने के लिए भाकृअप ने अनेक पहलें की हैं। तथापि, शैक्षणिक पेशे में सुधार हेतु इन मार्गों में, कृषि विश्वविद्यालयों में शिक्षण, अनुसंधान एवं सेवा के संबंध में संकाय जागरूकता के द्वारा सृजित किए गए नए मार्गों का और अधिक सशक्तिकरण करने की आवश्यकता है।
- एनईपी-2020 की सिफारिशों के अनुपालन में, कृषि विश्वविद्यालयों/महाविद्यालयों में सर्वश्रेष्ठ, जागरूक एवं सक्षम संकाय प्राप्त करने के लिए, उनके प्रभावी कार्यान्वयन हेतु निम्नलिखित पहलें पुन: प्रस्तुत की गई हैं।
- प्रत्येक क्लासरूम ऐसी प्रौद्योगिकी से सुसज्जित किया जाएगा जो सीखने का बेहतर अनुभव प्रदान करे।
- अध्यापन कार्य बहुत अधिक नहीं होना चाहिए ताकि शिक्षण गतिविधि सुखद बनी रहे और विद्यार्थियों के साथ विचार-विमर्श, अनुसंधान कार्य करने तथा विश्वविद्यालय की अन्य गतिविधियों के लिए पर्याप्त समय हो।

- संकाय को पाठ्यपुस्तक और पठन सामग्री, एसाइनमेंट एवं मूल्यांकनों सहित स्वीकृत अवसंरचना के भीतर अपनी स्वयं की पाठ्यचर्या और शैक्षणिक युक्तियों को डिजायन करने की स्वतंत्रता दी जाए है।
- फास्ट ट्रैक प्रमोशन प्रणाली द्वारा संकाय की उत्कृष्टता को पुरस्कृत/प्रोत्साहित किया जाना चाहिए। साथ ही, मूलभूत मानदंडों पर कार्य न करने वाले संकाय को उत्तरदायी ठहराया जाना चाहिए।

''कार्यकाल-ट्रैक'' विकल्प के साथ संकाय की भर्ती

- उत्कृष्टता को प्रोत्साहन देने के लिए सशक्त स्वायत्त संस्थानों के विजन को ध्यान में रखते हुए, विश्वविद्यालयों के संकाय की भर्ती के लिए स्पष्ट रूप से परिभाषित, स्वतंत्र एवं पारदर्शी प्रक्रियाएं और मानदंड होने चाहिएं।
- वर्तमान/उपरोक्त भर्ती प्रक्रिया को जारी रखते हुए, उत्कृष्टता को सुनिश्चित करने के लिए एक 'कार्यकाल ट्रैक' अर्थात उपयुक्त परिवीक्षा अवधि रखी जाएगी।

14. अनुसंधान सहायता प्रणाली-राष्ट्रीय अनुसंधान फाउंडेशन

- सभी विषयों में प्रतिस्पर्धात्मक अनुसंधान निधियन के लिए एनईपी, राष्ट्रीय अनुसंधान फाउंडेशन (एनआरएफ) के सृजन के साथ एक सुदृढ़ अनुसंधान पारिस्थितिक तंत्र स्थापित कर रहा है। किसी भी फील्ड में किसी भी अनुसंधानकर्ता/विश्वविद्यालय के लिए पीयर-रिव्यू अनुसंधान निधियन प्रणाली उपलब्ध होगी। इसका उद्देश्य, विश्वविद्यालयों में अनुसंधान प्रणालियों को सशक्त बनाना है।

यह समिति सिफारिश करती है कि शिक्षा, अनुसंधान एवं विस्तार के संबंध में भाकृअप द्वारा कृषि विश्वविद्यालयों के लिए स्थापित, प्रायोजित करने और मॉनीटरिंग की प्रचलित प्रणाली को बनाए रखा जाना चाहिए। भाकृअप की सहायता के साथ कृषि विश्वविद्यालयों में प्रचलित शिक्षा-अनुसंधान-विस्तार के त्रिआयामी गुण की विशिष्टता को सुनिश्चित करना राष्ट्रीय हित में है। कृषि अनुसंधान एवं विकास (आर एंड डी) की सशक्त प्रणाली को बनाए रखने के लिए एक महत्वपूर्ण विधि के रूप में इसे व्यापक रूप से मान्यता मिली है। इसके अतिरिक्त, अंतरविषयक कार्यनीतियों के लाभ प्राप्त करने के लिए, अन्य संस्थाओं के साथ सहयोग में सभी कृषि विश्वविद्यालयों को एनआरएफ के माध्यम से उपलब्ध प्रतिस्पर्धात्मक अनुसंधान निधियन का लाभ उठाना चाहिए।

(घ) कृषि शिक्षा के विनियमन में भाकृअप की भूमिका

15. विनियमन संरचना की नई प्रणाली

एनईपी-2020 में सभी स्तरों पर विनियमन प्रणाली के समग्र पुन: कल्पन की सिफारिश की गई है। भारतीय उच्च शिक्षा आयोग (एचईसीआई) के एकछत्र नियंत्रण के तहत चार विशिष्ट तथा स्वतंत्र शीर्षस्थ स्तरों (वर्टीकल्स) के द्वारा विनियमन, प्रत्यायन, निधिकरण तथा शैक्षणिक मानक निर्धारण के विशिष्ट कार्यकलाप निष्पादित किए जाएंगे।

वर्तमान तंत्र तथा एनईपी-2020 के प्रावधान के अनुपालन के आधार पर समिति ने भारतीय उच्च शिक्षा आयोग के तहत सुझाए गए संबंधित वर्टीकल के अंतर्गत निम्नलिखित सिफारिशें करती है:-

वर्टीकल I - राष्ट्रीय उच्च कृषि शैक्षणिक विनियमन परिषद (एनएचईआरसी)

एनईपी-2020 में वर्तमान में मौजूदा अनेक विनियमन एजेंसियों द्वारा विनियमन संबंधी प्रयासों की पुनरावृत्ति के उन्मूलन तथा वियोजन को रोकने की जरूरत पर विशेष जोर दिया है। इसमें वर्तमान अधिनियमों पर पुन: विचार करने तथा इन्हें समाप्त करने और मौजूदा अनेक विनियमन निकायों के पुर्नगठन का समर्थन किया गया है ताकि एकल बिन्दु विनियमन तंत्र बनाया जा सके।

इस पृष्ठ भूमि में समिति ने कृषि शिक्षा के लिए मौजूदा विनियामक प्रणाली में विभिन्न संगठनों की स्थिति और भूमिका का विवरण तैयार किया है।

1. कृषि में अनुसंधान, शिक्षा तथा विस्तार के समन्वय, मार्गदर्शन तथा प्रबंधन के लिए भाकृअप एक शीर्षस्थ निकाय है।
2. संबंधित राज्यों के विभिन्न महाविद्यालयों तथा संस्थानों में कृषि शिक्षा के प्रोत्साहन तथा समन्वयन के लिए राज्य परिषदें/सरकारें वैधानिक संगठन हैं।
3. यूजीसी, भारत में विश्वविद्यालय शिक्षा के समन्वय, निर्धारण तथा मानकों के रख-रखाव के लिए संसद के अधिनियम द्वारा स्थापित भारत सरकार का एक वैधानिक निकाय है।

भाकृअप द्वारा प्रभावशाली भूमिका निभाने के लिए वैधानिक प्रावधान

कृषि अनुसंधान एवं शिक्षा विभाग (डेयर), कृषि एवं किसान कल्याण मंत्रालय, भारत

सरकार के तहत भाकृअप एक स्वायत्तशासी संगठन है। रायल कमीशन आन एग्रीक-ल्चर की रिपोर्ट के अनुसरण में सोसायटी पंजीकरण अधिनियम, 1860 के तहत पंजीकृत सोसायटी के रूप में इसे दिनांक 16 जुलाई, 1929 को स्थापित किया गया था। यह पूरे देश में बागवानी, मात्स्यिकी और पशुविज्ञान में अनुसंधान और शिक्षा के समन्वय, मार्गदर्शन और प्रबंधन के लिए एक शीर्षस्थ निकाय है।

राज्य सूची (सूची-।।) में ''कृषि और कृषि शिक्षा'' के लिए संवैधानिक प्रावधान को ध्यान में रखते हुए राज्य कृषि विश्वविद्यालयों को राज्य विधान मंडल के अधिनियम द्वारा स्थापित किया जाता है। राज्य कृषि विश्वविद्यालयों के मुख्य बजटीय संसाधन संबंधित राज्य सरकारों से आते हैं। अब तक कुछ राज्यों में राज्य परिषद स्थापित हो चुकी हैं। भाकृअप के पास वैधानिक शक्ति न होने के कारण कृषि विश्वविद्यालय/महाविद्यालय खोलने के लिए इनसे अनुमोदन नहीं लिया जाता। चूंकि डेयर को आवंटित कार्यों में खाद्य और कृषि सहित पशु विज्ञान, डेरी तथा मात्स्यिकी से संबंधित उच्च शिक्षा या अनुसंधान और वैज्ञानिक तथा तकनीकी संस्थान के लिए समन्वय तथा मानक निर्धारण का कार्य शामिल है, भाकृअप कृषि में शिक्षा और अनुसंधान कार्यों के समन्वय, मार्गदर्शन तथा प्रबंधन में शामिल रहता है।

नीति के अनुसार भाकृअप पीएमएसबी के रूप में काम करेगा। एनईपी में यह स्वागत योग्य प्रावधानों में से एक है और उच्चतर कृषि शिक्षा के लिए यह एकल मानक निर्धारण निकाय होगा जिससे बदलते समय में समस्त हितधारकों की मांग पूरी होगी।

- जैसा कि पूर्व में कहा गया है, चूंकि संवैधानिक रूप से कृषि राज्य का विषय है अत: वर्तमान में कृषि और कृषि शिक्षा की जिम्मेदारी राज्य सरकार के कार्यक्षेत्र में आती है। इस प्रकार भाकृअप के पास देश में उच्चतर कृषि शिक्षा के मानक बनाने के लिए वैधानिक शक्ति या अधिदेश नहीं है। दूसरी ओर यूजीसी द्वारा डिग्री विवरण, संकाय नियुक्ति के लिए जरूरी अर्हताएं, कैरियर एडवांसमेंट स्कीम (सीएएस) तथा वेतनमान संबंधी विनियमन प्रदान किया जाता है। यह उल्लेख है कि किसी विश्वविद्यालय द्वारा दी गई डिग्री तभी मान्य होती है जब इसे यूजीसी अधिनियम 1956 के सैक्शन 22 के तहत विनिर्दिष्ट किया गया हो।
- अत: समिति उच्चतर कृषि शिक्षा के विनियमन के लिए केन्द्रीकृत अधिकरण के रूप में भाकृअप को अधिदेशित करने का प्रस्ताव करती है। इसका उद्देश्य भाकृअप को एनईपी 2020 के कार्यान्वयन के लिए जिम्मेदार अन्य संगठनों के समकक्ष लाना हो।

- विनिर्दिष्ट पीएसएसबी के रूप में सार्वजनिक और निजी दोनों संस्थानों में सभी उच्च शैक्षणिक संस्थानों के लिए भाकृअप द्वारा अपेक्षित दिशानिर्देश उपलब्ध कराए जाने चाहिए।
- यह पाठ्यक्रम तैयार करने, शैक्षणिक मानक निर्धारित करने और देशभर में शिक्षण, अनुसंधान और कृषि डोमेन के विस्तार का काम जारी रखेगी।
- प्रस्तावित सामान्य शिक्षा परिषद (जीईसी) के सदस्य के रूप में भाकृअप को देश में कृषि शिक्षा के लिए एक महत्वपूर्ण भूमिका निभानी होगी। ऐसे अनेक सामान्य विश्वविद्यालय और महाविद्यालय हैं जो कृषि (बी.एससी, कृषि) में विभिन्न अवधि (3/4 वर्ष) के स्नातक पूर्व डिग्री कार्यक्रम संचालित करते हैं। पीएसएसबी के रूप में, भाकृअप को एकसमान शैक्षणिक संरचना तैयार करने के लिए जीईसी के माध्यम से आवश्यक उपाय करने होंगे और कृषि संबंधी विज्ञानों में शैक्षणिक कार्यक्रम संचालित करने वाले देश भर के सरकारी और निजी दोनों संस्थानों में एकसमान न्यूनतम मानक निर्धारित करने होंगे।
- एकल नियामक बिन्दु के रूप में प्रस्तावित पहला वर्टिकल नामत: राष्ट्रीय उच्च शैक्षणिक नियामक परिषद (एनएचईआरसी) इस दिशा में एक कदम के रूप में दिखाई देता है और भाकृअप, कृषि शिक्षा हेतु एनएचईआरसी के कार्यान्वयनकर्ता के रूप में कार्य करेगी।

वर्टिकल-II: राष्ट्रीय प्रत्यायन परिषद (एनएसी)

- एनइपी-2020 के अनुसार अमेटा- प्रत्यायन निकाय के रूप में राष्ट्रीय प्रत्यायन परिषद, समुचित संख्या में संस्थानों को मान्यता प्राप्त प्रत्यायनकार के रूप में कार्य करने का काम आंवटित करेगी।
- भाकृअप, गुणवत्तापूर्ण उच्च कृषि शिक्षा की चिन्ताओं का समाधान निरन्तर कर रही है रहेगी और इसके राष्ट्रीय कृषि शिक्षा प्रत्यायन बोर्ड (एनएइएबी) को सरकारी और निजी दोनों क्षेत्रों में कृषि विश्वविद्यालयों/महाविद्यालयों के प्रत्यायन के माध्यम से शिक्षा की गुणवत्ता सुनिश्चित करने में शामिल किया गया है। कृषि शिक्षा के लिए उपयुक्त बनाने की दृष्टि से तीन स्तरीय प्रत्यायन प्रणाली अर्थात कार्यक्रम, महाविद्यालय और विश्वविद्यालय को अपनाते हुए प्रत्यायन हेतु दिशा-निर्देश तैयार किए गए हैं।
- इस परिप्रेक्ष्य में , भाकृअप में एनएईएबी को सभी प्रकार के विश्वविद्यालयों, कृषि के साथ-साथ सामान्य में कृषि शिक्षा संचालित करने वाले विश्वविद्यालयों/महाविद्यालयों के प्रत्यायन लिए अधिदेश दिया जा सकता है।

वर्टिकल-III: उच्च शिक्षा अनुदान परिषद (एचईजीसी)

इससे निर्धारित मापदंडों के आधार पर कृषि शिक्षा संस्थानों का निधियन और वित्तपोषण किया जाना अपेक्षित है। इसे नए फोकस क्षेत्रों की शुरूआत करने और सभी विभागों एवं क्षेत्रों में विश्वविद्यालय स्तर पर संचालित किए जाने वाले गुणवत्तापूर्ण कार्यक्रमों का विस्तार करने के लिए छात्रवृत्तियों और विकास निधियों के संवितरण के साथ सौंपा जाएगा।

- बहुविभागीय बनने के लिए कृषि विश्वविद्यालयों के विस्तार की आवश्यकता को देखते हुए एचईजीसी से निधि की मांग करने का यह बड़ा अवसर है। अत: समिति सभी कृषि विश्वविद्यालयों को यह सिफारिश करती है कि वे संस्थागत विकास योजनाएं तैयार करें और अवसरों का लाभ उठाएं

वर्टिकल-IV: सामान्य शिक्षा अनुदान परिषद (जीईसी),

इसे उच्च शिक्षा कार्यक्रमों, जो ''स्नातक विशेषताओं'' के रूप में भी संदर्भित है, के लिए लर्निंग आउटकम तैयार करने के लिए अधिदेश दिया गया है। उच्च शिक्षा अर्हताएं, जो डिग्री/डिप्लोमा/ प्रमाण-पत्र में परिणत होती हैं, को ऐसे शिक्षण परिणामों के अनुसार राष्ट्रीय उच्च शिक्षा अर्हता फ्रेमवर्क (एनएचईक्यूएफ) द्वारा वर्णित किया जाएगा।

निर्दिष्ट पीएसएसबी के रूप में भाकृअप, उच्च शिक्षा प्रणाली में महत्वपूर्ण भूमिका निभाएगी और इसे जीईसी के सदस्य के रूप में आमंत्रित किया जाएगा।

16. पशुचिकित्सा शिक्षा के लिए व्यावसायिक निर्धारण निकाय (पीएसएसबी) के रूप में भारतीय पशुचिकित्सा परिषद (वीसीआई)

बी.वी.एससी एवं पशुपालन (साढे पांच वर्ष) की विभिन्न शैक्षणिक संरचना तथा पीएसएसबी के रूप में वीसीआई के पदनाम को ध्यान में रखते हुए समिति यह सिफारिश करती है कि पाठ्यक्रम तैयार करने, शैक्षणिक मानक निर्धारित करने और बहुविभागीय विश्वविद्यालयों के रूप में पशुचिकित्सा विज्ञान के शिक्षण, अनुसंधान एवं विस्तार के बीच समन्वय स्थापित करने के लिए वीसीआई को इस संबंध में आवश्यक कदम उठाने चाहिए।

17. शिक्षा के व्यवसायीकरण पर रोक लगाना

उच्चतर शिक्षा के व्यवसायीकरण से निपटने और इसे रोकने के लिए जांच और संतुलन के साथ एनईपी-2020 बहुविध मैकेनिज्म की वकालत करती है।

सभी उच्च शिक्षा संगठन (एचईआई) — सरकारी और निजी- को नियामक शासन व्यवस्था के तहत सम स्तरीय माना जाएगा। नियामक शासन व्यवस्था से शिक्षा में निजी लोकोप-

कारी प्रयासों को प्रोत्साहन मिलेगा। सभी विधायी अधिनियमों के लिए सामान्य राष्ट्रीय दिशा-निर्देश होंगे जिससे निजी एचईआई गठित होंगे। इन सामान्य न्यूनतम दिशा-निर्देशों से निजी एचईआई स्थापित करने के लिए ऐसे सभी कार्य हो सकेगें और इस प्रकार निजी और सरकारी एचईआई के लिए सामान्य मानक निर्धारित हो सकेगें। इन सामान्य दिशा-निर्देशों से सुशासन, वित्तीय स्थिरता एवं सुरक्षा, शैक्षणिक परिणाम और प्रकटीकरण की पारदर्शिता शामिल होगी।

शुल्क निर्धारण की प्रगतिशील शासन व्यवस्था के माध्यम से लोकोपकारी और सार्वजनिक जोशपूर्ण उद्देश्य वाले निजी एचईआई को प्रोत्साहित किया जाएगा। विभिन्न प्रकार के संस्थानों के लिए, उनकी प्रत्यायन स्थिति/ श्रेणी के आधार पर अधिकतम सीमा के साथ शुल्क निर्धारण हेतु पारदर्शी तंत्र विकसित किया जाएगा ताकि अलग-अलग संस्थान प्रति_कूल रूप से प्रभावित न हो सके। इससे निजी एचईआई को अपने कार्यक्रमों के लिए स्वतंत्र रूप से, यद्यपि निर्धारित नियमों और व्यापक लागू नियामक तंत्र के तहत, शुल्क निर्धारण हेतु सशक्त किया जा सकेगा।

निजी एचईआई को पर्याप्त संख्या में अपने विद्यार्थियों को छात्रवृत्तियां प्रदान करने के लिए प्रोत्साहित किया जाएगा। निजी एचईआई द्वारा निर्धारित सभी शुल्कों और प्रभारों को पार-दर्शितापूर्ण और पूर्णत: प्रकट किया जाएगा और किसी विद्यार्थी के नामांकन की अवधि के दौरान इन शुल्कों/प्रभारों में कोई मनमानी वृद्धि नही होगी।

समिति यह सिफारिश करती है कि एनटीए/भाकृअप द्वारा आयोजित एआईईईए के माध्यम से निजी संस्थानों को विद्यार्थियों का आबंटन सरकारी संस्थानों को किए गए आबंटन के समान तर्ज पर किया जाए। इससे संस्थानों को प्रतिभाशाली विद्यार्थियों को आकर्षित करने के लिए प्रतिस्पर्द्धात्मक वातावरण प्राप्त होगा।

18. विश्वविद्यालयों में सुशासन और नेतृत्व (लीडरशिप)

एनईपी-2020 स्पष्ट रूप से ऐसे प्रभावी सुशासन ओर नेतृत्व के महत्व को रेखांकित करती है जिससे उच्चतर शिक्षा संस्थानों में उत्कृष्टता और नवोन्मेषण की संस्कृति का सृजन करने में मदद मिलती है। भारत सहित सभी विश्व-स्तरीय संस्थानों की सामान्य विशेषता निश्चित रूप से मजबूत स्व-सुशासन और संस्थागत लीडर्स की उत्कृष्ट योग्यता-आधारित नियुक्तियों का होना है।

इस पृष्ठभूमि में एसएयू की संभाव्यता को मान्यता देते हुए और एनईपी-2020 के प्रावधानों की अनुपालना स्वरूप समिति निम्नलिखित रोड़मैप पुन: प्रस्तुत करती है जिसमें नवोन्मेषण और उत्कृष्टता को बढ़ावा देने वाले और स्वतंत्र स्व-शासित बनने

वाले संस्थानों को श्रेणीकृत प्रत्यायन और श्रेणीकृत स्वायत्ता की समुचित प्रणाली का समावेश है।

बोर्ड ऑफ गवर्नर्स की स्थापना:

- उपयुक्त श्रेणीकृत प्रत्यायनों, जो इस प्रकार की कार्रवाई के लिए संस्थान को तैयार हुआ मानते हैं, के प्राप्त होने पर बोर्ड ऑफ गवर्नर्स की स्थापना की जाएगी जिसमें सिद्ध क्षमताओं और संस्थान के प्रति समर्पण का मजबूत भाव रखने वाले उच्च अर्हता प्राप्त, सक्षम और समर्पित लोगों के समूह का समावेश होगा।
- संस्थान के बीओजी को किसी बाहरी हस्तक्षेप से मुक्त संस्थान को चलाने, संस्थान के प्रमुख सहित सभी प्रकार की नियुक्तियां करने तथा सुशासन से संबंधित सभी निर्णय लेने के लिए अधिकृत किया जाएगा।
- अति महत्वपूर्ण विधान होगा जो पूर्व के अन्य विधानों के विरोधाभासी प्रावधानों का अतिक्रमण करेगा और गठन, नियुक्ति, कार्य प्रणाली, नियमों और विनियमों की रूपरेखा तथा बीओजी की भूमिका तथा जिम्मेदारियां उपलब्ध कराएगा।
- बोर्ड द्वारा नियुक्त विशेषज्ञ समिति द्वारा बोर्ड के नए सदस्यों की पहचान की जाएगी; और नए सदस्यों का चयन स्वयं बीओजी द्वारा किया जाएगा। सदस्यों का चयन करते समय समानता के विचार को भी ध्यान में रखा जाएगा।
- यह स्पष्ट है कि सभी एचईआई को इस प्रक्रिया के दौरान प्रोत्साहित, समर्थित और शिक्षित किया जाएगा और इसका उद्देश्य वर्ष 2035 तक स्वायत बनना तथा ऐसा सशक्त बीओजी बनाना होगा।
- बीओजी, सभी संबंधित रिकार्ड के पारदर्शी स्व-प्रकटीकरण के माध्यम से हितधारकों के प्रति उत्तरदायी और जबावदेह होगा। यह राष्ट्रीय उच्च शिक्षा नियामक परिषद (एनएचईआरसी) के माध्यम से अधिदेशित सभी नियामक दिशा-निर्देशों को पूरा करने के लिए उत्तरदायी होगा।

19. संस्थागत नेतृत्व को बढ़ावा देना

एनईपी-2020 यह स्वीकार करती है कि किसी संस्थान और इसके संकाय की सफलता के लिए उत्कृष्ट और प्रभावी संस्थागत नेतृत्व अत्यन्त महत्वपूर्ण है। यह बताती है कि उच्च शैक्षणिक और सेवा-रिकार्ड के साथ-साथ सिद्ध नेतृत्व एवं प्रबंधकीय कौशल के साथ उत्कृष्ट संकाय की पहचान प्रारंभ में ही की जाए और उन्हें नेतृत्व पद-धारकों के माध्यम से प्रशिक्षित किया जाए।

संस्थागत नेतृत्व के महत्व और कुलपतियों, डीनों और निदेशकों के रिक्त पदों वाले कई विश्वविद्यालयों की मौजूदा स्थिति को ध्यान में रखते हुए, समिति, एसएयू में लागू करने के लिए एनईपी- 2020 की सिफारिशों का समर्थन करती है।

- नेतृत्व के पद रिक्त नहीं रहेंगे।
- बोर्ड ऑफ गवर्नेंस (बीओजी) द्वारा नेतृत्व के पदों के लिए चयन बीओजी द्वारा गठित एक प्रतिष्ठित विशेषज्ञ समिति (ईईसी) के नेतृत्व में एक कड़ी, निष्पक्ष, योठ ग्यता-आधारित और सक्षमता-आधारित प्रक्रिया के माध्यम से किया जाना चाहिए।
- डीन और निदेशकों के पदों को नामांकित पद्धति/आंतरिक परिचालन के बजाय खुली चयन प्रक्रिया के आधार पर भरा जाना चाहिए।

इन पहलुओं के अनुपालन को विश्वविद्यालयों की मान्यता और रैंकिंग के लिए गुणवत्ता आश्वासन मानकों में से एक के रूप में देखा जाना चाहिए।

20. ऑनलाइन और डिजिटल शिक्षा

विज्ञान और शिक्षा में हाल की प्रगति के साथ, जब भी शिक्षा के पारंपरिक और व्यक्तिगत तौर-तरीकों को पूरक/समृद्ध करने की आवश्यकता होती है, हम गुणवत्तापूर्ण शिक्षा के वैकल्पिक तरीकों के साथ तैयार हैं। इस संबंध में, एनईपी-2020 इसके संभावित जोखिमों और खतरों को स्वीकार करते हुए प्रौद्योगिकी का लाभ उठाने के महत्व को पहचानता है। यह इस बात की भी वकालत करता है कि मौजूदा डिजिटल प्लेटफॉर्म और चल रही आईसीटी-आधारित शैक्षिक पहलों को सभी के लिए गुणवत्तापूर्ण शिक्षा प्रदान करने में वर्तमान और भविष्य की चुनौतियों का सामना करने के लिए अनुकूलित और विस्तारित किया जाना चाहिए।

- भाकृअप को मौजूदा ई-लर्निंग प्लेटफॉर्म जैसे स्वयं, दीक्षा, स्वयंप्रभा, आदि का लाभ उठाने और कृषि और संबद्ध विज्ञान में ई-कोर्स विकसित करने के लिए आव-श्यक कदम उठाने चाहिए। वर्तमान महामारी की स्थिति के दौरान ऑनलाइन कक्षाएं आयोजित करने के लिए उपकरण, जैसे दो-तरफ़ा वीडियो और ऑडियो इंटरफ़ेस विशेष रूप से आवश्यक हैं।
- मौजूदा ई-लर्निंग प्लेटफॉर्म जैसे स्वयं, दीक्षा स्वयंप्रभा, आदि का उपयोग वर्चुअल लैब बनाने के लिए किया जा सकता है ताकि सभी छात्रों को गुणवत्तापूर्ण व्यावहा-रिक और प्रयोग-आधारित लर्निंग के अनुभवों तक समान पहुंच प्राप्त सके।

21. प्रौद्योगिकियों और पद्धतियों से जुड़ा बाजार-आधारित विस्तार

यह अपेक्षा की जाती है कि कृषि शिक्षा प्रदान करने वाली संस्थाओं को कृषि और उद्यमिता विकास की सतत प्रगति के लिए स्थानीय समुदाय को सीधे लाभ पहुंचाना चाहिए; एक दृष्टिकोण यह हो सकता है कि प्रौद्योगिकी ऊष्मायन, प्रसार और स्थायी पद्धतियों को बढ़ावा देने के लिए ऊष्मायन केंद्र / कृषि प्रौद्योगिकी पार्क स्थापित किए जाएं।

मौजूदा कृषि विश्वविद्यालय प्रणाली में, केवीके (आईसीएआर और राज्य सरकार द्वारा संयुक्त रूप से वित्त पोषित) द्वारा एसएयू की विस्तार और आउटरीच गतिविधियों को बहुत मजबूत किया गया है, जो अब नेतृत्व कर रहे हैं और एसएयू की विस्तार गतिविधियों को पूरक कर रहे हैं। उनका उद्देश्य प्रौद्योगिकी मूल्यांकन, शोधन और प्रदर्शनों के माध्यम से कृषि और संबद्ध उद्यमों में स्थान विशिष्ट प्रौद्योगिकी मॉड्यूल का मूल्यांकन करना है। केवीके, देश के प्रत्येक जिले की कृषि अर्थव्यवस्था में सुधार के लिए सार्वजनिक, निजी और स्वैच्छिक क्षेत्र की पहलों का समर्थन करते हुए कृषि प्रौद्योगिकी के ज्ञान और संसाधन केंद्र के रूप में कार्य कर रहे हैं।

केवीके, उपरोक्त कार्यों के अलावा, गुणवत्ता वाले तकनीकी उत्पादों (बीज, रोपण सामग्री, जैव-एजेंट, पशुधन) के उत्पादन में एसएयू के पूरक हैं और इसे किसानों को उपलब्ध कराते हैं, फ्रंटलाइन विस्तार गतिविधियों का आयोजन करते हैं, चयनित कृषि नवाचारों की पहचान और प्रलेखन करते हैं और केवीके के अधिदेश के तहत चल रही योजनाओं और कार्यक्रमों के साथ सामंजस्य करते हैं।

प्रौद्योगिकी अपनाने और प्रसार के महत्व को देखते हुए, समिति का सुझाव है कि सभी विश्वविद्यालयों को मौजूदा इकाइयों को मजबूत करने और प्रौद्योगिकी पार्क के रूप में विकसित करने की आवश्यकता है।

ड. विचारार्थ विषयों की अन्य मद

i. कृषि शिक्षा को चिकित्सा एवं विधिक शिक्षा की श्रेणी में रखने पर विचार करना।

इस मुद्दे पर विभिन्न हितधारकों के बीच चर्चा हुई लेकिन बहुमत के दृष्टिकोण ने कृषि शिक्षा को फिर से आकार देने के बारे में यथा प्रस्तावित एनईपी की सिफारिशों को स्वीकार करने का समर्थन किया। यह संभावना है कि पशु चिकित्सा और पशु विज्ञान के यूजी कार्यक्रम को उस श्रेणी के तहत माना जा सकता है। इस पर वीसीआई द्वारा निर्णय लिया जाएगा।

ii. कृषि शिक्षा के संवैधानिक प्रावधानों का मामला। पर्याप्त प्रावधान किए जाने चाहिए ताकि एयू, शिक्षा मंत्रालय द्वारा संचालित रूसा (आरयूएसए) योजना के तहत निधियां प्राप्त करने के लिए योग्य हो जाएं। केंद्रीय विकास निधि का प्रवाह जो भाकृअप के माध्यम से एयू तक पहुंचता है, जारी रखा जाना चाहिए और एनईपी शासन व्यवस्था के तहत एयू की संसाधन- वृद्धि की आवश्यकता पर विचार किया जाए। यह आवश्यक है कि भाकृअप के माध्यम से और अधिक निधि का प्रवाह सुनिश्चित किया जाए।

च. कृषि विश्वविद्यालयों (एयू) द्वारा एनईपी के कार्यान्वयन के लिए समय-सीमा

2021- 2022

- सभी विश्वविद्यालयों द्वारा उच्च शिक्षा में बहुविध निकास और प्रवेश बिंदु उपलब्ध कराए जा सकते हैं। यूजी, पीजी और पीएचडी कार्यक्रमों की आवासीय आवश्यकताओं में ढील देने की जरूरत है ताकि बाहर निकलने/प्रवेश करने के इच्छुक छात्र किसी भी समय सीमा के बावजूद ऐसा करने में सक्षम हो सकें। इसे विश्वविद्यालय की अकादमिक परिषदों और बीओएम की मंजूरी लेकर लागू किया जा सकता है, भले ही विश्वविद्यालय अधिनियम और क़ानून में कोई प्रावधान मौजूद हो।
- एनईपी द्वारा सूचित नई पद्धति के अनुसार यूजी पाठ्यक्रम के पुनर्गठन और पुन: संरूपण के लिए 6वीं डीन समिति का गठन (समिति का गठन जल्दी किया जाए ताकि रिपोर्ट वर्ष 2021 के भीतर ही प्रस्तुत की जा सके।)
- शिक्षा मंत्रालय के निर्देशों के अनुसार अकादमिक बैंक ऑफ क्रेडिट के साथ अनुपालन
- भाकृअनुप के मानद (डीम्ड) विश्वविद्यालय उन्हें बहु-विषयक शिक्षा और अनुसंधान विश्व_विद्यालय (एमईआरयू) में बदलने की प्रक्रिया शुरू कर सकते हैं।

2022-23

- सभी कृषि विश्वविद्यालयों में छात्रों के प्रवेश के लिए आईसीएआर द्वारा सामान्य प्रवेश परीक्षा आयोजित की जा सकती है। विश्वविद्यालयों को आईसीएआर के निर्देश के आधार पर तदनुसार अधिसूचित करने की आवश्यकता है। यूजी के लिए भी परीक्षा क्षेत्रीय भाषाओं में आयोजित की जानी चाहिए।

- कृषि विश्वविद्यालय अपनी क्षमता के अनुसार वार्षिक आधार पर 2021-22 शैक्षणिक सत्र से सीटों में वृद्धि करना शुरू करेंगे। आदर्श रूप से, विश्वविद्यालय द्वारा 10% से कम वार्षिक वेतन वृद्धि को एक मानदंड नहीं बनाया जाना चाहिए , जब तक कि यह लक्ष्य प्राप्त नहीं कर लेता।
- अनुसंधान क्षेत्रों के लिए अपनी मूल ताकत की पहचान करते हुए एयू अपनी संस्थागत विकास योजनाएं विकसित कर सकते हैं।

2025-2030

- एक ही परिसर में स्थित सभी संस्थान , जो पेशेवर या सामान्य शिक्षा प्रदान करते हैं, का उद्देश्य बहु-विभागीय/विषयक संस्थानों / समूहों में व्यवस्थित रूप से और एकीकृत तरीके से दोनों की पेशकश करना हो सकता है।

2035

- व्यावसायिक शिक्षा सहित उच्च कृषि शिक्षा में 50 प्रतिशत सकल नामांकन अनुपात (जीईआर) प्राप्त करना।
- सभी कृषि विश्वविद्यालय नवाचार और उत्कृष्टता का अनुसरण करने वाले स्वतंत्र स्वशासी संस्थान बनने का लक्ष्य रखेंगे। उपयुक्त श्रेणीबद्ध प्रत्यायन प्राप्त होने पर, जो संस्था को इस तरह के कदम के लिए तैयार मानती है, एक बोर्ड ऑफ गवर्नर्स (बीओजी) की स्थापना की जा सकती है।

2040

- सभी उच्च शिक्षा संस्थानों (एचईआई) को 2040 तक बहु-विषयक संस्थान बनने का लक्ष्य रखना चाहिए

2030-40 का दशक

- संपूर्ण नीति एक प्रचालन मोड में होगी, जिसके बाद एक और समग्र समीक्षा की जाएगी।

छ. शैक्षणिक व्यवस्था का राष्ट्रीय शिक्षा नीति–आधारित पुनर्गठन और कार्यान्वयन

क्र.स.	कृषि शिक्षा का पुनर्गठित शैक्षणिक कार्यक्रम	अवधि	समय
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2.	**4 वर्षीय बी.एससी./बी.टेक कार्यक्रम** प्रथम वर्ष: सर्टिफिकेट कोर्स (2 सेमेस्टर) (सिद्धांत और व्यावहारिक प्रशिक्षण) प्रमाण पत्र के साथ बाहर निकलने का विकल्प	एक वर्ष - प्रमाण पत्र के साथ बाहर निकलने का विकल्प	2025 तक
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8.	**बीएससी 3 वर्षीय** कार्यक्रम *संभावना और कार्यान्वयन के परीक्षण के लिए 2025 में डीन समिति*	3 वर्ष (छह सेमेस्टर)	2030 तक
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Implementation Strategy for National Education Policy-2020 in Agricultural Education System

भाकृअनुप
ICAR

शिक्षा प्रभाग
भारतीय कृषि अनुसंधान परिषद
कृषि अनुसंधान भवन-II, पूसा, नई दिल्ली -110 012
Education Division
Indian Council of Agricultural Research
Krishi Anusandhan Bhavan-II, Pusa, New Delhi-110 012

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A. Executive Summary

New Education Policy-2020 (NEP-2020) of India has proposed several changes in the education system of India, including higher agriculture education system. A national level Committee has been constituted by the ICAR to develop an implementation strategy to comply with various provisions of National Education Policy-2020 (NEP-2020). In this direction, several meetings were conducted to deliberate with all the concerned stakeholders and based on the principles and philosophy of NEP-2020, a roadmap has been prepared with the following activities envisaged to comply with various provisions of NEP-2020.

1. Restructuring of Agricultural Universities under NEP-2020

- As per the main thrust of the policy, it has been recommended to end the fragmentation of higher agricultural education by transforming Agricultural Universities/Colleges into large multidisciplinary universities, colleges, and HEI clusters/ Knowledge Hubs with 3,000 or more students. The canvas of multi-disciplinarity of agricultural education shall encompass academic programmes of basic sciences, social sciences and allied disciplines of agricultural sciences. Therefore, the single stream universities under the ICAR-AU system need to move towards multidisciplinary institutions by 2030 while continuing the focus on agriculture.
- Several affiliating colleges exist in large numbers in both public and private domain. As per NEP-2020, they need to be brought under the new norms of higher education. In compliance with the proposed policy, collective steps have been proposed to work in coordination with the universities to eliminate "Affiliation" by 2035.
- By taking the advantage of the available expertise and resources, the necessary steps will be taken to translate ICAR Deemed Universities into multi-disciplinary research-intensive universities.

2. Academic Restructuring of Agriculture Education

- It has been proposed to revamp academic program structure

with an innovative system of multiple entry and exits with options to award certificate, diploma, UG degree general, or degree research, and one or two years of Master's degree. The residential requirements of UG, and PG programmes will be relaxed so that the students wishing to exit/enter may be able to do so irrespective of any time limit.

- A Deans' committee may be constituted by ICAR for restructuring UG curricula in compliance with the provisions of NEP. Based on the demand, the universities may enhance the intake of UG so that the exits of few students with Certificate/Diploma do not hamper the numbers of degree pass-out students. Further, the agricultural universities may be given time to make this restructured four year UG programme functional by 2025. A separate curriculum and admission criteria may be devised for the admissions to one year certificate and two year diploma in Agriculture.
- In PG programmes, it is proposed to follow multidisciplinary approach with an option to choose major and minors as per the choice of the student. Teaching assistantship shall be encouraged to PhD students to gain the required experience and also to address the shortage of faculty in many institutions /universities.
- Policy directives have been enlisted to enhance Gross Enrolment Ratio (GER) in agricultural universities with at least increase of 10% seats from 2021-22 academic session on annual basis; the scores of the common entrance test conducted by ICAR through National Testing Agency (NTA) for admission of the students in all the AUs for UG/PG/Ph.D. may be used by AUs for the admissions. Entrance Examination for UG may be conducted in regional languages and compliance with Academic Bank of Credits (ABC) as per the directives of the Ministry of Education.

3. Role of ICAR in Regulation of agricultural education

- As per the recommendations of NEP-2020, the ICAR shall act as a Professional Standard Setting Body (PSSB) for Agricultural Education to develop the curricula and lay down academic standards for the agricultural education. As a member of the proposed General Education Council (GEC), the ICAR shall take

necessary steps through PSSB for making a uniform academic structure across the country both in public and private institutions offering academic programmes in agricultural sciences.

- As member of the GEC, the ICAR will be able to contribute in the regulation of agricultural education through single regulatory body to be enacted as a National Higher Education Regulatory Council (NHERC), the first vertical of the proposed Higher Education Commission of India.
- As per NEP-2020, the National Accreditation Council (NAC) shall act as a meta Accrediting body and shall assign the task of functioning as recognized accreditor to appropriate number of institutions.
- The task to function as a recognized accreditor shall be awarded to an appropriate number of institutions by NAC. In this perspective, the NAEAB of ICAR may be recognized as an Accreditor for the accreditation of Universities/Colleges offering agricultural education.
- To achieve the goal of 'internationalization at home' by maintaining global quality standards and attracting greater numbers of international students, an International Students Office shall be created to coordinate all matters relating to welcoming and supporting students arriving from abroad.
- Research/teaching collaborations and faculty/student exchanges with high-quality foreign institutions will be facilitated, and relevant mutually beneficial MOUs with foreign countries will be signed.
- With the available alternative modes of quality education, we need to complement/enrich traditional and in-person modes of education.
- The necessary steps should be taken to avail the existing e-learning platforms such as SWAYAM, DIKSHA, SWAYAMPRABHA, etc and also to develop e-courses in agriculture and allied sciences.
- The tools, such as, two-way video and audio interface for holding online classes are particularly necessary during the present pandemic situation and also reach across the globe.

B. Agricultural Education as perceived under NEP-2020

1. Background about the Report:

National Education Policy-2020 (NEP-2020) of India has proposed several changes in the education system of India, including higher agriculture education system. This report presents the implementation strategies of National Education Policy (NEP) -2020 in the agricultural education system of the country regulated and supported by Indian Council of Agricultural Research (ICAR). These changes include transforming the institutional structure as new form of multidisciplinary research-intensive Higher Education Institutions (HEIs), course curricula, academic structure of degrees/diplomas/certificate system, credit banking system, partnerships among HEIs, universities, industry and other stakeholders while continuing the focus on agricultural education encompassing teaching, research and extension systems. The NEP-2020 envisions a complete overhaul and re-energising of the higher education system to overcome the challenges currently faced by the higher education system in India and thereby deliver high-quality higher education, with equity and inclusion.

NEP 2020 recommended following key changes in present higher education system which includes agriculture education system also;

a. moving towards multidisciplinary universities and colleges, with at least one in or near every district, and with more HEIs across India that offer medium of instruction or programmes in local/ Indian languages;

b. moving towards a more multidisciplinary undergraduate education;

c. moving towards faculty and institutional autonomy;

d. revamping curriculum, pedagogy, assessment, and student support for enhanced student experiences;

e. reaffirming the integrity of faculty and institutional leadership positions through merit-appointments and career progression based on teaching, research, and service;

f. establishment of a National Research Foundation to fund outstanding peer-reviewed research to universities and colleges;

g. governance of HEIs by high qualified independent boards having academic and administrative autonomy

h. "light but tight" regulation by a single regulator for higher education;

i. increased access, equity, and inclusion through a range of measures, including greater opportunities for outstanding public education; scholarships by private/philanthropic universities for disadvantaged and underprivileged students; online education, and Open Distance Learning (ODL); and all infrastructure and learning materials accessible and available to learners with disabilities.

To implement the NEP 2020 in National Agricultural Research and Education System (NARES), a Webinar was organised by ICAR under the Chairmanship of Shri Narendra Singh Tomar, Hon'ble Minister for Agriculture and Farmers Welfare, Government of India on August 26, 2020. Shri Parshottam Rupala and Shri Kailash Choudhary, Ministers of State for Agriculture and Farmers Welfare, Govt. of India; Dr. Trilochan Mohapatra, Secretary (DARE) and Director General (ICAR); Vice Chancellors of Agricultural Universities and their Officers, officers of Education Division of ICAR, distinguished invitees from NEP- 2020 core team and representatives of Association of Indian Universities (AIU), University Grants Commission (UGC) and Indian Agricultural Universities Association (IAUA) participated in the Webinar and shared views on NEP-2020 and role of ICAR. Hon'ble Minister for Agriculture and Farmers Welfare advised to constitute a committee of experts to deliberate on all issues regarding implementation of NEP-2020 under higher agricultural education system and prepare a road map for its implementation in NARES regulated and supported by ICAR. Indian Council of Agricultural Research has been mandated to regulate, aid, support and coordinate higher agricultural education in the country to enable quality human resource development.

Accordingly, the following national level committee was constituted by ICAR vide Office order No.Edn.5/14/2020-EQR/Edn dated 9th September 2020.

S.No.	Name	Designation
1.	Dr.Tej Pratap,	Vice-Chancellor, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Udham SinghNagar-263145 Uttarakhand (Chairman)
2.	Dr.B.S.Dhillon	Vice-Chancellor, Punjab Agricultural University, Ludhiana, Punjab (Member)
3.	Dr AK Singh	Director, ICAR-IARI, New Delhi (Member)
4.	Dr. V. Praveen Rao,	Vice-Chancellor, Professor Jayashankar Telangana State Agricultural University, Administrative Office, Rajendranagar, Hyderabad-500030 Telangana (Member)
6.	Dr.R.C.Srivastava	Vice-Chancellor, RPCAU, Samastipur, Bihar (Member)
7.	Dr Gopal Krishna	Director, ICAR – Central Institute of Fisheries Education, Panch Marg, Yari Road, Andheri West, Mumbai 400061 (Member)
8.	Dr.C.Balachandran	Vice-Chancellor, TANUVAS, Chennai, Tamil Nadu (Member)
9.	Dr. (Mrs) Pankaj Mittal,	Secretary General, SG Office, Association of Indian Universities (AIU), New Delhi (Member)
10.	Dr. Ashish Motiram Paturkar	Vice-Chancellor, MAFSU, Nagpur, Maharashtra (Member)
11.	Dr. R.C Agrawal	DDG (Agril. Education), ICAR, New Delhi (Member Convener)

Special invitees-

1. Dr. G. Venkateshwarlu, Assistant Director General (EQA&R), Education Division, ICAR, New Delhi
2. Dr. S.K. Sankhyan, Principal Scientist, Agricultural Education Division, ICAR, New Delhi
3. Dr. Prabhat Kumar, National Co-ordinator, CAAST and Component-2, NAHEP, ICAR, New Delhi

Terms of Reference

a. Assessing and recommending requirements of higher agricultural education in the present set of education/research/extension and suggestion for consideration of agricultural education in the categories of Medical and Legal Education under NEP-2020.

b. To deliberate issues of Constitutional provisions of agriculture education, which is under State List, for implementation of NEP-2020 in the State Agricultural Universities.

c. To suggest a roadmap for ICAR to move forward with the recommendations of NEP- 2020.

d. Any other point as desired by the committee.

2. Principles of National Education Policy-2020 (NEP-2020)

The purpose of the education system is to develop good human beings capable of rational thought and action, possessing compassion and empathy, courage and resilience, scientific temper and creative imagination, with sound ethical moorings and values. It aims at producing engaged, productive, and contributing citizens for building an equitable, inclusive, and plural society as envisaged by our Constitution.

A good education institution is one in which every student feels welcomed and cared for, where a safe and stimulating learning environment exists, where a wide range of learning experiences are offered, and where good physical infrastructure and appropriate resources conducive to learning are available to all students. Inculcating these qualities must be the goal of every educational institution. However, at the same time, there must also be seamless integration and coordination across institutions and across all stages of education.

This **NEP-2020 envisions** an education system rooted in Indian ethos that contributes directly to transforming India, that is Bharat, sustainably into an equitable and vibrant knowledge society, by providing high-quality education to all, and thereby making India a global knowledge superpower. The Policy envisages that the curriculum and pedagogy of our institutions must develop among the students a deep sense of respect towards the fundamental duties and Constitutional values, bonding with one's country, and a conscious awareness of one's roles and responsibilities in a changing world.

The fundamental principles that will guide both the higher agriculture education system and individual institutions in the regime of NEP-2020 are;

- **recognizing, identifying,** and **fostering the unique capabilities of each student,** by sensitizing teachers as well as parents to promote each student's holistic development in both academic and non-academic spheres;
- **flexibility**, so that learners have the ability to choose their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests;
- **no hard separations between arts and sciences**, between curricular and extra-curricular activities, between vocational and academic streams, etc. in order to eliminate harmful hierarchies among, and silos between different areas of learning;
- **multidisciplinary** and a **holistic education** across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world in order to ensure the unity and integrity of all knowledge;
- **emphasis on conceptual understanding** rather than rote learning and learning-for-exams;
- **creativity and critical thinking** to encourage logical decision-making and innovation;
- **ethics and human & Constitutional values** like empathy, respect for others, courtesy, democratic spirit, spirit of service, scientific temper, liberty, responsibility, pluralism, equality, justice and cleanliness and respect for public property;
- **promoting multilingualism and the power of language** in teaching and learning;
- **life skills** such as communication, cooperation, teamwork, and resilience;
- **focus on regular formative assessment for learning rather than the summative assessment that encourages today's 'coaching culture**';
- **extensive use of technology in teaching and learning**, removing language barriers, increasing access for *Divyang* students, and educational planning and management;
- **respect for diversity and respect for the local context** in all curriculum, pedagogy, and policy

- **full equity and inclusion** as the cornerstone of all educational decisions to ensure that all students are able to thrive in the education system;
- **synergy in curriculum across all levels of education** from early childhood care and education to school education to higher education;
- **teachers and faculty as the heart of the learning process** – their recruitment, continuous professional development, positive working environments and service conditions;
- **a 'light but tight' regulatory framework** to ensure **integrity, transparency**, and **resource efficiency** of the educational system through audit and public disclosure while encouraging innovation and out-of-the-box ideas through autonomy, good governance, and empowerment;
- **outstanding research** as a co-requisite for outstanding education and development;
- continuous review of progress based on sustained research and regular assessment by educational experts;
- a **rootedness and pride in India,** and its rich, diverse, ancient and modern culture and knowledge systems and traditions;
- **education is a public service;** access to quality education must being a basic right of every child;
- **substantial investment in a strong, vibrant public education system** as well as the encouragement and facilitation of true philanthropic private and community participation.

3. NEP-2020 Vision for Transforming Agricultural Education

3.1 NEP-2020 calls for strengthening linkages between agriculture education and allied disciplines. Standalone agricultural universities shall need to become multidisciplinary institutions, offering holistic multidisciplinary education. Institutions offering professional (single subject) or general agriculture education will aim to organically evolve into institutions/ clusters offering both, seamlessly by 2030, that means convert into multidisciplinary research-intensive institutions by 2030 while continuing focus on agriculture.

3.2 NEP-2020 has stated that the preparation of professionals in agriculture and veterinary sciences through programmes integrated with general education are to be increased. Most importantly, NEP-2020 has indicated that "**THE DESIGN OF AGRICULTURAL EDUCATION WILL HAVE TO BE STRENGTHENED TOWARDS DEVELOPING PROFESSIONALS"** with the ability to understand and use local knowledge, traditional knowledge and emerging technologies, while being cognizant of critical issues of declining profitability and/or productivity but enhanced economic aspirations of farmers, climate change, food sufficiency etc.

3.3 Another important criteria NEP-2020 envisions for agriculture education universities and colleges, offering agricultural education must benefit the local communities directly.

3.4 Therefore, the existing institutions will need to reinvent themselves and their structure will undergo an evolution of sorts while being provided with adequate funding, legislative enablement and autonomy in a phased manner. The universities in turn will need to display commitment to institutional excellence, engagement with their local communities and accountability.

3.5 As envisaged in NEP-2020, each Agricultural University/ Higher Agricultural Education Institution has to prepare Strategic Institutional Development Plan (IDP) that contain specific plans for action on increasing participation from Socio–Economically Disadvantaged Group (SEDGs), including but not limited to the items listed under steps to be taken by all HEIs in the NEP-2020 document. On the basis of IDP, university will plan its phased growth initiatives, assess its own progress, and reach the goals set in the IDP. The IDP will thus be an important parameter for accessing more funding and achieving higher rankings. For holistic planning and clear vision, NEP-2020 suggests that IDP should be prepared with the joint participation of Board Members, institutional leaders i.e. Deans, Directors, HODs, Faculty, Students and Staff.

4. Growth and development of Agricultural Education System in India

4.1. Formal agricultural research and education in India started in the beginning of the 20th Century with the establishment of Imperial Agricultural Research Institute (IARI) and the agriculture colleges at Kanpur, Nagpur, Coimbatore, Pune and Sabour. A two year Post Graduate Course leading to Diploma of Associateship of IARI was started in 1923. Soon after independence, the Government of India constituted University Education Commission under the Chairmanship of Dr. S. Radhakrishnan. Recommendations of the commission helped greatly to shape the destinies of higher education in India and formed the basis for establishing agricultural universities in India.

4.2. First and second joint Indo-American Teams recommended for establishment of Agricultural Universities in various States of the Country on the pattern of the Land Grant Colleges of the USA. In a historic decision, Indian Agricultural Research Institute, New Delhi was declared as the first Deemed to be University of India in 1958. It started imparting post graduate education leading to M.Sc. and Ph.D. degrees in agriculture. This was the beginning of reorganization and modernization of higher agricultural education in the country.

4.3. Following this, the first agricultural university was established in 1960 at Pantnagar. Thereafter, subsequent State Agricultural Universities (SAUs) were established at Bhubaneshwar, Ludhiana, Hyderabad, Jabalpur and Bangalore in early and mid-sixties. Today, India has 74 Farm Universities and among these there are 3 Central Agriculture Universities, 63 State Agriculture Universities (SAUs), 4 Deemed to be Universities and 4 Central Universities with Agricultural Faculties. While many agriculture Universities have multiple colleges, disciplines and degree programs but there are also single subject Universities, such as Veterinary Universities, Horticulture Universities and Fisheries Universities.

4.4 While all the above categories of Agriculture Universities fall under the domain of ICAR led NARES, there are also Government

as well as private Agriculture Colleges in many states. These are either affiliated to Agriculture Universities or to General Universities. Those Agriculture Colleges which are affiliated to General Universities are imparting three-year degree course (B.Sc. 3 year) as against 4-year degree course in Agriculture Universities falling within NARES.

4.5. Coordinated and guided by the ICAR the system is different from other universities in the country. Compared to general and technical universities, the focus of agricultural universities is different as there is integration of teaching, research and extension activities. The same is clearly reflected in their objectives, which are listed below:

- to impart higher education in agriculture and allied sciences;
- to promote scientific advancement through research studies;
- to organize extension programs (usually a state or part of it) to serve as a model for the extension functionaries of the State Governments; and
- to provide overall leadership in respect of agricultural development.

4.6. To achieve the stated objectives, all the Agricultural Universities (AUs) which include SAU, CAUs (Central Agricultural Universities) and Deemed Universities (DUs) have integrated teaching, research and extension at all levels of university administration and management, especially:

- Unified administration and complementarities of colleges, research stations, All India Coordinated Research Project (AICRP) centres, Krishi Vigyan Kendras (KVKs) and Directorates with multidisciplinary team-work in the development of programs of education, research and extension.
- Functioning with a philosophy of service to farmers and farming having emphasis on programs which are directly and immediately related to solving their problems.

- Quicker communication of new knowledge and information to students in classrooms, to extension workers, farmers and rural youth for adoption in production technology and allied professions.

4.7. ICAR Model Act

Considering the fact that Agriculture Universities have specific requirements for effective functioning, the ICAR developed a Model Act for Agricultural Universities in 1966, with a primary objective to provide a guiding document for creating a legal base for implementation of various provisions across the country which the States may adopt.

The Higher Agricultural Education has registered huge expansion both in qualitative and quantitative terms in last few decades and to fulfill the requirements the ICAR revised the Model Act in 1984, 1994 and 2009.

C. Restructuring of Agricultural Universities under NEP-2020

An analysis of expected shape of universities and the state of affairs of these universities, indicates that the agriculture university system is confronted with following major challenges;

i. For enhancing the GER, Agriculture Education system of India will require massive expansion to levels much beyond its present capacities within each university. Also, our present admission system has drifted to pure meritocracy in admissions and its limitations are now visible in the form of lesser number of students wanting to opt for farming as a vocation after graduation. Actually, many of them may have no farming background and no family farms. So, the present admission process appears inappropriate with respect to attracting/admitting rural students with farming backgrounds. Farm universities thus face a double challenge of increasing numbers as well as also providing space in admission to youths from farming backgrounds.

ii. In terms of quality standards, MINIMUM STANDARDS OF QUALITY OF AGRICULTURE EDUCATION will need to be defined, and strategies planned and ensure that these are adhered to by all stakeholders, within and outside the ICAR governing domain. Bottom limit remains

undefined for most of the institutions not governed by ICAR. Indian Council of Agricultural Research as PSSB for agriculture education, presently does not govern and monitor the whole agriculture education.

iii. Agriculture Universities system is confronted with the challenges of maintaining its recognition with respect to research contributions. Even though market decides relevance of research, the role played by the agriculture universities in facilitating food security and economic well-being of farming communities across the nation need to match with the requirement of the Governments, Industry and public. So how to improve research contribution rating remains a challenge with each university. It has direct bearing on the willingness to invest both by the State and private system.

iv. Universities will need to equip themselves for generating technologies of the future to stay relevant for tomorrow's world. That will not happen without cutting edge research as well as applied research to give solutions to farmers problems in their respective regions. The Agricultural Universities should emphasize on scientific excellence, hiring certain percentage of scientists that match the best talent available globally, as well as maintaining a pool of scientific community that is adapt in working with farmers of the area on their problems.

v. With increasing student numbers graduating from farm universities, how to cope with 80:20 problem, meaning 20% better placements and 80% underemployment/misplaced employment/ no employment. Meaning thereby, providing right skills and knowledge through certificate and diploma courses envisioned under NEP. These are not expected to be simple experience certificates but skill and confidence building measures for earning a livelihood by themselves. Therefore, planning these courses with old mind set is not going to serve the cause. This aspect also needs deep out of box thinking by agriculture universities.

5. Institutional Restructuring and Consolidation

The main thrust of the NEP-2020 regarding higher education is to end the fragmentation of higher education by transforming HEIs into large multidisciplinary universities, colleges, and HEI

clusters/Knowledge Hubs with minimum of 3,000 students. The NEP-2020 has called attention on the fact that University, worldwide, means a multidisciplinary institution of higher learning that offers undergraduate, graduate, and Ph.D. programmes, and engages in high-quality teaching and research. The present complex nomenclature of HEIs in the country such as 'deemed to be university', 'affiliating university', 'affiliating technical university', 'unitary university' shall be replaced simply by 'university' on fulfilling the criteria as per norms. NEP-2020 envisions a new conceptual perception/understanding for a university or a college and defines university as multidisciplinary institution of higher learning that offers undergraduate and graduate programmes, with high quality teaching, research, and community engagement. This would help build vibrant communities of scholars and peers, breakdown harmful silos, enable students to become well-rounded across disciplines including artistic, creative, and analytic subjects as well as sports, develop active research communities across disciplines including cross-disciplinary research, and increase resource efficiency, both material and human, across higher education.

University giving emphasis on research with thrust on Post Graduate academic program would be categorized as **Research-intensive University**. Present Agriculture Universities giving greater emphasis to teaching but with significant research program can be categorized as Education and Research Universities or Research Intensive Universities. Institutions/ Universities/ College with main focus on teaching, are to be categorized as Education focussed Institutions. The degree-granting Colleges (AC) will refer to a large multidisciplinary institution of higher learning that grants undergraduate degrees and is primarily focused on undergraduate teaching though it would not be restricted to that.

In view of above, the Committee recommends the following steps:

- **Agricultural universities shall need to expand to become teaching and research multidisciplinary institutions**. Most agricultural universities today fall under the category of Multidisciplinary Education and Research Universities (MERU) with varying degree of multidisciplinarity. Therefore, many of

these can opt to grow and achieve higher levels of education and research, increasing number of students beyond 3000 threshhold.

- To expand the canvas of multidisciplinarity of agricultural education, universities can be expanded with the inclusion of academic programmes of basic sciences, social sciences, allied disciplines of agricultural sciences, engineering and languages. These are suggestive options to be selected by individual universities as per their capacities and they can manage to receive further support from public and private sources/stakeholders/ partners.
- For each university it is necessary that it works on preparing a blue print of its future called, Institutional Development Plan (IDP) and use it to seek/attract funding from different sources as well for planned growth and development.

  The NEP-2020 has indicated that the minimum strength of students in a university has to be 3000, therefore Universities should focus on increasing student numbers first to achieve the minimum target of 3000 and then go beyond. As elaborated in earlier section, exponential increase in student enrolment by universities is felt necessary and therefore there should be a plan having more agricultural universities with student's strength of 10,000 or more.

6. Making Multi-disciplinary Agricultural Universities

The NEP-2020 calls for evolving into multidisciplinary institutions by 2030 and phasing out the single stream HEIs over time. Thus, all agriculture Universities will have to move towards becoming vibrant multidisciplinary institutions. Colleges have the choice of becoming parts of vibrant multidisciplinary farm universities. Single-stream universities will, either add colleges, departments, disciplines across different suggested fields that would help them transform from the single stream that they currently are into multidisciplinary institution or simply become themselves part of another institution. Therefore, the committee recommends that:

Single stream Agriculture University, namely Agriculture, Horticulture, Forestry, Veterinary and Fisheries education will have to

either merge with Parent University or expand into multidisciplinary universities by 2030. If the single stream universities are located in the same premises, the necessary steps may be taken by the State Governments to consolidate them into single multidisciplinary universities. ICAR needs to be authorized by the General Education Council to enforce NEP-2020 recommendations for transforming single stream agricultural universities into Multi-disciplinary Agricultural Universities.

7. Eliminating "Affiliation system" in the Universities and Colleges

As per NEP, the affiliation system has to be phased out by 2035. Several colleges offering UG courses exist in large numbers in both public and private domain. They will need to be brought under the new norms of higher education.

- Government colleges offering agriculture/forestry/veterinary science in some states are affiliated to either Central University or State General University. In such cases, steps will need to be taken by the state to integrate these with the respective universities. That will help make the universities larger as well as multidisciplinary.
- The private agricultural colleges which are affiliated to SAUs may develop as autonomous colleges granting undergraduate degrees based on the guidelines in NEP-2020. The respective SAUs should impress upon their affiliating colleges managements and state Governments to move accordingly.

8. Converting Deemed Universities of ICAR into Multidisciplinary Education and Research Universities

- As per NEP-2020, 'deemed to be university', shall be replaced by 'university' on fulfilling the criteria as per norms. Therefore, the committee recommends that the single stream Deemed Universities under the ICAR-AU system, need to move towards multidisciplinary institutions by 2030 while continuing the focus on agriculture. There are 4 Deemed Universities (DUs) namely Indian Agricultural Research Institute (IARI), Indian Veterinary Research Institute (IVRI), National Dairy Research Institute

(NDRI) and Central Institute of Fisheries Education (CIFE) under ICAR. Some of these institutions have been offering education for nearly 100 years. The 4 Deemed Universities of ICAR have excellent infrastructure for research, teaching and extension, and can be converted into research intensive universities.

- "These DUs may be allowed to expand into multidisciplinary Universities with Doctoral, Master's and Bachelor's degree programmes as envisaged in NEP-2021" and existing system of these DUs under ICAR needs to be retained.

9. Enhancing Gross Enrolment Ratio (GER) in Agricultural Universities

The NEP-2020 has observed that although Agricultural Universities comprise approximately 9% of all universities in the country, enrolment in agriculture and allied sciences is less than 1% of all enrolment in higher education. It also recommended that both capacity and quality of agriculture and allied disciplines must be improved in order to increase agricultural productivity through better skilled graduates and technicians, innovative research, and market-based extension linked to technologies and practices. In order to enhance the GER, the Committee proposes the following strategies:

- All agriculture universities will, as first step, aim to increase student enrolment, to cross the 3000 mark. Minding maintaining quality, both infrastructure development and faculty availability will have to be planned and executed before hand.
- Those Universities which are already above the 3000 mark, should plan in their IDPs for exponential growth in GER such as 5000 by 2025, 10,000 by 2030 and 25000 by 2040. India needs few agricultural universities of these scales in coming decades.
- Agriculture Universities should be provided freedom to forage for foreign students, like the practice prevalent in General Universities. Many private universities have used the provision successfully, scouting for students in prospective countries

in Africa and Asia to enhance their enrolment and finances. ICAR may restrict its role to recommending foreign students to the extent of recommending admission of students which are supported by it with scholarships. So there will be two categories of foreign students, ICAR scholarship holders and students taking admissions directly on their own (Self-financing) or supported by their Govts or any other funding agency.

- Thus in case of regulations for admission of foreign students in UG and PG, there should be level playing field with other general universities, making same UGC regulations applicable in agriculture universities.
- Not all but only few SAUs at present have several constituent colleges located at different places offering only one academic programme with intake of about 60 students. In order to utilize the resources efficiently and enhance the GER, these colleges may be expanded to include other related academic programmes. A College offering B.Sc. (Agriculture) can easily initiate UG programmes in Horticulture and *vice versa*. Further, instead of starting a new college at new place, the existing colleges may be developed as clusters/hubs of higher education in other streams with emphasis on agriculture education.
- Few universities have established PG colleges offering only PG and Ph.D. programmes with very limited intake. With the available manpower and learning resources, these PG colleges may start UG programmes making the institute holistic and vibrant.
- Currently, the diploma programmes/certificate courses are being offered at different colleges. The integration of vocational and higher education, as given in the NEP-2020, is the most important and immediate step to be taken by all Agriculture Universities. The framework for academic program discussed elsewhere, indicates how certificate and diploma courses will be integrated, in line with the guidelines in NEP-2020.

The Committee recommends that ICAR may issue advisory immediately to the State Governments to restrain them from

opening new single subject universities, such as agricultural// forestry/veterinary/fisheries universities. Instead, the states should focus efforts on strengthening of the existing farm universities with respect to infrastructure and faculty that will enable them to expand.

10. Moving Forward: Academic Restructuring of Agriculture Education

The NEP-2020 has proposed revamping academic program structure with an innovative system of multiple entry and exits with options to award certificate, diploma, UG degree general, or degree research, and one or two years of Master's degree.

- Currently, the four-year UG programme is being offered by all the SAUs which has been improved continuously on the basis of recommendation of five Deans' Committees over the years with the comprehensive consultation process. Based on the requirement of the sector, one-year Student Rural Entrepreneur Awareness Development Yojana (Student READY) has been developed and made it mandatorily to be offered in the final year of all the UG programmes. The Student READY programme has been designed to integrate Rural Agricultural Work Experience (RAWE), Experiential Learning, Hands-on Training, In-plant Training and student research with an objective to enable the students to get acquainted with the rural work experience and entrepreneurship development. Further, the UG programme fulfils the following recommendations of the NEP-2020:
    - Four-year bachelor's degree programme
    - Choice based credit system
    - Integration of entrepreneurship in academic programmes

However, NEP necessitates that present academic program has to be restructured. There are these following options;

i. Academic restructuring with old mind set, maintaining as much old norms as possible with some new changes

ii. Academic restructuring with cosmetic changes to get feeling of coming within NEP framework

iii. Academic restructuring with new mindset, seeking innovative overhauling of the existing academic system

First option appears suitable for providing us opportunity of comfortable adjustment to imperatives of NEP. However, it gives no guarantee of a total system overhaul for different levels of outcomes expected in NEP. Implementation strategy for option i. will be a mix of compromises, adjustments, falling short on expected outcomes.

Second option is most comfortable way when it is necessary to be riding the bandwagon, but no support is expected by institutions for advised structural changes. Obviously, outcomes will be much below expectations, and not expected under NEP.

Third option will force us to work on uncomfortable changes with desired outcomes of NEP, i.e. many times enhanced GER, multiple exit and entry system for students, large population of skilled youth in farm and agribusiness activities and above all universities that are appreciated within by farmers and Governments and recognised globally for cutting edge research outputs, academic excellence and unique extension services nowhere seen in the world. Well thought out IDPs worked out by the universities, prospects of required levels of funding and quality governance and management systems in place are difficult stepping stones of this pathway.

Committee has chosen to propose strategy for third option. Suggested steps of this strategy are;

- Restructure the 4 year degree program as follows; one year certificate course and two year diploma course to be offered in a university. A student can pick up any one course for award of one year certificate. There will be choice of diploma after qualifying the test. Similarly, the Diploma students will have the choice of exit or entry into degree course based on test score and seats available. Initially existing UG degree of 4 years, should continue.
- Certificate courses/ Diploma courses will need to be identified and designed in such a way that they are as per the demand of stakeholders. In order to make these Certificate and Diploma courses attractive, they should offer career opportunities to the students. The entire UG programme needs to be restructured enabling the first year courses as standalone having a component of hands-on training/

experiential learning in the form of elective on the desired aspect (such as mushroom production, nursery management, bee keeping etc.). Similarly, elective courses can be made available to those students who would like to exit the programme with the Diploma.

- Committee proposes that in this regard, a Deans Committee may be constituted by ICAR for restructuring UG curricula in compliance with the provisions of NEP-2020.

Issues to be considered by the Deans Committee include;

- Certificate course structure, areas, end of course test and criteria for entry into Certificate and Diploma
- Whether two streams certificate courses can be considered, one for those admitted to B.Sc. (on the basis of merit as is the present practice) and second certificate course designed for those students who will be admitted on different criteria, giving weightage of farming background. This certificate course will allow limited number of entries to Diploma and then still limited numbers to Degree, based on test merit. Can it be 3 year degree for these candidates with no option for post graduation or possibility of common 4 year degree, along with other degree students.
- Inter- transferability of student from one stream to another after completion of first year to be explored. Also the mechanism of admission of students after two years diploma courses from Polytechnique to various programs in Agricultural Universities to be explored.
- Assessment of type of skilled human resource in the field of agriculture and allied sectors required by different sectors to be assessed to get the requirement of various topics, practical exposures, internships etc. alongwith the issue of employability and recognition of the one year certificate and 2 year diploma holders.
- To develop the mechanism for the of the students during/after education to have opportunity of practicing in their area of domain with the support of university by exploring PPP mode.

Based on the demand, the universities may enhance the intake of UG so that the exits of few students with Certificate/Diploma do not hamper the number of degree pass-out students.

Agricultural education is different from general education as also reflected in Section 4.0, so the present system of 4 year B.Sc. degree and 2 year M.Sc. degree should continue.

The degree granting AUs should impart education in at least 50% of the total credits. Academic bank of credit should be implemented for courses in agricultural universities. Prior permission of degree granting AUs should be obtained before taking any course from other AUs.

In case of Veterinary students, the regulations for UG program are framed and regulated by Veterinary Council of India (VCI). ICAR has in its fold PG programs of Veterinary and Animal Sciences. Thus, specific consideration is needed for veterinary sciences while formulating only post graduate programmes. Whether the B.V.Sc.& A.H five and half year programme needs any restructuring is left to be considered by VCI. The VCI is also one of the PSSB and a member of General Education Council and it is expected that it may be considering recommendations of NEP and reposition its UG program accordingly.

Ph.D. students, irrespective of disciplines, will be required to take credit-based courses in teaching/ pedagogy/ communication skills or subjects related to the chosen Ph.D. research area during their doctoral programme. Course curricula design and structure is left to be decided by the universities. However, the Ph.D. Scholars will also be required to invest prescribed minimum number of hours of actual teaching. For this Universities will necessarily provide teaching assistantship to every Ph D student.

As per the NEP-2020, the curriculum and pedagogy will be designed by universities along with standards of student assessment, both for on-line and in-class modes. In ICAR-AU system, it is being done collectively and periodically through Deans' Committees and Broad Subject Matter Committees in Agriculture (BSMA). The Committee recommends that these activities need to be taken by ICAR as a Professional Standard Setting Body (PSSB).

11. Internationalization of ICAR-AU System

The human resources and scientific expertise developed in agricultural sciences in India have been internationally recognized and a number

of developing and developed countries have shown keen interest to avail the facilities available in the ICAR-AU system.

The NEP-2020 provides for facilitating easy change of institutions/ credit transfers for those students aspiring to move between institutions within India and abroad. It plans for credit transfer system as well as research in foreign institutions and vice versa. The NEP-2020 encourages research and/or teaching collaborations with foreign universities, student exchange programmes with quality institutions abroad. To encourage it, credits acquired in foreign universities (only those credits earned in agricultural or basic science subjects. Not that of humanities and fine arts) be permitted to be counted for the award of degrees. The NARES system needs to revisit regulations to make provision for all the above recommendations of NEP with respect to internationalization of education.

Currently, several international students, especially from Africa and Asia, are enrolled in these higher agricultural educational institutions under several schemes. The ICAR/DARE has been working in a partnership mode with AUs and has contributed significantly in developing human resource by way of co-ordinating and implementation of these schemes. However, to take the full advantage of global demand, most AUs will require investment in infrastructure and staff and the option with AUs is to prepare their IDPs to make a case for funding by Centre as well as respective states. At present, many AUs do not have a clear policy or modalities/adequate provisions to offer academic programmes for international students. It has been observed that several aspirants, especially from Africa and Asia, are looking at India and Indian institutions for higher education in agriculture. The interest of these students is mainly because of similar cropping pattern and climatic conditions prevalent and the cost of education which being quite reasonable in India compared to developed nations.

In this background, giving priority to Internationalisation of Agricultural Education, methods will need to be devised by ICAR as PSSB and each University should make efforts to attract more and more international students.

However, for this to happen, as a first step, Agricultural Universities under ICAR will need to be liberated from the restrictions imposed by DARE on

foreign collaboration for education and research. It has been stated elsewhere in earlier sections that Agricultural Universities must have same liberty as is available in General Universities with respect to forging collaboration with foreign Universities and about admitting foreign students, framing rules for joint degrees as well as credit transfers etc

11.1 Need to develop a single window system for international students by each university.

Following academic, housing, healthcare, visa facilitation and other services are put in place:

- ICAR-NARES makes provision for allowing universities to start Dual degree, integrated and sandwich programmes with national and international universities/organizations.
- Apart from credit transfer regulations, the host universities should also ensure facilities for the foreign students in the form of orientation programmes, remedial courses, and appropriate accommodation.
- The universities should make special efforts to overcome language barrier through holding special classes to make foreign students comfortable in and outside class-rooms.
- Agricultural universities and colleges should have strong alliances with foreign institutions for various activities including development and delivery of courses, joint research, and/or the exchange of staff and students.

12. Student Development

As recommended by the NEP-2020, the financial assistance to students shall be made available through various means/measures. It is heartening to mention that the ICAR offers various scholarships namely National Talent Scholarships (NTS) for UG and PG students; ICAR PG Scholarships for Masters students and ICAR JRF/SRF for Ph.D. students. Similarly, several agricultural universities extend financial support to academic performers and students belonging to SC, ST, OBC and other Socially and Economically Disadvantaged groups (SEDGs). In this backdrop, the Committee recommends the following financial support to meritorious students:

- National Talent Scholarships may be awarded to the students pursuing Ph.D. programme (on the similar lines of UG and PG).
- Teaching assistantships may be offered to Ph.D. students
- Provision for university fellowships for Ph.D. students on merit basis.

The committee also recommends for the student exchange program amongst the Agricultural Universities which shall provide the opportunity to students to avail the facility of Experience Learning and Incubation Facilities available according to the interest of the students in other universities.

A committee may be constituted to submit the guidelines for making provisions of the project associateship of students of UG/PG/Ph.D. in various projects under operation in AUs for certain hours in a week based on certain criteria.

13. Faculty Development

- The NEP-2020 recognizes that the most important factor in the success of HEIs is the quality and engagement of its faculty. Acknowledging the criticality of faculty in achieving the goals of higher education, the ICAR has taken various initiatives for providing faculty with professional development opportunities through Post-doctoral Fellowships, Netaji Subhas International Fellowships; and training programmes through Centres for Advanced Faculty Training (CAFT), Summer/Winter Schools etc. However, these avenues for improvements in the academic profession, faculty motivation in terms of teaching, research, and service in agriculture universities need to further strengthen new avenues created.
- In compliance with the recommendations of the NEP-2020, the following initiatives are reproduced for their effective implementation to achieve the best, motivated, and capable faculty in agricultural universities/colleges:
- Every class room shall be equipped with technology that enables better learning experience.
- Teaching duties should not be excessive, so that the activity of teaching remains pleasant and there is adequate time for

interaction with students, conducting research, and other university activities.

- Faculty may be given the freedom to design their own curricular and pedagogical approaches within the approved framework, including textbook and reading material, assignments and assessments.
- Faculty excellence should be rewarded/ incentivized with fast-track promotion system. At the same time, the faculty not delivering on basic norms need to be held accountable.

Faculty Recruitment with 'tenure-track' option

- In keeping with the vision of autonomous institutions empowered to drive excellence, the universities should have clearly defined, independent, and transparent processes and criteria for faculty recruitment.
- While continuing the current/above recruitment process, a 'tenure-track' i.e., suitable probation period shall be put in place to further ensure excellence.

14. Research Support System – National Research Foundation

- NEP is putting in place a robust research ecosystem with the creation of National Research Foundation (NRF) for supporting competitive research funding in all the disciplines. The peer reviewed research funding system will be available to any researcher/ university in any field. It is aimed at strengthening research systems in universities.

  Committee recommends that the prevailing system of sponsorship and monitoring set up by ICAR for agriculture universities with respect to education, research and extension should be maintained. It is in the national interest to ensure the uniqueness of three-dimensional feature of education-research-extension system prevalent in the agriculture universities with the support of ICAR. It is widely recognized as an important tool for maintaining a strong system of agriculture Research and Development (R&D). Additionally, competitive research funding available through NRF need to be availed by all the agricultural universities in collaboration with other institutes to reap the benefits of interdisciplinary strategies.

D. Role of ICAR in Regulation of agricultural education

15. New Regime of Regulatory Architecture

The NEP-2020 recommends complete overhaul of the regulatory system at all levels. Under one umbrella of Higher Education Commission of India (HECI), distinct functions of regulation, accreditation, funding and academic standard setting shall be performed by four distinct and independent verticals.

Based on the prevailing mechanism and in compliance with the provisions of NEP-2020, the Committee offers the following recommendations under respective verticals suggested under Higher Education Commission of India.

Vertical-I: National Higher Educational Regulatory Council (NHERC)

The NEP-2020 categorically expresses the need to eliminate the duplication and disjunction of regulatory efforts by the multiple regulatory agencies that exist at present. It advocates to relook and repealing of existing Acts and restructuring of various existing regulatory bodies to enable the single point regulation.

In this background, the Committee brings out the status and role of various organizations in the existing regulatory system for agricultural education.

1. ICAR as an apex body for co-ordinating, guiding and managing research, education and extension in agriculture
2. State Councils/Governments as statutory organizations for promotion and coordination of agricultural education in various colleges and institutes of the respective States
3. The UGC as a statutory body of the Government of India established through an Act of Parliament for the coordination, determination and maintenance of standards of university education in India.

Statutory provisions for playing effective role by ICAR

The ICAR is an autonomous organisation under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture

and Farmers Welfare, Government of India. It was **established on 16 July 1929** as a registered society under the Societies Registration Act, 1860 in pursuance of the report of the Royal Commission on Agriculture. It acts as an apex body for co-ordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the entire country.

In view of the Constitutional provision for "Agriculture and Agricultural Education" in State List (List-II), the SAUs are being established by an Act of State Legislature. Major budgetary resources of SAUs come from the respective State Governments. So far, the State Councils have been established in some of the states. In the absence of statutory powers to the ICAR, its approval is not taken for opening an agricultural university/college. As the Allocation of Business to DARE is Co-ordination and determination of standards in institutions for higher education or research and scientific and technical institutions in so far as it relates to food and agriculture including animal husbandry, dairying and fisheries, the ICAR is involved in co-ordinating, guiding and managing research and education in agriculture.

As per the Policy, the ICAR shall act as a PSSB. It is one of the welcome provisions in NEP-2020 and it shall serve as a sole standard setting body for higher agriculture education, fulfilling the required demand of all the stakeholders over changing times.

- As stated earlier, at present the responsibility for agriculture and agricultural education, lies in the domain of State Government, agriculture constitutionally being a State subject. Thus, the ICAR does not have statutory powers or mandate to sustain standards of higher agricultural education in the country. On the other hand, the UGC has been providing the regulations in terms of Degree nomenclature, essential qualifications for appointment of faculty, Career Advancement Scheme (CAS) and pay scales. It is to mention here that the degrees awarded by a university are recognized only when they are specified by UGC under Section 22 of the UGC Act, 1956.
- Hence, the Committee proposes mandating ICAR as a central authority for regulation of higher agricultural education. It will

aim to make ICAR on par with the other institutions responsible for implementing NEP-2020.

- As the designated PSSB, the ICAR should provide the required guidelines for all the higher educational institutes both public and private institutes.
- It may continue to draw the curricula, lay down academic standards and coordinate between teaching, research and extension of agriculture domain all over the country.
- As a member of the proposed General Education Council (GEC), the ICAR has to play a pivotal role for agricultural education in the country. There are several General Universities and colleges offering UG degree program in agriculture (B.Sc. Agriculture) of variable duration (3/4 year). As PSSB, the ICAR has to take necessary steps through GEC for making a uniform academic structure and set uniform minimum standards across the country both in public and private institutions offering academic programmes in agricultural sciences.
- The proposed first vertical namely, National Higher Educational Regulatory Council (NHERC) as a single regulatory point is seen in this direction and ICAR will be implementing arm of NHERC for Agriculture Education.

Vertical-II: National Accreditation Council (NAC)

- As per NEP-2020, the National Accreditation Council, as a meta-Accrediting body will assign the task of functioning as recognized accreditor to appropriate number of institutions.
- ICAR continues to address the concerns of quality higher agricultural education and its National Agricultural Education Accreditation Board (NAEAB) has been involved in ensuring the quality of education through accreditation of Agricultural Universities/Colleges both in public and private sector. In order to suit the agricultural education, the guidelines for accreditation have been framed following three tier accreditation system i.e. Programme, College and University.
- In this perspective, the NAEAB of ICAR may have the mandate for the accreditation of Universities/Colleges offering agricultural

education across all kinds of universities, agricultural as well as general.

Vertical-III: Higher Education Grants Council (HEGC)

It is expected to carry out funding and financing of higher education institutions, based on set criteria. It will be entrusted with the disbursement of scholarships and developmental funds for launching new focus areas and expanding quality programme offerings at universities across disciplines and fields.

- In view of the need to expand the agricultural universities to become multidisciplinary, it is a great opportunity to seek the funding from the HEGC. Hence, the Committee recommends all AUs to prepare Institutional Development Plans (IDPs) and avail the opportunities.

Vertical-IV: General Education Council (GEC)

It is mandated to frame learning outcomes for higher education programmes, also referred to as 'graduate attributes'. Higher education qualifications leading to a degree/diploma/certificate shall be described by the National Higher Education Qualification Framework (NHEQF) in terms of such learning outcomes.

The ICAR, as a designated PSSB, will play a key role in the higher education system and it will be invited as a member of the GEC.

16. Veterinary Council of India (VCI) as a Professional Standard Setting Body (PSSB) for Veterinary Education

In view of the different academic structure for B.V.Sc. &A.H. (five and half years) and the designation of VCI as PSSB, the Committee recommends that the VCI should take necessary steps in this regard to draw the curricula, lay down academic standards and coordinate between teaching, research and extension of veterinary science as multidisciplinary universities.

17. Curbing Commercialization of Education

The NEP-2020 advocates for multiple mechanisms with checks and balances to combat and stop the commercialization of higher education.

All HEIs - public and private - shall be treated on par within this regulatory regime. The regulatory regime shall encourage private philanthropic efforts in education. There will be common national guidelines for all Legislative Acts that will form private HEIs. These common minimal guidelines will enable all such Acts to establish private HEIs, thus enabling common standards for private and public HEIs. These common guidelines will cover Good Governance, Financial Stability & Security, Educational Outcomes, and Transparency of Disclosures.

Private HEIs having a philanthropic and public-spirited intent will be encouraged through a progressive regime of fee determination. Transparent mechanisms for fixing of fees with an upper limit, for different types of institutions depending on their Accreditation Status/Grade, will be developed so that individual institutions are not adversely affected. This will empower private HEIs to set fees for their programmes independently, though within the laid-out norms and the broad applicable regulatory mechanism.

Private HEIs will be encouraged to offer scholarships in significant numbers to their students. All fees and charges set by private HEIs will be transparently and fully disclosed, and there shall be no arbitrary increases in these fees/charges during the period of enrolment of any student.

The Committee recommends the allotment of students to private institutions through AIEEA conducted by NTA/ICAR on the same lines of allotment to public institutions. It will enable the institutions to have a competitive environment to attract meritorious students.

18. Governance and Leadership in Universities

The NEP-2020 clearly underlines the importance of effective governance and leadership that enables the creation of a culture of excellence and innovation in higher education institutions. The common feature of all world-class institutions globally including India has indeed been the existence of strong self-governance and outstanding merit-based appointments of institutional leaders.

In this backdrop, recognizing the potential of SAUs and in compliance with the provisions of NEP-2020, the Committee reproduces the following roadmap encompassing a suitable system of graded accreditation and graded autonomy to become independent self-governing institutions pursuing innovation and excellence:

Establishment of Board of Governors:

- Upon receiving the appropriate graded accreditations that deem the institution ready for such a move, a Board of Governors (BoG) shall be established consisting of a group of highly qualified, competent, and dedicated individuals having proven capabilities and a strong sense of commitment to the institution.
- The BoG of an institution will be empowered to govern the institution free of any external interference, make all appointments including that of head of the institution, and take all decisions regarding governance.
- There shall be overarching legislation that will supersede any contravening provisions of other earlier legislation and would provide for constitution, appointment, modalities of functioning, rules and regulations, and the roles and responsibilities of the BoG.
- New members of the Board shall be identified by an expert committee appointed by the Board; and the selection of new members shall be carried out by the BoG itself. Equity considerations will also be taken care of while selecting the members.
- It is envisaged that all HEIs will be incentivized, supported, and mentored during this process, and shall aim to become autonomous and have such an empowered BoG by 2035.
- The BoG shall be responsible and accountable to the stakeholders through transparent self-disclosures of all relevant records. It will be responsible for meeting all regulatory guidelines mandated by HECI through the National Higher Education Regulatory Council (NHERC).

19. Promoting Institutional Leadership

The NEP-2020 recognizes that outstanding and effective institutional leadership is extremely important for the success of an institution and of its faculty. It advises that the excellent faculty with high academic and service credentials as well as demonstrated leadership and management skills should be identified early and trained through a ladder of leadership positions.

Considering the importance of institutional leadership and the prevailing situation of several universities with vacant positions of Vice Chancellors, Deans and Directors, the Committee endorses NEP-2020 recommendations for implementing in SAUs

- Leadership positions shall not remain vacant.
- The selection for leadership positions should be carried out by the BoG through a rigorous, impartial, merit-based, and competency-based process led by an Eminent Expert Committee (EEC) constituted by the BoG.
- The positions of Deans and Directors should be filled based on the open selection process rather than nominating practice/ internal circulation.

Compliance of these aspects should be seen as one of the quality assurance parameters for accreditation and ranking of universities.

20. Online and Digital Education

With the recent advances in science and education, we are ready with alternative modes of quality education whenever there is a need to complement/enrich traditional and in-person modes of education. In this regard, the NEP-2020 recognizes the importance of leveraging the advantages of technology while acknowledging its potential risks and dangers. It also advocates that the existing digital platform and ongoing ICT-based educational initiatives must be optimized and expanded to meet the current and future challenges in providing quality education for all.

- The ICAR should take necessary steps to avail the existing e-learning platforms such as SWAYAM, DIKSHA, SWAYAMPRABHA, etc and also to develop e-courses in agriculture and allied

sciences. The tools, such as, two-way video and audio interface for holding online classes are particularly necessary during the present pandemic situation.

- The existing e-learning platforms such as SWAYAM, DIKSHA SWAYAMPRABHA, etc. may be leveraged for creating virtual labs so that all students have equal access to quality practical and hands-on experiment-based learning experiences.

21. Market-based extension linked to technologies and practices

It is expected that the institutions offering agricultural education must benefit the local community directly for sustainable progress of agriculture and entrepreneurship development; one approach could be to set up Incubation Centres/Agricultural Technology Parks to promote technology incubation and dissemination and promote sustainable methodologies.

In the existing agricultural university system, the extension and outreach activities of the SAUs have been greatly strengthened by the KVKs (jointly funded by ICAR and State Government), which are now taking a lead and complementing SAU's extension activities. They aim at assessment of location specific technology modules in agriculture and allied enterprises, through technology assessment, refinement and demonstrations. The KVKs have been functioning as knowledge and resource centre of agricultural technology supporting initiatives of public, private and voluntary sector for improving the agricultural economy of each district of the country.

The KVKs in addition to the above functions, also complement SAUs in the production of quality technological products (seed, planting material, bio-agents, livestock) and making it available to farmers, organize frontline extension activities, identify and document selected farm innovations and converge with ongoing schemes and programs within the mandate of KVK.

In view of the importance of the technology adoption and dissemination, the Committee suggests that all the universities need to strengthen the existing units and develop as Technology Parks.

E. Other items in Terms of Reference

i. Considering Agriculture Education in the category of Medical and Legal education category.

This issue was debated among different stakeholders but the majority view point favoured accepting NEP recommendations about reshaping agricultural education as proposed. It is likely that UG program of Veterinary and Animal Sciences may have to be treated under that category. That is a call for VCI to take.

ii. Issue of Constitutional provisions of agricultural education. Sufficient provisions should be made so that AUs gets qualified for receiving funds under RUSA scheme operated by Ministry of Education. The flow of central development funds that reaches to AUs through ICAR should be continued and considering enhanced resource requirements of AUs under NEP regime, it is necessary that more fund flow through ICAR is ensured.

F. Timelines for implementation of NEP by AUs

2021- 2022

- Multiple exit and entry points into higher education may be made available by all the universities. The residential requirements of UG, PG and Ph.D. programmes need to be relaxed so that the students wishing to exit/enter may be able to do so irrespective of any time limit. This may be implemented by taking the approval of Academic Councils of the University and the BOM, whatever the provisions exist in the university Act and Statute.
- Constitution of 6th Deans Committee for restructuring and reformulation of the UG curriculum in accordance with the new system advised by NEP. (Committee to be set up early so that the report may be submitted within 2021 itself.)
- Compliance with Academic Bank of Credits as per the directives of the Ministry of Education
- Deemed universities of ICAR may initiate process for transforming them into Multidisciplinary Education and Research University (MERU)

2022-23

- Common entrance test may be conducted by ICAR for admission of the students in all the AUs. The universities need to notify accordingly based on the direction from ICAR. The examination for UG also to be conducted in regional languages.
- AUs to start increasing seats starting from 2021-22 academic session on annual basis, as per their capacity. Ideally not less than 10% annual increment be made a norm by the university, until it achieves the target.
- AUs may develop their Institutional Development Plans identifying their core strength for research areas.

2025-2030

- All institutions, located in the same premises, offering either professional or general education may aim to organically evolve into multi-disciplinary institutions/clusters offering both seamlessly, and in an integrated manner.

2035

- Achieving 50 per cent Gross Enrolment Ratio (GER) in higher agricultural education including vocational education.
- All Agriculture Universities will aim to become independent self-governing institutions pursuing innovation and excellence. Upon receiving the appropriate graded accreditations that deem the institution ready for such a move, a Board of Governors (BoG) may be established

2040

- All higher education institutions (HEIs) should aim to become multidisciplinary institutions by 2040

Decade of 2030-40

- The entire policy will be in an operational mode, following which another comprehensive review will be undertaken.

G. NEP based Restructuring and Implementation of Academic

Sr No	Restructured Academic Program of Agriculture Education	Period	Timeline
1.	**4 year B.Sc./B.Tech program - running**	On going 4 years	Upto 2025
2.	**4 year B.Sc./B.Tech program** First year: Certificate course (2 semesters) (theory and hands on training) exit option with certificate	One Year– exit option with certificate	BY 2025
3.	**4 year B.Sc./B.Tech program** Second year: Diploma Course (2+2 = 4 semesters) (theory and practical) exit option with Diploma	Two years– exit option with diploma	By 2025
4.	**4 year B.Sc./B.Tech program** 3rd year, semesters 5 &6, intensive course work and practical	Three Years	By 2025
5.	**4 year B.Sc./B.Tech program** 4th year, semesters 7&8, advanced course work/specialization	Four Years Completion of B.Sc. **/B.Tech** degree	By 2025
6.	**M.Sc. 2 year program,** current system to continue as it is.	2 years	continuing
7.	**Ph.D.2-3 year program,** current system to continue as it is.	3 years	continuing
8.	**B.Sc. 3 year** program *Deans Committee in 2025 to examine possibility and implementation*	3 years (six semesters)	By 2030
9.	**M.Sc. one year** program *Deans Committee in 2025 to examine possibility and implementation*	1 year (two semesters)	By 2030

कृषि विश्वविद्यालयों की सूची

क्र.सं.	विश्वविद्यालय का नाम
1.	आचार्य एन.जी. रंगा कृषि विश्वविद्यालय, गुंटूर (आंध्र प्रदेश)
2.	आचार्य नरेंद्र देव कृषि और प्रौद्योगिकी विश्वविद्यालय, अयोध्या (उत्तर प्रदेश)
3.	कृषि विश्वविद्यालय, जोधपुर (राजस्थान)
4.	कृषि विश्वविद्यालय, कोटा (राजस्थान)
5.	अलीगढ़ मुस्लिम विश्वविद्यालय, अलीगढ़ (उत्तर प्रदेश)
6.	आनंद कृषि विश्वविद्यालय, आणंद (गुजरात)
7.	असम कृषि विश्वविद्यालय, जोरहाट (असम)
8.	बांदा कृषि और प्रौद्योगिकी विश्वविद्यालय, बांदा उत्तर प्रदेश)
9.	बिधान चंद्र कृषि विश्वविद्यालय, कल्याणी (पश्चिम बंगाल)
10.	बिहार कृषि विश्वविद्यालय, सबौर, भागलपुर (बिहार)
11.	बिहार पशु विज्ञान विश्वविद्यालय, पटना (बिहार)
12.	बिरसा कृषि विश्वविद्यालय, रांची (झारखंड)
13.	केंद्रीय कृषि विश्वविद्यालय, इरोइसेम्बा (इम्फाल)
14.	चौ. सरवन कुमार कृषि विश्वविद्यालय, पालमपुर (हिमाचल प्रदेश)
15.	चंद्रशेखर आजाद कृषि और प्रौद्योगिकी विश्वविद्यालय, कानपुर (उत्तर प्रदेश)
16.	चौधरी चरण सिंह हरियाणा कृषि विश्वविद्यालय, हिसार (हरियाणा)
17.	दाऊ श्री वासुदेव चंद्राकर कामधेनु विश्वविद्यालय, दुर्ग (छ.ग.)
18.	डॉ. बालासाहेब सावंत कोंकण कृषि विद्यापीठ, दापोली (महाराष्ट्र)
19.	डॉ. पंजाबराव देशमुख कृषि विद्यापीठ, अकोला (महाराष्ट्र)
20.	डॉ. राजेंद्र प्रसाद केंद्रीय कृषि विश्वविद्यालय, पूसा, समस्तीपुर (बिहार)

List of Agricultural Universities

SN	NAME OF UNIVERSITY
1.	Acharya N.G. Ranga Agricultural University, Guntur (Andhra Pradesh)
2.	Acharya Narendra Deva University of Agriculture and Technology, Ayodhya (Uttar Pradesh)
3.	Agriculture University, Jodhpur (Rajasthan)
4.	Agriculture University, Kota (Rajasthan)
5.	Aligarh Muslim University, Aligarh (Uttar Pradesh)
6.	Anand Agricultural University, Anand (Gujarat)
7.	Assam Agricultural University, Jorhat (Assam)
8.	Banda University of Agriculture and Technology, Banda Uttar Pradesh)
9.	Bidhan Chandra Krishi Viswavidyalaya, Kalyani (West Bengal)
10.	Bihar Agricultural University, Sabour, Bhagalpur (Bihar)
11.	Bihar Animal Sciences University, Patna (Bihar)
12.	Birsa Agricultural University, Ranchi (Jharkhand)
13.	Central Agricultral University, Iroisemba (Imphal)
14.	Ch. Sarwan Kumar Krishi Vishvavidyalaya, Palampur (Himachal Pradesh)
15.	Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (Uttar Pradesh)
16.	Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana)
17.	Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg (Chhattisgarh)
18.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (Maharashtra)
19.	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra)
20.	Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur (Bihar)

21. डॉ. वाई.एस. परमार बागवानी और वानिकी विश्वविद्यालय, नौनी–सोलन (हिमाचल प्रदेश)
22. डॉ. वाई.एस.आर. बागवानी विश्वविद्यालय, वेंकटरमन्नागुडेम (आंध्र प्रदेश)
23. जी.बी. पंत कृषि और प्रौद्योगिकी विश्वविद्यालय, पंतनगर (उत्तराखंड)
24. गुरु अंगद देव पशु चिकित्सा और पशु विज्ञान विश्वविद्यालय, लुधियाना (पंजाब)
25. भाकृअनुप–केंद्रीय मात्स्यिकी शिक्षा संस्थान, मुंबई (महाराष्ट्र)
26. भाकृअनुप–भारतीय कृषि अनुसंधान संस्थान, नई दिल्ली (दिल्ली)
27. भाकृअनुप–भारतीय पशु चिकित्सा अनुसंधान संस्थान, बरेली (उत्तर प्रदेश)
28. भाकृअनुप–राष्ट्रीय डेयरी अनुसंधान संस्थान, करनाल (हरियाणा)
29. इंदिरा गांधी कृषि विश्वविद्यालय, रायपुर (छ.ग.)
30. कृषि विज्ञान संस्थान, बनारस हिंदू विश्वविद्यालय, वाराणसी (उत्तर प्रदेश)
31. जवाहरलाल नेहरू कृषि विश्वविद्यालय, जबलपुर (मध्य प्रदेश)
32. जूनागढ़ कृषि विश्वविद्यालय, जूनागढ़ (गुजरात)
33. कामधेनु विश्वविद्यालय, अमरेली (गुजरात)
34. कर्नाटक पशु चिकित्सा, पशु और मत्स्य विज्ञान विश्वविद्यालय, बीदर (कर्नाटक)
35. केरल कृषि विश्वविद्यालय, त्रिशूर (केरल)
36. केरल यूनिवर्सिटी ऑफ फिशरीज एंड ओशन स्टडीज, पनांगड (केरल)
37. केरल पशु चिकित्सा और पशु विज्ञान विश्वविद्यालय, लक्कीडी (केरल)
38. लाला लाजपत राय पशु चिकित्सा और पशु विज्ञान विश्वविद्यालय, हिसार (हरियाणा)
39. महाराणा प्रताप बागवानी विश्वविद्यालय, करनाल (हरियाणा)
40. महाराणा प्रताप कृषि और प्रौद्योगिकी विश्वविद्यालय, उदयपुर (राजस्थान)

21. Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni-Solan (Himachal Pradesh)
22. Dr. Y.S.R. Horticultural University, Venkataramannagudem (Andhra Pradesh)
23. G.B. Pant University of Agriculture and Technology, Pantnagar (Uttarakhand)
24. Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana (Punjab)
25. ICAR-Central Institute of Fisheries Education, Mumbai (Maharashtra)
26. ICAR-Indian Agricultural Research Institute, New Delhi (Delhi)
27. ICAR-Indian Veterinary Research Institute, Bareilly (Uttar Pradesh)
28. ICAR-National Dairy Research Institute, Karnal (Haryana)
29. Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh)
30. Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (Uttar Pradesh)
31. Jawaharlal Nehru Krishi Viswavidyalaya, Jabalpur (Madhya Pradesh)
32. Junagadh Agricultural University, Junagarh (Gujarat)
33. Kamdhenu University, Amreli (Gujarat)
34. Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar (Karnataka)
35. Kerala Agricultural University, Thrissur (Kerala)
36. Kerala University of Fisheries and Ocean Studies, Panangad (Kerala)
37. Kerala Veterinary and Animal Sciences University, Lakkidi (Kerala)
38. Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar (Haryana)
39. Maharana Pratap Horticultural University, Karnal (Haryana)
40. Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan)

41. महाराष्ट्र पशु और मत्स्य विज्ञान विश्वविद्यालय, नागपुर (महाराष्ट्र)
42. महात्मा फुले कृषि विद्यापीठ, राहुरी (महाराष्ट्र)
43. नागालैंड विश्वविद्यालय, लुमामी, जुन्हेबोटो (नागालैंड)
44. नानाजी देशमुख पशु चिकित्सा विज्ञान विश्वविद्यालय, जबलपुर (मध्य प्रदेश)
45. नवसारी कृषि विश्वविद्यालय, नवसारी (गुजरात)
46. उड़ीसा कृषि और प्रौद्योगिकी विश्वविद्यालय, भुवनेश्वर (ओडिशा)
47. पी वी नरसिम्हा राव तेलंगाना राज्य पशु चिकित्सा विश्वविद्यालय, हैदराबाद (तेलंगाना)
48. प्रोफेसर जयशंकर तेलंगाना राज्य कृषि विश्वविद्यालय, हैदराबाद (तेलंगाना)
49. पंजाब कृषि विश्वविद्यालय, लुधियाना (पंजाब)
50. राजस्थान पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय, बीकानेर (राजस्थान)
51. राजमाता विजयाराजे सिंधिया कृषि विश्व विद्यालय, ग्वालियर (मध्य प्रदेश)
52. रानी लक्ष्मीबाई केंद्रीय कृषि विश्वविद्यालय, झांसी (उत्तर प्रदेश)
53. सरदार वल्लभभाई पटेल कृषि और प्रौद्योगिकी विश्वविद्यालय, मेरठ (उत्तर प्रदेश)
54. सरदारकृषिनगर दंतीवाड़ा कृषि विश्वविद्यालय, सरदारकृषिनगर (गुजरात)
55. शेर–ए–कश्मीर कृषि विज्ञान और प्रौद्योगिकी विश्वविद्यालय, जम्मू, जम्मू (जम्मू और कश्मीर)
56. शेर–ए–कश्मीर यूनिवर्सिटी ऑफ एग्रीकल्चरल साइंसेज एंड टेक्नोलॉजी ऑफ कश्मीर, श्रीनगर (जम्मू और कश्मीर)
57. श्री कर्ण नरेंद्र कृषि विश्वविद्यालय, जोबनेर (राजस्थान)
58. श्री कोंडा लक्ष्मण तेलंगाना राज्य बागवानी विश्वविद्यालय, हैदराबाद (तेलंगाना)

41. Maharashtra Animal and Fishery Sciences University, Nagpur (Maharashtra)
42. Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra)
43. Nagaland University, Lumami, Zunheboto (Nagaland)
44. Nanaji Deshmukh University of Veterinary Science, Jabalpur (Madhya Pradesh)
45. Navsari Agricultural University, Navsari (Gujarat)
46. Orissa University of Agriculture and Technology, Bhubaneswar (Odisha)
47. P. V. Narsimha Rao Telangana State Veterinary University, Hyderabad (Telanagana)
48. Professor Jayashankar Telangana State Agricultural University, Hyderabad (Telanagana)
49. Punjab Agricultural University, Ludhiana (Punjab)
50. Rajasthan University of Veterinary & Animal Sciences, Bikaner (Rajasthan)
51. Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (Madhya Pradesh)
52. Rani Lakshmi Bai Central Agricultural University, Jhansi (Uttar Pradesh)
53. Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (Uttar Pradesh)
54. Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar (Gujarat)
55. Sher-e-Kashmir University of Agricultural Science & Technology of Jammu, Jammu (Jammu and Kashmir)
56. Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Srinagar (Jammu and Kashmir)
57. Sri Karan Narendra Agriculture University, Jobner (Rajasthan)
58. Sri Konda Laxman Teleangana State Horticulture University, Hyderabad (Telanagana)

59. श्री. वेंकटेश्वर पशु चिकित्सा विश्वविद्यालय, तिरुपति (आंध्र प्रदेश)
60. स्वामी केशवानंद राजस्थान कृषि विश्वविद्यालय, बीकानेर (राजस्थान)
61. तमिलनाडु कृषि विश्वविद्यालय, कोयंबटूर (तमिलनाडु)
62. तमिलनाडु डॉ जे जयललिता मत्स्य विश्वविद्यालय, नागापट्टिनम (तमिलनाडु)
63. तमिलनाडु पशु चिकित्सा और पशु विज्ञान विश्वविद्यालय, चेन्नई (तमिलनाडु)
64. उ प्र पं. दीन दयाल उपाध्याय पशु चिकित्सा विज्ञान विश्व विद्यालय पूर्व संध्या गो अनुसंधान संस्थान, मथुरा (उत्तर प्रदेश)
65. कृषि और बागवानी विज्ञान विश्वविद्यालय, शिमोगा (कर्नाटक)
66. कृषि विज्ञान विश्वविद्यालय, बेंगलुरु (कर्नाटक)
67. कृषि विज्ञान विश्वविद्यालय, धारवाड़ (कर्नाटक)
68. कृषि विज्ञान विश्वविद्यालय, रायचूर (कर्नाटक)
69. बागवानी विज्ञान विश्वविद्यालय, बागलकोट (कर्नाटक)
70. उत्तर बंगा कृषि विश्वविद्यालय, कूचबिहार (पश्चिम बंगाल)
71. वसंतराव नायक मराठवाड़ा कृषि विद्यापीठ, परभणी (महाराष्ट्र)
72. वीर चंद्र सिंह गढ़वाली उत्तराखंड बागवानी और वानिकी विश्वविद्यालय, भरसर, पौड़ी गढ़वाल (उत्तराखंड)
73. विश्व भारती, बोलपुर–शांति निकेतन (पश्चिम बंगाल)
74. पश्चिम बंगाल पशु और मत्स्य विज्ञान विश्वविद्यालय, बेलगछिया (पश्चिम बंगाल)

59. Sri. Venkateswara Veterinary University, Tirupati (Andhra Pradesh)
60. Swami Keshwanand Rajasthan Agricultural University, Bikaner (Rajasthan)
61. Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu)
62. Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam (Tamil Nadu)
63. Tamil Nadu Veterinary and Animal Sciences University , Chennai (Tamil Nadu)
64. U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwa Vidhyalaya Evem Go Anusandhan Sansthan, Mathura (Uttar Pradesh)
65. University of Agricultural and Horticultural Sciences, Shimoga (Karnataka)
66. University of Agricultural Sciences , Bangaluru (Karnataka)
67. University of Agricultural Sciences, Dharwad (Karnataka)
68. University of Agricultural Sciences, Raichur (Karnataka)
69. University of Horticultural Sciences, Bagalkot (Karnataka)
70. Uttar Banga Krishi Viswavidyalaya, Cooch Behar (West Bengal)
71. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra)
72. Veer Chandra Singh Garhwali Uttarakhand University of Horticulture & Forestry, Bharsar, Pauri Garhwal (Uttarakhand)
73. Visva-Bharati, Bolpur-Santiniketan (West Bengal)
74. West Bengal University of Animal and Fishery Sciences, Belgachia (West Bengal)

एनईपी–2020 की कार्यान्वयन योजना बनाने के लिए के लिए कालक्रम
Chronology for Development of Implementation plan of NEP-2020

26 अगस्त, 2020

- माननीय कृषि मंत्री तथा दोनों राज्य मंत्रियों की कुलपतियों के साथ बैठक

9 सितंबर, 2020

- डॉ. तेज प्रताप, कुलपति, जीबी पंत कृषि विश्वविद्यालया की अध्यक्षता में गठित राष्ट्रीय स्तर की समिति

सितंबर–दिसंबर 2020

- समिति की 4 बैठकें

25 जनवरी, 2021

- मसौदा दस्तावेज के बारे में सचिव, कृषि शिक्षा विभाग और महानिदेशक, भारतीय कृषि अनुसंधान परिषद और भारतीय कृषि अनुसंधान परिषद के उप महानिदेशकों के साथ परामर्श

21 जनवरी, 2021 और 01 फरवरी, 2021

- NASC परिसर में हाइब्रिड मोड के माध्यम से आयोजित एक राष्ट्रीय कार्यशाला के माध्यम से माननीय कृषि राज्य मंत्री, भारत सरकार और छात्रों के साथ चर्चा

24 मार्च, 2021

- कुलपतियों की बैठक के माध्यम से राष्ट्रीय परामर्श प्रक्रिया

8 अप्रैल, 2021

- अनुमोदन के लिए मसौदा कार्यान्वयन योजना प्रस्तुत की

26 August, 2020

- Meeting of Hon'ble AM and both MoS held with VCs

9 September, 2020

- National level committee constituted under the chairmanship of Dr. Tej Pratap, VC, GBPUAT

September-December, 2020

- 4 meetings of the committee

January 25, 2021

- Consultation about the draft document with Secretary, Department of Agriculture Education and Director General, Indian Council of Agricultural Research and Deputy Director Generals of Indian Council of Agricultural Research January

21 January, 2021 and February 01, 2021

- Interaction of Hon'ble MoS and with students through a national workshop organized through hybrid mode at NASC complex

24 March, 2021

- National consultation process through Vice-chancellor's meeting

8 April, 2021

- Submitted the draft implementation plan for the approval

20 मई 2021

- माननीय राज्य मंत्री के समक्ष प्रस्तुति

1 जून 2021

- सचिव, डेयर और महानिदेशक, भाकृअनुप द्वारा मुख्य सचिवों की टिप्पणियों के लिए प्रारूप भेजा गया

29 जून 2021

- मसौदा रिपोर्ट माननीय कृषि मंत्री और दोनों माननीय कृषि राज्य मंत्री, भारत सरकार के समक्ष प्रस्तुत की गई

17 अगस्त, 2021

- माननीय कृषि मंत्री, भारत सरकार द्वारा समिति की मसौदा सिफारिशों का अनुमोदन

20 May, 2021

- Presentation before Hon'ble Minister of State

1 June, 2021

- The draft report was circulated to all the Chief Secretaries of States

29 June, 2021

- The draft report was presented before Hon'ble Agriculture Minister and both Hon'ble Minister of States for Agriculture, Government of India.

17 August, 2021

- Approval of the Draft recommendations of the committee by Hon'ble Agriculture Minister, Government of India

कृषि विश्वविद्यालयों में स्नातक के विषय
Subjects in Under Graduate program at various Agricultural Universities

1. कृषि
   Agriculture
2. कृषि इंजीनियरिंग
   Agriculture Engineering
3. जैव प्रौद्योगिकी
   Biotechnology
4. डेयरी प्रौद्योगिकी
   Dairy Technology
5. मछली पालन
   Fisheries
6. खाद्य प्रौद्योगिकी
   Food Technology
7. वानिकी
   Forestry
8. सामुदायिक विज्ञान (गृह विज्ञान)
   Community Science (Home Science)
9. खाद्य पोषण और आहार विज्ञान
   Food Nutrition and Dietetics
10. बागवानी
    Horticulture
11. रेशम के कीड़ों का पालन
    Sericulture
12. कृषि विपणन, व्यवसाय और सहयोग
    Agriculture Marketing, Business and Cooperation

कृषि विश्वविद्यालयों में स्नातकोत्तर और पीएच.डी. के विभिन्न विषय

Subjects being offered in Post-Graduate and Ph.D. programmes by various Agricultural Universities

क्रमांक Sl. No.	बीएसएमए समिति का नाम Name of the BSMA Committee	विषय Disciplines
1.	पादप विज्ञान Plant Sciences	1. आनुवंशिकी और पादप प्रजनन 2. बीज विज्ञान और प्रौद्योगिकी 3. पादप आनुवंशिक संसाधन 1. Genetics and Plant Breeding 2. Seed Science and Technology 3. Plant Genetic Resources
2.	पादप संरक्षण Plant Protection	1. कीटविज्ञान 2. सूत्रकृमिविज्ञान 3. प्लांट पैथोलॉजी 1. Entomology 2. Nematology 3. Plant Pathology
3.	बागवानी विज्ञान Horticultural Sciences	1. फल विज्ञान 2. सब्जी विज्ञान 3. फूलों की खेती और भूनिर्माण 4. वृक्षारोपण, मसाले, औषधीय और सुगंधित फसलें 5. कटाई उपरांत प्रबंधन 1. Fruit Science 2. Vegetable Science 3. Floriculture and Landscaping 4. Plantation, Spices, Medicinal & Aromatic Crops 5. Post-harvest Management
4.	वानिकी Forestry	1. वानिकी (सिल्विकल्चर और एग्रोफोरेस्ट्री) 2. वानिकी (वन जीव विज्ञान और वृक्ष सुधार) 3. वानिकी (वन उत्पाद और उपयोग) 4. वानिकी (वन संसाधन प्रबंधन) 1. Forestry (Silviculture and Agroforestry) 2. Forestry (Forest Biology and Tree Improvement) 3. Forestry (Forest Products and Utilization) 4. Forestry (Forest Resource Management)

क्रमांक Sl. No.	बीएसएमए समिति का नाम Name of the BSMA Committee	विषय Disciplines
5.	भौतिक विज्ञान Physical Science	1. कृषि मौसम विज्ञान 2. कृषि विज्ञान 3. मृदा विज्ञान 4. कृषि भौतिकी 5. जैविक खेती 1. Agricultural Meteorology 2. Agronomy 3. Soil Science 4. Agricultural Physics 5. Organic Farming
6.	सामाजिक विज्ञान Social Sciences	1. कृषि–व्यवसाय प्रबंधन 2. कृषि अर्थशास्त्र 3. कृषि विस्तार शिक्षा 1. Agri-Business Management 2. Agricultural Economics 3. Agricultural Extension Education
7.	बुनियादी विज्ञान Basic Sciences	1. कृषि रसायन 2. जीव रसायन 3. कीटाणु–विज्ञान 4. प्लांट फिज़ीआलजी 1. Agricultural Chemicals 2. Biochemistry 3. Microbiology 4. Plant Physiology
8.	जैव प्रौद्योगिकी और जैव सूचना विज्ञान Biotechnology & Bioinformatics	1. बायोइनफॉरमैटिक्स 2. आण्विक जीवविज्ञान और जैव प्रौद्योगिकी 1. Bioinformatics 2. Molecular Biology & Biotechnology

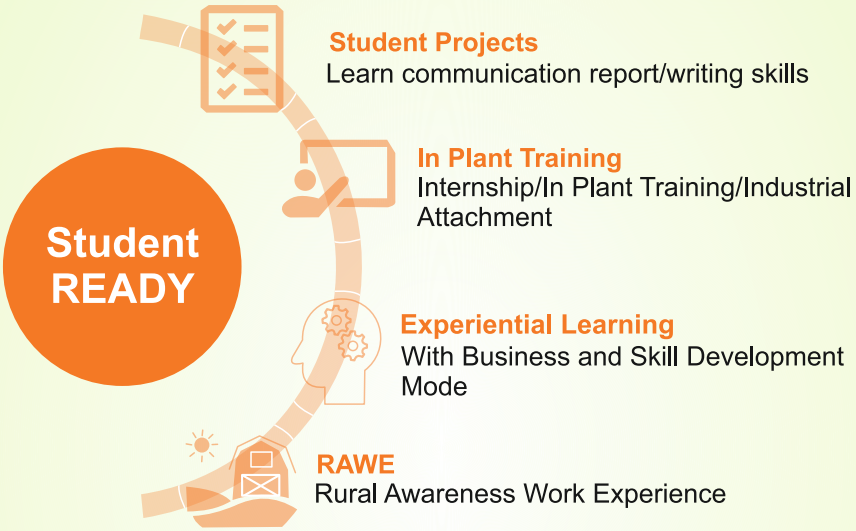
क्रमांक Sl. No.	बीएसएमए समिति का नाम Name of the BSMA Committee	विषय Disciplines
9.	सांख्यिकीय विज्ञान Statistical Sciences	1. कृषि सांख्यिकी 2. कंप्यूटर अनुप्रयोग
10.	बुनियादी पशु चिकित्सा विज्ञान Basic Veterinary Sciences	1. पशु चिकित्सा एनाटॉमी 2. पशु चिकित्सा जैव रसायन 3. पशु चिकित्सा जैव प्रौद्योगिकी 4. पशु चिकित्सा विस्तार शिक्षा 5. पशु चिकित्सा फिजियोलॉजी 1. Veterinary Anatomy 2. Veterinary Biochemistry 3. Veterinary Biotechnology 4. Veterinary Extension Education 5. Veterinary Physiology
11.	पशु चिकित्सा नैदानिक विषय Veterinary Clinical Subjects	1. पशु प्रजनन स्त्री रोग और प्रसूति 2. पशु चिकित्सा सर्जरी और रेडियोलॉजी 3. पशु चिकित्सा 1. Animal Reproduction Gynaecology & Obstetrics 2. Veterinary Surgery & Radiology 3. Veterinary Medicine
12.	पशु चिकित्सा पैरा–क्लिनिकल विषय Veterinary Para-Clinical Subjects	1. पशु चिकित्सा सूक्ष्म जीव विज्ञान, 2. पशु चिकित्सा पैथोलॉजी, 3. पशु चिकित्सा परजीवी विज्ञान, 4. पशु चिकित्सा सार्वजनिक स्वास्थ्य और महामारी विज्ञान, 5. पशु चिकित्सा औषध विज्ञान और विष विज्ञान 1. Veterinary Microbiology, 2. Veterinary Pathology, 3. Veterinary Parasitology, 4. Veterinary Public Health and Epidemiology, 5. Veterinary Pharmacology and Toxicology

क्रमांक Sl. No.	बीएसएमए समिति का नाम Name of the BSMA Committee	विषय Disciplines
13.	पशु उत्पादन विज्ञान Animal Production Sciences	1. पशु आनुवंशिकी और प्रजनन 2. पशुओं का आहार 3. पशुधन उत्पादन और प्रबंधन 4. पशुधन उत्पाद प्रौद्योगिकी 5. कुक्कुट विज्ञान 1. Animal Genetics & Breeding 2. Animal Nutrition 3. Livestock Production & Management 4. Livestock Products Technology 5. Poultry Science
14.	डेयरी विज्ञान और प्रौद्योगिकी Dairy Science and Technology	1. डेयरी प्रौद्योगिकी 2. डेयरी इंजीनियरिंग 3. डेयरी केमिस्ट्री 4. डेयरी माइक्रोबायोलॉजी 1. Dairy Technology 2. Dairy Engineering 3. Dairy Chemistry 4. Dairy Microbiology
15.	कृषि इंजीनियरिंग और प्रौद्योगिकी Agricultural Engineering & Technology	1. फार्म मशीनरी और पावर इंजीनियरिंग 2. प्रसंस्करण और खाद्य इंजीनियरिंग 3. सिंचाई और जल निकासी इंजीनियरिंग 4. अक्षय ऊर्जा इंजीनियरिंग (नया) 5. मृदा और जल संरक्षण इंजीनियरिंग 1. Farm Machinery and Power Engineering 2. Processing and Food Engineering 3. Irrigation and Drainage Engineering 4. Renewable Energy Engineering 5. Soil and Water Conservation Engineering (New)

क्रमांक Sl. No.	बीएसएमए समिति का नाम Name of the BSMA Committee	विषय Disciplines
16.	खाद्य विज्ञान और प्रौद्योगिकी Food Science& Technology	1. खाद्य प्रसंस्करण प्रौद्योगिकी 2. खाद्य प्रक्रिया इंजीनियरिंग 3. खाद्य सुरक्षा और गुणवत्ता 1. Food Processing Technology 2. Food Process Engineering 3. Food Safety and Quality
17.	मत्स्य विज्ञान Fisheries Science	1. मत्स्य पालन 2. मत्स्य संसाधन प्रबंधन 3. जलीय पर्यावरण प्रबंधन 4. मछली आनुवंशिकी और प्रजनन 5. मछली पोषण और चारा प्रौद्योगिकी 6. जलीय पशु स्वास्थ्य प्रबंधन 7. मछली जैव प्रौद्योगिकी 8. मछली प्रसंस्करण प्रौद्योगिकी 9. मत्स्य पालन प्रौद्योगिकी और इंजीनियरिंग 10. मत्स्य अर्थशास्त्र 11. मत्स्य विस्तार 12. मछली शरीर क्रिया विज्ञान और जैव रसायन 1. Aquaculture 2. Fisheries Resource Management 3. Aquatic Environmental Management 4. Fish Genetics & Breeding 5. Fish Nutrition & Feed Technology 6. Aquatic Animal Health Management 7. Fish Biotechnology 8. Fish Processing Technology 9. Fishing Technology & Engineering 10. Fisheries Economics 11. Fisheries Extension 12. Fish Physiology & Biochemistry

क्रमांक Sl. No.	बीएसएमए समिति का नाम Name of the BSMA Committee	विषय Disciplines
18.	सामुदायिक विज्ञान Community Science	1. परिधान और वस्त्र विज्ञान 2. विस्तार शिक्षा और संचार प्रबंधन 3. भोजन और पोषण 4. मानव विकास और परिवार अध्ययन 5. संसाधन प्रबंधन और उपभोक्ता विज्ञान 1. Apparel & Textile Science 2. Extension Education & Communication Management 3. Food & Nutrition 4. Human Development & Family Studies 5. Resource Management & Consumer Science
19.	रेशम के कीड़ों का पालन Sericulture	1. रेशम के कीड़ों का पालन 1. Sericulture

भाकृअनुप
ICAR



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UG Course

Curriculum

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA

VIDYALAYA, GWALIOR (M.P.)

Course Curricula

for

Undergraduate programme

in

Agriculture

UG- Certificate in Agriculture

UG- Diploma in Agriculture

B.Sc. (Hons)Agriculture

CONTENTS

INTRODUCTION

Present report is an outcome of the valuable suggestions and recommendations of Sixth Deans' Committee members after having multi-stage in-depth deliberations and discussions in virtual and physical meetings as well as personal communications with the Deans and faculty members of the Agriculture discipline of different SAUs and Central Agricultural Universities, stakeholders from related industries, Govt. Institutions, alumni and students of the existing course programme across the country.

Restructuring of Undergraduate programme of Agriculture has been carried out as per National Education Policy 2020 guidelines to build among students, a strong foundation of knowledge and increased practical exposure to instill competence and confidence for application of the professional knowledge coupled with hard and soft skills. New scientific advancements in the field of agriculture have been also given due emphasis with inclusion of courses with contents from such areas.

More emphasis has been given on Skill enhancement courses, industry attachments, flexibility in choice of courses via electives offered in fourth year and also through online courses along with provision of project work and internship. Provision of UG-Certificate in Agriculture, UG-Diploma in Agriculture and B.Sc(Hons) Agriculture degree with internshipwith amalgamation of multiple exit and entry options as per NEP 2020 is important change in the course curriculum.

The detailed report on undergraduate courses of Agriculture viz.UG-certificate in Agriculture, UG-diploma in Agriculture and B.Sc(Hons) Agriculture has been prepared with due care and inputs of Deans, Heads and faculty members of various departments of agriculture, nationwide.

HIGHLIGHTS

- The B. Sc (Hons) Agriculture program will be of 177 credits, which will have 167 credits offered by the parent university and 10 credits of online courses taken by the student as per his/ her choicein consultation with university/HAEIs.
- After the admission in the college, the students will register for the Foundation programme of 2 weeks' duration in the 1st semester. A course entitled "*Deeksharambh*" (0+2) (Non-gradial) will be offered at the start of first semester for two weeks' duration. This will create a platform for students to learn from each other's life experiences, help for cultural Integration of students from different backgrounds, know about the operational framework of academic process in university, instilling life and social skills, social Awareness, ethics and values, team work, leadership, creativity, etc.. It will also help in identifying the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario. There will be sessions by alumni, business leaders, outstanding achievers in related fields, people with inspiring life experiences as well as the University academic & research managers.
- The first year of the course programme comprises of skill development courses along with other fundamental courses of agricultural science. After satisfactory completion of 42 credits of courses in two semesters of 1st year and subsequent satisfactory completion of 10 credits (10 weeks) of industry/ institute training/ internship, the student will become eligible for the award of UG-Certificate in Agriculture on exit. The students continuing the study further, would not have to attend the internship after 1st year.
- The second year has been designed with the skill development courses, basic courses as well as fundamental courses in agriculture with adequate theory and practical components, enabling the student to get acquainted with the basic principles and applications of agricultural sciences. After satisfactory completion of the courses (84 credits) during first two years and subsequent satisfactory completion of 10 credits (10 weeks) of internship, the student will become eligible for the award of UG-Diploma in Agriculture on exit. The students continuing the study further, would not have to attend the internship after 2nd year.
- During the 5th semester, the students will have a study tour of 10-12 days duration, which will be counted as 2 credits (Non-gradial).
- The third and fourth year courses have been designed to impart specialized knowledge to the students in the major disciplines. During the 7th semester, the students will adequately select 20 credits from a basket of elective courses, each course being of 4 credits giving an opportunity to them to gain advanced knowledge in frontier areas of agricultural science. The Universities will have flexibility to include more courses as Electives depending on specific needs and situational variations. The objective is to enable the student to acquire deeper understanding in any particular field.
- In the 8th semester of the course the major focus has been on strengthening of the knowledge and skill for developing confidence of the students to take entrepreneurship as their future career. For this they will undergo an advanced skill enhancement through Student READY programme (Rural Entrepreneurship in Agriculture Development Yozna) which will have segments as i(RAWE (Rural Awareness Work Experience) ii) Student project work and internship (10+10 credits), iii) Internship (20 credits) iii) Elective with student project work (10+10 credits) /Experiantial Learning / Hands on Training/Industrial attachment. A student will select option/s on choice to complete the degree and pursue future career with 20 credits. Each student will be attached to a mentor either from the institution or from an organization/ industry. A university or a college will have the freedom to select the options as referred above.
- The core and elective courses can also be modified maximum up to 30% with approval from competent authority of the University.

- The students will take a minimum of 12 credits of online courses during four years as a partial requirement for the B.Sc(Hons) Agriculture programme. The indicative list of courses have been provided, however, online courses can be from any field such as Agriculture and allied sciences, Basic Sciences, Humanities, Psychology, Anthropology, Economics, Business Management, Languages including foreign language, Communication skills/ Music, etc. and can be taken from NPTEL, mooKIT, edX, Coursera, SWAYAM or any other such reputed portal. The objective is to allow the students to groom their passion or strengthen their knowledge and competency in any field beyond prescribed courses. These online courses will be non-gradial and separate certificates would be issued by institute/organization offering the courses. However, the university/ institute will keep a record of such courses registered and completed by each student and will indicate the title of the (successfully completed) courses in final transcript issued to the student. A student must submit the list of online courses along with the content he intends to undertake to the Dean/Assoc. Dean/Principal of the college for apermission and records.
- At each stage of exit (UG-certificate/ UG-Diploma and B.Sc (Hons) Agriculture, the students are expected to acquire competency and confidence to get jobs, to face the real challenges in varied jobs and research, as well as to start their own enterprise. The social skills acquired by the students will also make the students more empathetic towards the society and social issues.
- The credits (and contact hours) have been designed in such a way that along with class room teaching, the students will take up NSS/ NCC and Physical Education, Yoga, etc. in the first year as the case may. Further a balance has been made by inclusion of common courses, core courses in basic and applied areas, skill development courses, elective courses in advanced areas, online courses of choice, options for entrepreneurship and skill development to pursue future career. This will increase their acquaintance with the social/ technical problems, improve their analytical ability of the issues/ challenges and enhance their social responsibility.

Entry and Exit Options

The entry and exit options for the UG programme in Agriculture are shown in the Fig.-1 below.

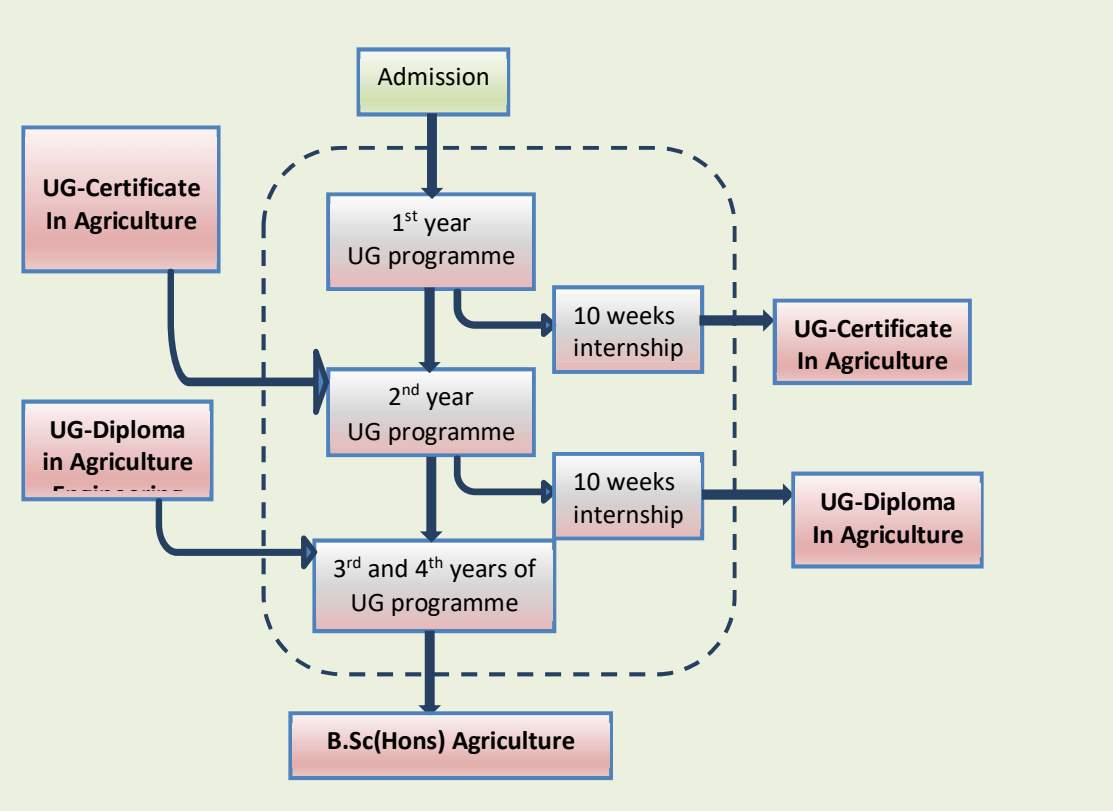

Fig. 1 Entry and Exit options for the UG programme in Agriculture

Exit options

1. **UG-Certificate in Agriculture** (exit after first year and completion of 10 weeks' internship)
2. **UG-Diploma in Agriculture** (exit after second year and completion of 10 weeks' internship)
3. **B. Sc (Hons)Agriculture** (on successful completion of four-year degree requirements)

Eligibility for Entry into 1st year UG programme: +2 Science with biology as one subject

Provision for multiple exit and entry into the UG programme in agriculture has been made in the light of NEP 2020. A student may exit after completion of 1st year and 2nd year requirements followed by 10 weeks of internship after 1st year and 2nd year, respectively to get UG-Certificate in Agriculture and UG-Diploma in Agriculture.

The Universities may consider allowing lateral entry for the candidates having Diploma in Agriculture (as such courses are available in many states and lateral entry is practiced in some Universities). In such cases, the candidates having Diploma in Agriculture (with minimum 3 years course programme after 10th or equivalent) may be allowed admission into the 2nd year of the UG programme, as per the provisions to be notified by the respective AU from time to time.

ACADEMIC PROGRAMME
Semester wise course and credits Allocation

S. No	Course Title	Credit Hours	Total credt hours
First year			
I Semester			
1	Induction cum Foundation course (Deekshaarambh)	1 week (NG) Non-gradial	**21(11+10)21**
2	Skill Enhancementcourse-I	2(0+2)	
3	Skill Enhancementcourse-II	2(0+2)	
4	Communication Skills	2(1+1)	
5	Fundamentals of Agronomy	3(2+1)	
6	Fundamentals of Soil Science	3(2+1)	
7	Fundamentals of Horticulture	3(2+1)	
8	Farming based livelihood systems	3 (2+1)	
9	Rural Sociology and Educational Psychology	2 (2+0)	
10	National Service Scheme(NSS-I)/ National Cadet Corps(NCC-I)	1(0+1)	
11	Introductory mathematics (need based)	1(1+0) Non-gradiel	
II Semester			
1	Skill Enhancementcourse-III	2(0+2)	**21(10+11)**
2	Skill Enhancementcourse-IV	2(0+2)	
3	Personality Development	2(1+1)	
4	Environmental Studies and Disaster Management	3(2+1)	
5	Soil Fertility Management	3(2+1)	
6	Fundamentals of Entomology	3(2+1)	
7	Livestock and Poultry Management	2(1+1)	
8	Fundamentals of Plant Pathology	3(2+1)	
9	NCC-II/NSS-II	1(0+1)	
Second year			
III Semester			
1	Skill Enhancementcouse-V	2(0+2)	**21(10+11)**
2	Entrepreneurship Development and Business Communication	3 (2+1)	
3	Physical Education, First Aid and Yoga Practices	2(0+2)	
4	Principles of Genetics	3(2+1)	
5	Crop Production Technology-I (Kharif crops)	3(2+1)	
6	Production Technology of Fruit and Plantation Crops	2 (1+1)	
7	Fundamentals of Extension Education	2(1+1)	

8	Fundamentals of Nematology	2(1+1)	
9	Principles and Practices of Natural Farming	2(1+1)	
	IV Semester		
1	Skill Enhancement course-VI	2(0+2)	**21(12+9)**
2	Agri informatics	3(2+1)	
3	Production Technology of Vegetables and Spices	2(1+1)	
4	Principles of Agricultural Economics and Farm Management	2(2+0)	
5	Crop Production Technology-II (Rabi Crops)	3(2+1)	
6	Farm Machinery and Power	2 (1+1)	
7	Water Management	2 (1+1)	
8	Problematic Soils and their management	2(1+1)	
9	Basics of Plant Breeding	3(2+1)	
Third year			
V Semester			
1	Agricultural Marketing and Trade	3 (2+1)	**22(13+9)**
2	Introduction to Agro-meteorology	2(1+1)	
3	Fundamentals of Crop Physiology	3(2+1)	
4	Pest management in Crops and Stored Grains	3 (2+1)	
5	Diseases of Field & Horticultural Crops & their Management	3(2+1)	
6	Crop Improvement - I	2 (1+1)	
7	Weed Management	2(1+1)	
8	Ornamental Crops, MAPs and Landscaping	2 (1+1)	
9	Introductory Agro forestry	2 (1+1)	
	VI Semester		
1	Fundamentals of Agri Biotechnology	3(2+1)	**21(12+9)**
2	Basic and Applied Agril. Statistics	3(2+1)	
3	Crop Improvement - II	2(1+1)	
4	Renewable energy in Agriculture and Allied Sector	2(1+1)	
5	Dryland agriculture/ Rainfed agriculture and watershed management	2(1+1)	
6	Essentials of Plant Biochemistry	3 (2+1)	
7	Agricultural Microbiology and Phyto -remediation	2(1+1)	
8	Agricultural Finance & Cooperation	2(1+1)	
9	Fundamentals of Seed Science & Technology	2(1+1)	

Fourth year			
VII Semester			
1	5 Elective Courses (major or minor) each of 4(3+1) credits for B.Sc (Hons) Agriculture degree		**20(15+5)**
VIII Semester			
1	For B.Sc (Hons)Agriculture Degree Student READY (RAWEP/ Industrial Attachment /Experiantial Learning / Hands on Training/ Project Work / Internship		**20 Credits**
		Total	**167**
	***Online courses**	10	**10**
		Grand Total	**167+10***

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Department/section wise course breakup

S. No	Course title	Credit Hours	Total
Agronomy			
1	Fundamentals of Agronomy	3(2+1)	**22(13+9)**
2	Farming based livelihood systems	3 (2+1)	
3	Crop Production Technology-I (Kharif Crops)	3 (2+1)	
4	Crop Production Technology-II (Rabi Crops)	3(2+1)	
5	Water Management	2 (1+1)	
6	Weed Management	2(1+1)	
7	Introductory Agro forestry	2 (1+1)	
8	Dryland agriculture/ Rainfed agriculture and watershed management	2(1+1)	
9	Principles and Practices of Natural Farming	2(1+1)	
Soil Science:			
1	Fundamentals of Soil Science	3(2+1)	**8(5+3)**
2	Soil Fertility Management	3(2+1)	
2	Problematic Soils and their management	2(1+1)	
Horticulture			
1.	Fundamentals of Horticulture	3(2+1)	**9(5+4)**
2.	Production Technology of Fruit and Plantation Crops	2(1+1)	
3.	Production Technology of Vegetables and Spices	2(1+1)	
4.	Ornamental Crops, MAPs, , and Landscaping	2(1+1)	
Genetics and Plant Breeding			
1.	Principles of Genetics	3(2+1)	**12(7+5)**
2.	Basics of Plant Breeding	3(2+1)	
3.	Crop Improvement - I	2 (1+1)	
4.	Crop Improvement - II	2(1+1)	
5.	Fundamentals of Seed Science and Technology	2(1+1)	
Entomology			
1.	Fundamentals of Entomology	3(2+1)	**6(4+2)**
2.	Pest management in Crops and Stored Grains	3(2+1)	
Plant Pathology:			
1.	Fundamentals of Plant Pathology	3(2+1)	**8(5+3)**
2.	Diseases of Field & Horticultural Crops & their Management	3(2+1)	
3.	Agricultural Microbiology and Phyto-remediation	2(1+1)	

Extension Education			
1.	Rural Sociology and Educational Psychology	2 (2+0)	**8(5+3)**
2.	Fundamentals of Extension Education	2 (1+1)	
3.	Communication skills	2 (1+1)	
4.	Personality development	2(1+1)	
Agricultural Meteorology			
1.	Environmental Studies and Disaster mgt.	3(2+1)	**5(3+2)**
2.	Introduction to Agro-meteorology	2(1+1)	
Agricultural Economics			
1.	Principles of Agricultural Economics and Farm Management	2(2+0)	**9(6+3)**
2	Entrepreneurship Development and Business Communication	3 (2+1)	
3	Agricultural Marketing and Trade	2 (1+1)	
4.	Agricultural Finance & Cooperation	2(1+1)	
Agricultural Statistics			**6(4+2)**
1.	Agri informatics	3(2+1)	
2.	Basic and Applied Agril. Statistics	3(2+1)	
3.	Introductory Mathematics	1(1+0)	Non gradiel
Agricultural Engineering			
1.	Farm Machinery and Power	2 (1+1)	**4(2+2)**
2.	Renewable energy in Agriculture and Allied Sector	2(1+1)	
	Nematology		
1.	Fundamentals of Nematology	2(1+1)	**2(1+1)**
	Biochemistry		
1.	Essentials of Plant Biochemistry	3 (2+1)	**3 (2+1)**
	Crop Physiology		
1.	Fundamentals of Crop Physiology	3(2+1)	**3(2+1)**
	Animal Husbandry		
1.	Livestock and poultry Management	2(1+1)	**2(1+1)**
	Agricultural Bio-technology		
1.	Fundamentals of Agri Biotechnology	3(2+1)	**3(2+1)**
1.	**Students' Welfare** NCC/NSS	1(0+1)	**1(0+1)**
2.	NCC/NSS	1(0+1)	**1(0+1)**

3.	Physical Education, First Aid and Yoga Practices	2(0+2)	**2(0+2)**
4.	Study Tour	2(0+2)	**2(0+2)** Non gradiel
***Elective Courses (Indicative)**			
1	Agri-Business Management	4(3+1)	**20*(15+5)** 5* Elective Courses
2	Management of natural resources	4(3+1)	
3	Agrochemicals	4(3+1)	
4	Agricultural Journalism	4(3+1)	
5	Landscaping	4(3+1)	
6	Commercial Plant breeding	4(3+1)	
7	Food safety and standards	4(3+1)	
8	Bioformulation and Nanoformulation	4(3+1)	
9	Biopesticides and Biofertilizers	4(3+1)	
10	System Simulation and Agroadvisory	4(3+1)	
11	Hi-tech Horticulture	4(3+1)	
12	Protected cultivation	4(3+1)	
13	Climate Resilient Agriculture	4(3+1)	
14	Biotechnology of Crop Improvement	4(3+1)	
15	Geoinformatics and Remote Sensing, precision farming	4(3+1)	
16	Micro-propagation Technologies	4(3+1)	
17	Commercial Seed Production	4(3+1)	
18	Principles and Practices of Organic Farming/ Conservation Agriculture	4(3+1)	
19	Food Science and Nutrition	4(3+1)	
20	Post Harvest Technology and Value Addition		
****Skill enhancement courses (SECs)**			
1.	SEC-I	2(0+2)	**12(0+12)**
2.	SEC-II	2(0+2)	
3.	SEC-III	2(0+2)	
4.	SEC-IV	2(0+2)	
5.	SEC-V	2(0+2)	
6.	SEC-VI	2(0+2)	

***Host institution may add more courses into this list**

**** SEC will be decided by host institution depending on strength**

Summary of credit distributions among different categories of courses

Semester	Core Courses (Major and Minor)	Multi-Disciplinary Course (MDC)	Value Added Course (VAC)	Ability Enhancement Course (AEC)	Skill Enhancement Course (SEC)	Internship/ Project/ Student READY	Total Credits	Non gradiel	Internship	Online course/ MOOC
I	11	**3**[3]	___	1[4]+2[5]	4		21	2[1]+1[2]	----	
II	11	---	3[6]	**1**[4]**+2**[7]	4		21		10[13]	
III	14	3[8]	---	2[9]	2		21		---	**10**[15]
IV	16	---	3[10]	----	2		21		10[14]	
V	19	3[11]	----	----	----		22	2[12]	----	
VI	**21**	_	---	---	---		21		---	
VII	**20**	--	--	---	--		20		--	
VIII		--	--	---	--	20	20			
Total	**112**	**9**	**6**	**8**	**12**		**167**	**4**	**20**	10

- [1] Deeksharambh (Induction-cum-Foundation Course) of 2 credits (2 weeks duration).
- [2]Remedial Course: Mathematics of 1 credit
- [3] Farming based Livelihood systems
- [4]NCC/NSS
- [5]Communication Skills
- [6] Environmental Studies and Disaster management
- [7]Personality development
- [8] Entrepreneurship Development and Business Management
- [9] Physical Education, First Aid and Yoga Practices
- [10]Agri informatics
- [11] Agricultural Marketing & Trade
- [12] Study tour (10-14 days)
- [13] Only for those opting for an exit with UG-Certificate and [14] Only for those opting for an exit with UG-Diploma
- [15]Online course: student will make his own planning and execution of online courses with intimation to the Dean

ABSTRACT

Core courses			
i)	Major	:	80 credits
ii)	Minor	:	32 credits
Skill Enhancement courses		:	12 credits
Common courses		:	19 credits
NCC/NSS		:	02 credit
Physical Education, First Aid and Yoga Practices	: 02 credits		
Student READY/Internship	: 20 credits		
*MOOC courses (compulsory non-gradial)		:	10 credits
Grand Total		**:167+10* Credits**	

List of Courses as per above Categories

Course category	Course title	Credit Hours
Induction cum Foundation course	Deeksha Arambh	2 weeks (Non-gradial)
Common courses	Farming based livelihood systems	3(2+1)
	Communication skill	2 (1+1)
	Personality development	2(1+1)
	Environmental studies and disaster management	3(2+1)
	Agricultural informatics	3(2+1)
	Entrepreneurship Development and Business Management	3(2+1)
	Agricultural Marketing & Trade	3(2+1)
	NSS/ NCC-I	2 courses each of 1(0+1) credits
	Physical Education, First Aid and YogaPractices	2 credits
	Total credits	**23**
Core Courses	Fundamentals of Agronomy	3(2+1)
	Crop Production Technology-I (Kharif Crops)	3 (2+1)
	Crop Production Technology-II (Rabi Crops)	3(2+1)
	Water Management	2 (1+1)
	Weed Management	2(1+1)
	IntroductoryAgro forestry	2 (1+1)
	Dryland agriculture/ Rainfed agriculture and watershed management	2(1+1)
	Principles and Practices of Natural Farming	2(1+1)
	Fundamentals of Soil Science	3(2+1)
	Soil Fertility Management	3(2+1)
	Problematic Soils and their management	2(1+1)
	Fundamentals of Horticulture	3(2+1)
	Production Technology of Fruit and Plantation Crops	2(1+1)
	Production Technology of Vegetables and Spices	2(1+1)
	Ornamental Crops, MAPs, , and Landscaping	2(2+1)
	Principles of Genetics	3(2+1)
	Basics of Plant Breeding	3(2+1)
	Crop Improvement - I	2 (1+1)
	Crop Improvement - II	2(1+1)
	Fundamentals of Seed Science Technology	2(1+1)
	Fundamentals of Entomology	3(2+1)
	Pest management in Crops and Stored Grains	3 (2+1)

	Fundamentals of Plant Pathology	3(2+1)
	Diseases of Field & Horticultural Crops & their Management	3(2+1)
	Agricultural Microbiology and Phyto -remediation	2(1+1)
	Rural Sociology and Educational Psychology	2 (2+0)
	Fundamentals of Extension Education	2(1+1)
	Introduction to Agro-meteorology	2(1+1)
	Principles of Agricultural Economics and Farm Management	2(2+0)
	Agricultural Finance & Cooperation	2(1+1)
	Basic and Applied Agril. Statistics	3(2+1)
	Farm Machinery and Power	2 (1+1)
	Renewable energy in Agriculture and Allied Sector	2(1+1)
	Fundamentals of Nematology	2(1+1)
	Essentials of Plant Biochemistry	3 (2+1)
	Fundamentals of Crop Physiology	3(2+1)
	Livestock and poultry Management	2(1+1)
	Fundamentals of Agri Biotechnology	3(2+1)
	TOTAL	**92**
Elective Courses	20 credits will be taken from list of choice based course list or departmentwise courses to be decided by host institution	20
	TOTAL	**20**
Skill Enhancement Courses **(indicative)**	SDC-I (Biofertlizer and biopesticide production)	2(0+2)
	SEC-II(Mushroom production technology)	2(0+2)
	SEC-III (Seed production technology)	2(0+2)
	SEC-IV (Post harvest processting technology)	2(0+2)
	SEC-V (Beneficial insect farming)	2(0+2)
	SEC-VI(Horticulture nursery management)	2(0+2)
	SEC-VII(Plantation crops production and management)	2(0+2)
	TOTAL	**12**
Students READY		10+10
	TOTAL	**20**
Other courses	Remedial course on 1. Mathematics	1 credit Non-gradiel
	Study tour(2 weeks in 5th semester)	2(0+2) Non-Gradial
	Total for offline course credits	**167**
Online courses	*Online courses	10

	TOTAL	**10**
	Grand Total	**167+10***

DETAILED SYLLABI

Semester 1

S. No.	CourseTitle	Credithours
1	Induction-cum-Foundation course (Deeksha Arambh)	2 weeks (NG)
2	Skill Enhancementcourse	2(0+2)
3	Skill Enhancementcourse	2(0+2)
4	Communication Skills	2(1+1)
5	Farming based livelihood systems	3 (2+1)
6	Rural Sociology and Educational Psychology	2 (2+0)
7	Fundamentals of Agronomy	3(2+1)
8	Fundamentals of Soil Science	3(2+1)
9	Fundamentals of Horticulture	3(2+1)
10	NCC/ NSS	1(0+1)
11	Introductory mathematics (need based)	1(1+0) non-grdaial
	Total	**21(11+10)**

Course Title: Induction cum Foundation Course(Deeksha Arambh)-Non gradiel
Credit Hours: 1(1+0)

Objectives:

- Help for cultural Integration of students from different backgrounds,
- Know about the operational framework of academic process in the University/College/Institute
- Instilling life and social skills,
- Social Awareness, Ethics and Values, Team Work, Leadership, Creativity, etc.
- Identify the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario.
- Identify strength and weakness of the students in different core areas of the discipline.

The details of activities will be decided by the parent universities. The structure shall include, but not restricted to:

i. Discussions on operational framework of academic process in the University, as well as interactions with academic & research managers of the University

ii. Interaction with alumni, business leaders, perspective employers, outstanding achievers in related fields, and people with inspiring life experiences

iii. Group activities to identify the strength and weakness of students (with expert advice for their improvement) as well as to create a platform for students to learn from each other's life experiences

iv. Activities to enhance cultural Integration of students from different backgrounds.

v. Field visits to related fields/ establishments

vi. Sessions on personality development (instilling life and social skills, social awareness, ethics and values, team work, leadership, etc.) and communication skills

Communication Skills2 (1+1)

Objectives:

To acquire competence in oral, written and non-verbal communication, develop strong personal and professional communication and demonstrate positive group communication

Theory

Communication Process: The magic of effective communication; Building self-esteem andovercoming fears; Concept, nature and significance of communication process; Meaning, types and models of communication; Verbal and non-verbal communication; Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunication.

Basic Communication Skills: Listening, Speaking, Reading and Writing Skills; Precis writing/Abstracting/Summarizing; Style of technical communication Curriculum vitae/resume writing;Innovative methods to enhance vocabulary, analogy questions.

Structural and Functional Grammar: Sentence structure, modifiers, connecting words and verbals; phrases and clauses;Case: subjective case, possessive case; objective case; Correct usage of nouns, pronouns and antecedents, adjectives, adverbs and articles; Agreement of verb with the subject: tense, mood, voice; Writing effective sentences; Basic sentence faults;

Practical

Listening and note taking; Writing skills: precis writing, summarizing and abstracting; Reading and comprehension (written and oral) of general and technical articles; Micro-presentations and Impromptu Presentations: Feedback on presentations; Stage manners: grooming, body language, voice modulation, speed; Group discussions; Public speaking exercises; vocabulary building exercises; Interview Techniques; organization of events.

Suggested readings

1. Allport, G W, 1937, Personality: A Psychological Interpretation. Holt,New York.
2. Brown Michele &GylesBrandreth, 1994, How to Interview and be Interviewed. Sheldon Press, London.
3. Carnegie Dale, 1997, The Quick and Easy Way to Effective Speaking. Pocket Books, New York.
4. Francis Peter S J, 2012, Soft Skills and Professional Communication. Tata McGraw Hill, New Delhi .
5. Kumar S and PushpaLata, 2011, Communication Skills. Oxford University Press.
6. Neuliep James W, 2003, Intercultural Communication A Contextual Approach. Houghton Mifflin Co Boston.
7. Pease, Allan, 1998, Body Language. Sudha Publications, Delhi.
8. Raman M and Singh P, 2000, Business Communication. Oxford University Press.
9. Seely J, 2013, Oxford Guide to Effective Writing and Speaking. Oxford University Press.
10. Thomson A J and Martinet A V, 1977, A Practical English Grammar. Oxford University

Farming based livelihood systems 3 (2+1)

Objectives

i) To make the students aware about farming based livelihood systems in agriculture
ii) To disseminate the knowledge and skill how farming based systems can be a source of livelihood

Theory

Status of agriculture in India and different states, Income of farmers and rural people in India, Livelihood-Definition, concept and livelihood pattern in urban & rural areas, Different indicators to study livelihood systems. Agricultural livelihood systems (ALS) : Meaning, approach, approaches and framework , Definition of farming systems and farming based livelihood systems Prevalent Farming systems in India contributing to livelihood. Types of traditional & modern farming systems. Components of farming system/ farming based livelihood systems- Crops and cropping systems, Livestock, (Dairy, Piggery, Goatry, Poultry, Duckry etc.), Horticultural crops, Agro--forestry systems, Aqua culture Duck/Poultry cum Fish, Dairy cum Fish, Piggery cum Fish etc., Small, medium and large enterprises including value chains and secondary enterprises as livelihood components for farmers, Factors affecting integration of various enterprises of farming for livelihood. Feasibility of different farming systems for different agro-climatic zones, Commercial farming based livelihood models by NABARD, ICAR and other organizations across the country, Case studies on different livelihood enterprises associated with the farming. Risk & success factors in farming based livelihood systems, Schemes & programmes by Central & State Government, Public & Private organizations involved in promotion of farming based livelihood opportunities. Role of farming based livelihood enterprises in

21st Century in view of circular economy, green economy, climate change, digitalization & changing life style.

Practical

Survey of farming systems and agricultural based livelihood enterprises, Study of components of important farming based livelihood models/ systems in different agro-climatic zones, Study of production and profitability of crop based, livestock based, processing based and integrated farming based livelihood models, Field visit of innovative farming system models. Visit of Agri-based enterprises & their functional aspects for integration of production, processing & distribution sectors and Study of agri-enterprises involved in industry and service sectors(Value Chain Models), Learning about concept of project formulation on farming based livelihood systems along with cost & profit analysis, Case study of Start-Ups in agri-sectors.

Suggested Readings

1. Dixon, J. and A. Gulliver with D. Gibbon. (2001). Farming Systems and Poverty: Improving Farmers' Livelihoods in a ChangingWorld. FAO & World Bank, Rome, Italy & Washington, DC, USA
2. Ashley, C.; Carney, D. (1999). Sustainable Livelihoods: Lessons from Early Experience; Department for International Development: London, UK,; Volume 7. [Google Scholar]
3. Reddy, S.R. 2016. Farming System and Sustainable Agriculture, Kalyani Publishers, New Delhi.
4. Panwar et al. 2020. Integrated Farming System models for Agricultural Diversification, Enhanced Income and employment, Indian Council of Agricultural Research, New Delhi.
5. Singh, J.P., et al. 2015. Region Specific Integrated Farming System Models, ICAR-Indian Institute of Farming Systems Research, Modipuram.
6. Walia, S. S. and U. S. Walia, 2020. Farming System and Sustainable Agriculture, Scientific Publishers, Jodhpur, Rajasthan.
7. Livelihood Improvement of Underprivileged Farming Community : Some Experiences from Vaishali, Samastipur, Darbhanga and Munger Districts of Bihar by B. P. Bhatt, Abhay Kumar, P.K. Thakur, AmitavaDeyUjjwal Kumar, Sanjeev Kumar, B.K. Jha, Lokendra Kumar, K. N. Pathak, A. Hassan , S. K. Singh, K. K. Singh and K. M. Singh ICAR Research Complex for Eastern Region ICAR Parisar, P.O. Bihar Veterinary College, Patna - 800 014, Bihar
8. Carloni, A (2001) Global Farming Systems Study: Challenges and Priorities to 2030 – Regional Analysis: Sub-Saharan Africa, Consultation Document, FAO, Rome, Italy
9. Evenson, R.E. (2000). Agricultural Producitivity and Production in Developing Countries'. In FAO, The State of Food and Agriculture, FAO, Rome, Italy
10. Agarwal, A. &Narain, S. (1989). Towards Green Villages: A strategy for Environmentally, Sound and Participatory Rural Development, Center for Science and Environment, New Delhi, India

Rural Sociology and Educational Psychology 2(2+0)

Objective:

Provide knowledge on concept and importance of sociology and rural sociology as well as the relationship with Extension Education

Theory

Extension Education and Agricultural Extension – Meaning, Definition, Scope, and Importance. Sociology and rural sociology, Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension, and Interrelationship between Rural Sociology & Agricultural Extension. Indian Rural Society, Important characteristics, Differences and Relationship between Rural and Urban societies. Social Groups- Meaning, Definition, Classification, Factors considered information and organization of groups, Motivation in group formation and Role of social groups in Agricultural Extension. Social Stratification- Meaning, Definition, Functions, Basis for stratification, Forms of Social stratification- Characteristics and- Differences between Class

& Caste System. Cultural concepts- Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions- Meaning, Definition and their Role in Agricultural Extension. Social Values and Attitudes – Meaning, Definition, Types and Role of Social Values and Attitudes in agricultural Extension. Social Institutions- Meaning, Definition, Major institutions in Rural Society, Functions, and their Role in agricultural Extension. Social Organizations- Meaning, Definition, Types of organizations and role of social organizations in agricultural Extension. Social Control- Meaning, Definition, need of social control and Means of Social Control. Social change- Meaning, Definition, Nature of Social Change, Dimensions of social change and factors of social change. Leadership- Meaning, Definition, Classification, Roles of leader, Different methods of Selection of Professional and Lay leaders. Training of Leaders Meaning, Definition, Methods of training, Advantages and Limitations in use of local leaders in Agricultural Extension, Psychology and Educational Psychology- Meaning, Definition, Scope, and Importance of Educational Psychology in Agricultural Extension. Intelligence- Meaning, Definition, Types, Factors affecting intelligence and Importance of intelligence in Agricultural Extension. Personality- Meaning, definition, Types, Factors influencing the Personality and Role of personality in agricultural Extension. Teaching- Learning process- Meaning and Definition of Teaching, Learning, learning experience and Learning situation, Elements of learning situation and its characteristics. Principles of learning and their implication of teaching.

Suggested readings

1. J.B. Chitambar -Introductory Rural Sociology
2. Ray, G. L. -Extension Communication and Management
3. Dahama O. P. and Bhatnagar, O. P. - Education and Communication for Development
4. Sandhu A. S. -Textbook on Agricultural Communication
5. A. R. Desai -Rural Sociology in India
6. R Velusamy Textbook on Rural Sociology and Educational Psychology
7. M.B. Ghorpade- Essential of psychology
8. Web Materials
9. Prepared You Tube videos

Fundamentals of Agronomy 3 (2 +1)

Objectives: To impart the basic and fundamental knowledge of Agronomy.

Theory: Agronomy and its scope: Definition, Meaning and scope of Agronomy; Art, science and business of crop production, relation of Agronomy with other disciplines of Agricultural Science, Fields crops and classification, importance, ecology and ecosystem, Seeds and sowing: Definitions of crops, variety and seed. Factors affecting crop stands establishment: good quality seed, proper tillage, time of sowing seed rate, depth and method of sowing: broadcasting, drilling, dibbling, transplanting etc.

Tillage and tilth: Definition, objectives, types, advantages and disadvantages of tillage including conservation tillage. Crop density and geometry: plant geometry and planting geometry, its effect on growth, yield

Crop nutrition: Definition of essential nutrients, criteria of essentiality, functional elements, classification of essential nutrients, role of macro and micro nutrients. Nutrient absorption, active and passive absorption of nutrients, forms of plant nutrients absorbed by plants, Combined /un-combined forms

Manures and fertilizers, nutrient use efficiency: Sources of nutrients: Inorganic (fertilizers), organic (manures) and bio-fertilizers; their classification and characteristics, method of preparation and role of organic manures in crop production

Integrated Nutrient Management: Meaning, different approaches and advantages of INM

Green manure- role in crop production: Definition, objectives types of green manuring, desirable characteristics, advantages and limitations of green manuring ,

Water management: Water resources of the world, India and the state; Soil Moisture Constants –gravitational water, capillary water, hygroscopic water, Soil moisture constants, Concept of water availability to plants, soil-plant-water relationship, crop water requirement, water use efficiency, Methods of irrigation : Scheduling of irrigation, different approaches of scheduling irrigation

Weeds: Definition, Importance and basics of classification of weeds and their control

Cropping systems: Factors affecting cropping systems, major cropping patterns and systems in the country. Sustainable crop production: Definition, importance and practices, natural resources and conservation pollution and pollutants, Allelopathy: Meaning and importance in crop production ,Growth and development of crops**:** Definition,Meaning and factors affecting growth and development

Practical: A visit to Instructional Crop farm and study on field crops, Identification of crops, seeds, fertilizers, pesticides, Crops and cropping systems in different Agro-climatic zones of the state, Study of some preparatory tillage implements, Study of inter tillage implements, Practice of ploughing / puddling, Study and practice of inter cultivation in field crops, Numerical exercises on calculation of seed, plant population and fertilizer requirement, Study of yield contributing characters and yield estimation of crops, Identification of weeds in different crops, Seed germination and viability test of seed, Practice on time and method of application of manures and fertilizers, Measurement of soil moisture by gravimetric and volumetric method and bulk density, Determination of field capacity, Determination of gross and net irrigation requirement, Determination of infiltration rate

Suggested readings:

1. William L Donn. 1965. Meteorology. McGraw-Hill Book Co. New York.
2. Yawalkar K S and Agarwal J P. 1977. Manures and Fertilizers. Agricultural Horticultural Publishing House,
3. Nagpur.
4. Rao V S. 1992. Principles of Weed Science. Oxford and IBH Publishing Co. Ltd. New Delhi.
5. Reddy Yellamanda T and Shankar Reddy G H. 1995. Principles of Agronomy. Kalyani Publishers
6. Ludhiana.
7. Reddy , S. R. 2008. principle of Crop Production, Kalyani Publisher, Ludiana

Fundamentals to Soil Science 3(2+1)

Objective: To impart knowledge on soil genesis, basic soil properties with respect to plant growth

Theory :

Soil- Pedological and edaphalogical concepts. Rocks and minerals, weathering, soil formation,, soil profile, soil texture, soil structure. Bulk density and particle density, soil consistency, soil temperature, soil air, soil water. Soil reaction and buffering capacity. Soil taxonomy, keys to soil orders. Soils of India.

Practical :

Study of general properties of minerals, study of minerals-silicate and non-silicate minerals, study of rocks-igneous, sedimentary and metamorphic rocks; study of a soil profile, collection andprocessing of soil for analysis, study of soil texture-feel method, mechanical analysis,determination of bulk density, particle density and soil porosity,determination of soil colour,study of s oil structure and aggregate analysis,determination of soil moisture,determination of soil moisture constants-field capacity; water holding capacity,sStudy of infiltration rate of soil

Suggested readings:

1. Soil Fertility and Nutrient Management – By S. S. Singh, Kalyani Publishers
2. Introductory Soil Science – By Dilip Kumar Das, Kalyani Publishers
3. Soil Fertility and Fertilizers – By Samual L. Tisdale, Werner L. Nelson and James D. Beaton, Macmillan Publishing Company, New York
4. The nature and Properties of Soils – By Harry O. Buckman and Nyle C.

Fundamentals of Horticulture 3 (2+1)

Objectives:

- To provide knowledge on different branches of horticulture viz. pomology, olericulture, floriculture and landscaping, spices and medicinal plants

- To provide knowledge onorchard management, propagation methods, cultural operations and nutrient management of horticultural crops
- To provide knowledge on different physiological aspects of horticultural crops

Theory:

- Horticulture-its different branches, importance & scope, Horticulture & botanical classification, soil and climate for horticultural crops, plant propagation- methods and propagation structures, seed dormancy and seed germination, principles of orchard establishment, principles and methods of training and pruning of fruit crops, Juvenility and flower bud differentiation, unfruitfulness in horticultural crops, pollination, pollinizers and pollinators, fertilization and parthenocarpy, medicinal and aromatic plants, importance of bioregulators in horticultural crops, irrigation and its methods, Fertilizer application in horticultural crops

Practical:

- Identification and nomenclature of fruit, Layout of an orchard, pit making and system of planting, Nursery raising techniques of fruit crops,Understanding of plant propagation structers, Propagation through seeds and plant parts, Propagation techniques for horticultural crops, Container, potting mixture, potting and repotting, Training and pruning methods on fruit crops, Preparation of fertilizer mixture and application, Preparation and application of PGR, Layout of different irrigation systems, Maturity studies, harvesting, grading, packaging and storage

Suggested readings:

1. Basics of Horticulture by Jitendra Singh
2. Introduction to Horticulture by N. Kumar
3. Handbook of Horticulture by K.L. Chadda

Course Title: National CaditCorps (NCC) ,National Service Scheme (NSS)

Credit hours: 1(0+1)

National Cadet Corps- As as government guidelines, for getting B and C certificate in NCC, minimum years of requirement is 2 & 3 years along with 1-2 annual camps

- Aims, objectives, organization of NCC and NCC song. DG's cardinals of discipline.
- Drill- aim, general words of command, attention, stands at ease, stand easy and turning.
- Sizing, numbering, forming in three ranks, open and close order march, and dressing.
- Saluting at the halt, getting on parade, dismissing, and falling out.
- Marching, length of pace, and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear. Turning on the march and wheeling. Saluting on the march.
- Marking time, forward march, and halt. Changing step, formation of squad and squad drill.
- Command and control, organization, badges of rank, honors, and awards
- Nation Building- cultural heritage, religions, traditions, and customs of India. National integration. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizens. Leadership traits, types of leadership. Character/personality development. Civil defense organization, types of emergencies, firefighting, protection. Maintenance of essential services, disaster management, aid during development projects.
- Basics of social service, weaker sections of society and their needs, NGO's and their contribution, contribution of youth towards social welfare and family planning.
- Structure and function of human body, diet and exercise, hygiene and sanitation. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health. Adventure activities. Basic principles of ecology, environmental conservation, pollution and its control.

National Service Scheme(NSS)

Evoking social consciousness among students through various activities viz., working together, constructive, and creative social work, to be skilful in executing democratic leadership, developing skill in programme, to be able to seek self-employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

All the activities related to the National Service Scheme are distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV each having one credit load.

The entire four courses should be offered continuously for two years.

A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other than five regular one day camp in a year and one special camp for duration of 7 days at any semester break period in the two years. Different activities will include orientation lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.

Introduction and Basic Components of NSS

- Orientation: history, objectives, principles, symbol, badge; regular programs under NSS
- organizational structure of NSS, Code of conduct for NSS volunteers, points to be considered by NSS volunteers' awareness about health.
- NSS program activities. Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analyzing guiding financial patterns of scheme, youth program/ schemes of GOI, coordination with different agencies and maintenance of diary. Understanding youth. Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change.
- Community mobilization. Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilization involving youth-adult partnership. Social harmony and national integration
- Indian history and culture, role of youth in nation building, conflict resolution and peace- building. Volunteerism and shramdaan. Indian tradition of volunteerism, its need, importance, motivation, and constraints; shaman as part of volunteerism
- Citizenship, constitution, and human rights. Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information. Family and society. Concept of family, community (PRIs and other community-based organizations) and society

Semester II

S. No	Course tilte	Total credits
1	Skill Enhancement course	2(0+2)
2	Skill Enhancement course	2(0+2)
3	Personality Development	2(1+1)
4	Environmental Studies and Disaster mgt.	3(2+1)
5	Soil Fertility Management	3(2+1)
6	Fundamentals of Entomology	3(2+1)
7	Livestock and poultry Management	2(1+1)
8	Fundamentals of Plant Pathology	3(2+1)
9	NSS-II/NCC-II	1(0+1)

	Total	**21(10+11)**

Course Title : Personality Development
Credits Hours : 2 (1+1)
Objectives:
To make students realize their potential strengths, cultivate their inter-personal skills and improve employability.
Theory:
Personality Definition, Nature of personality, theories of personality and its types . The humanistic approach - Maslow's self-actualization theory, shaping of personality, determinants of personality, Myers-Briggs Typology Indicator, Locus of control and performance, Type A and Type B Behaviours, personality and Organizational Behaviour.
Foundations of individual behavior and factors influencing individual behavior, Models of individual behavior, Perception and attributes and factors affecting perception, Attribution theory and case studies on Perception and Attribution. Learning: Meaning and definition, theoriesand principles of learning, Learning and organizational behavior, Learning and training, learning feedback. Attitude and values, Intelligence- types of Intelligence, theories of intelligence, measurements of intelligence, factors influencing intelligence, intelligence and Organizational behavior, emotional intelligence. Motivation- theories and principles, Teamwork and group dynamics.
Practical
MBTI personality analysis, Learning Styles and Strategies, Motivational needs, Firo-B, Interpersonal Communication, Teamwork and team building, Group Dynamics, Win-win game, Conflict Management, Leadership styles, Case studies on Personality and Organizational Behavior.
Suggested reading

1. Andrews, Sudhir, 1988, How to Succeed at Interviews. 21st (rep.) New Delhi.Tata McGraw-Hill.
2. Heller, Robert, 2002, Effective Leadership. Essential Manager series. Dk Publishing.
3. Hindle, Tim, 2003, Reducing Stress. Essential Manager series. Dk Publishing.
4. Lucas, Stephen, 2001, Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill.
5. Mile, D.J, 2004, Power of Positive Thinking. Delhi. Rohan Book Company.
6. Pravesh Kumar, 2005, All about Self- Motivation. New Delhi. Goodwill Publishing House.
7. Smith, B, 2004, Body Language. Delhi: Rohan Book Company.
8. Shaffer, D. R.,2009, Social and Personality Development (6th Edition). Belmont, CA: Wadswor

Environmental Studies and Disaster Management
Credits Hours : 3 (2+1)
Objective: To expose and acquire knowledge on the environment and to gain the state-of-the-art - skill and expertise on management of disasters

Theory
Introduction to Environment - Environmental studies - Definition, scope and importance - Multidisciplinary nature of environmental studies - Segments of Environment - Spheres of Earth - Lithosphere - Hydrosphere - Atmosphere - Different layers of atmosphere. Natural Resources: Classification - Forest resources. Water resources. Mineral resources Food resources. Energy resources. Land resources. Soil resources. Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem. Types of ecosystem. Biodiversity and its conservation: Introduction, definition, types. Biogeographical classification of India. Importance and Value of biodiversity. Biodiversity hot spots. Threats and Conservation of biodiversity
Environmental Pollution: Definition, cause, effects and control measures of: a. Air pollution. b. Water pollution. c. Soil pollution. d. Marine pollution. e. Noise pollution. f. Thermal pollution h. light pollution. Solid Waste Management: Classification of solid wastes and management methods, Composting, Incineration, Pyrolysis, Biogas production, Causes, effects and control measures of urban and industrial wastes. Social Issues and the Environment: Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Environment Protection Act. Air (Prevention and

Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Human Population and the Environment: Environment and human health: Human Rights, Value Education. Women and Child Welfare. Role of Information Technology in Environment and human health.

Disaster management - Disaster definition - Types - Natural Disasters - Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves. Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents. International and National strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community-based organizations and media in disaster management. Central, state, district and local administration in disaster control; Armed forces in disaster response; Police and other organizations in disaster management.

Practical

Visit to a local area to document environmental assets river/forest/grassland/hill/mountain. Energy: Biogas production from organic wastes. Visit to wind mill / hydro power / solar power generation units. Biodiversity assessment in farming system. Floral and faunal diversity assessment in polluted and un polluted system. Visit to local polluted site - Urban/Rural/Industrial/Agricultural to study of common plants, insects and birds. Environmental sampling and preservation. Water quality analysis: pH, EC and TDS. Estimation of Acidity, Alkalinity. Estimation of water hardness. Estimation of DO and BOD in water samples. Estimation of COD in water samples. Enumeration of E. coli in water sample. Assessment of Suspended Particulate Matter (SPM). Study of simple ecosystem – Visit to pond/river/hills. Visit to areas affected by natural disaster

Suggested Readings

1. De. A.K., 2010. Environmental chemistry. Published by New Age International Publishers, New Delhi. ISBN:13–978 81 224 2617 5. 384 pp
2. DharChakrabarti. P.G., 2011. Disaster management - India's risk management policy frameworks and key challenges. Published by Centre for Social Markets (India), Bangalore. 36 pp.
3. ErachBharucha, Text book for Environmental studies. University Grants Commission, New Delhi
4. Parthiban, K.T. Vennila, S. Prasanthrajan, M. UmeshKanna, S. Forest, Environment, Biodiversity and Sustainable development. Narendra Publishing House, New Delhi, India 2023. (In Press).
5. Prasanthrajan M, P.P. Mahendran., 2008. A text book on Ecology and Environmental Science. ISBN 81-8321-104-6. Agrotech Publishing Academy, Udaipur - 313 002. First Edition: 2008
6. Prasanthrajan M, 2018. Objective environmental studies and disaster management. ISBN 9789387893825. Scientific publishers, Jodhpur, India. Pp. 146.
7. Sharma, P.D. 2009, Ecology and Environment, Rastogi Publications, Meerat, India

Tyler Miller and Scot Spoolman. 2009. Living in the Environment (Concepts, Connections, and Solutions). Brooks/cole, Cengage learning publication, Belmont, USA

Course Title : Soil Fertility Management
Credits Hours : 3(2+1)

Objective: To provide a comprehensive knowledge of soil fertility, plant nutrition, fertilizers, and nutrient management

Theory :

Introduction and importance of manures and fertilizers. Fertilizer recommendation approaches.Integrated nutrient management.Cemical fertilizers: classification, composition and properties of major fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of macro and micronutrients. Soil fertility evaluation, Soil testing. Criticallevels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissuetests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions. STCR/RTNM/IPNS.

Practical :
Introduction of analytical instruments and their principles, calibration and applications of Coloremetry and flame photometry; Estimation of alkaline hydrolysable N in soils;
Estimation of soil extractable P in soils;Estimation of exchangeable K in soils; Estimation of exchangeable Ca and Mg in soils; Estimation of soil extractable S in soils; Estimation of DTPA extractable Zn in soils; Estimation of N in plants; Estimation of P in plants; Estimation of K in plants; Estimation of S in plants.

Suggested readings:

1. Soil Fertility and Nutrient Management – By S. S. Singh, Kalyani Publishers
2. Introductory Soil Science – By Dilip Kumar Das, Kalyani Publishers
3. Soil Fertility and Fertilizers – By Samual L. Tisdale, Werner L. Nelson and James D. Beaton, Macmillan Publishing Company, New York
4. The nature and Properties of Soils – By Harry O. Buckman and Nyle C.

Course Title : Fundamentals of Entomology
Credits Hours :3 (2+1)
Objectives:

1. To know the history of entomology, classification of insects and their relationship with other arthropods
2. To study the various morphological characters of class insecta and their importance for classification of insects
3. To get an idea about the different physiological systems of insects and their roles in growth and development and communications of insects
4. To study the characteristics of commonly observed insect orders and their economically important families

Theory

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs. Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors and biotic factors. Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Systematics: Taxonomy – importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insectaupto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

Practical

Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and

wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and their formulations. Pesticide appliances and their maintenance. Sampling techniques for estimation of insect population and damage.

Suggested readings:

1) Imm's General Text book of Entomology— O.W. Rechards andR.G. Davies
2) Introduction to the study of Insects –D. J. Borror and DeLong's
3) Fundamentals of Ecology - Eugene.P. Odum& Gray W. Barrett
4) Integrated pest Management Concept and Approaches- G.S. Dhaliwal and Ramesh Arora

Course Title : Livestock and poultry Management
Credits Hours : 2(1+1)

Objectives: 1. Provide basic knowledge to the students about scientific livestock and poultry rearing practices
2. Entrepreneurship development through Livestock/poultry and Agriculture Integrated farming System

Theory:

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry. Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical:

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production

Suggested readings:

1. A Textbook of Animal Husbandry by G. C Banerjee
2. A text Book of Livestock Production management in Tropic by D. N. Verma

Course Title :Fundamentals of Plant Pathology
Credits Hours : 3(2+1)

Objectives:

1. To get acquainted with the role of different microorganisms in the development of plant disease.
2. To get general concepts and classification of plant diseases
3. To get knowledge of general characteristics of fungi, bacteria, virus, and othermicroorganisms causing plant diseases.
4. To acquaint the students with reproduction in fungi, and bacteria, causing plant diseases.
5. To get acquainted with various plant disease management principles and practices.

Theory:

Introduction to Plant Pathology: Concept of disease in plants; Different terms used in Plant Pathology, History of Plant Pathology with special references to India, Causes of plant disease: Inanimate and animate causes; Classification of plant disease; Parasitism and pathogenesis, Development of disease in plants: Disease Triangle, Disease cycle, Fungi and their morphology, reproduction and classification of fungi, Bacteria: Morphology, reproduction classification of phytopathogenic bacteria, Other plant pathogens: Mollicutes; Flagellant protozoa; FVB; Green algae and parasitic higher plants; Viruses and viroids, virus transmission, Principles of Plant disease management: Disease management with chemicals, Host resistance, cultural and biological method of Integrated Disease Management (IDM).

Practical:

Study of the microscope , Acquaintance with laboratory material and equipments, Study of different plant disease symptoms, Microscopic examination of general structure of fungi, Simple staining of bacteria: Direct and indirect staining, Gram staining of bacteria, Microscopic examination of fungal diseased specimen,Microscopic examination of bacterial diseased specimen, Preparation of culture media, Isolation of plant pathogens: Fungi, bacteria and viruses, Purification of plant pathogens, Study on plant disease diagnosis: Koch's Postulates, Characteristics, formulation, methods of application and calculation on fungicides

Suggested readings:

1. Pathak, V. N. Essentials of Plant Pathology. Prakash Pub., Jaipur
2. Agrios, GN. 2010. Plant Pathology. Acad. Press.
3. Kamat, M. N. Introductory Plant Pathology. Prakash Pub, Jaipur
4. Singh RS. 2008. Plant Diseases. 8 th Ed. Oxford & IBH. Pub. Co.
5. Singh RS. 2013. Introduction to Principles of Plant Pathology. Oxford and IBH Pub. Co.
6. Alexopoulos, Mims and Blackwel. Introductory Mycology
7. Mehrotra RS & Aggarwal A. 2007. Plant Pathology. 7 th Ed. Tata Mc Graw Hill Publ. Co. Ltd.
8. Gibbs A & Harrison B. 1976. Plant Virology - The Principles. Edward Arnold, London
9. Hull R. 2002. Mathew.s Plant Virology. 4th Ed. Academic Press, New York.
10. Verma JP. 1998. The Bacteria. Malhotra Publ. House, New Delhi.
11. Goto M. 1990. Fundamentals of Plant Bacteriology. Academic Press, New York.
12. Dhingra OD & Sinclair JB. 1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo.
13. Nene YL & Thapliyal PN. 1993. Fungicides in Plant Disease Control. 3rd Ed. Oxford & IBH, New Delhi.
14. Vyas SC. 1993. Handbook of Systemic Fungicides. Vols. I-III. Tata McGraw Hill, New Delhi.
15. Rajeev K & Mukherjee RC. 1996. Role of Plant Quarantine in IPM. Aditya Books.
16. Rhower GG. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture. 2nd Ed. Vol. II. (Ed. David Pimental). CRC Press.

Course Title: National CaditCorps (NCC) ,National Service Scheme (NSS)
Credit hours: 1(0+1)
National Cadet Corps (NCC)

- Arms Drill- Attention, stand at ease, stand easy. Getting on parade. Dismissing and falling out. Ground/take up arms, examine arms. Shoulder from the order and vice-versa, present from the order and vice-versa. Saluting at the shoulder at the halt and on the march. Short/long trail from the order and vice- versa. Guard mounting, guard of honor, Platoon/Coy Drill.
- Characteristics of rifle (.22/.303/SLR), ammunition, fire power, stripping, assembling, care, cleaning, and sight setting. Loading, cocking, and unloading. The lying position and holding.
- Trigger control and firing a shot. Range Procedure and safety precautions. Aiming and alteration of sight. Theory of groups and snap shooting. Firing at moving targets. Miniature range firing. Characteristics of Carbine and LMG.
- Introduction to map, scales, and conventional signs. Topographical forms and technical terms.

- The grid system. Relief, contours, and gradients. Cardinal points and finding north. Types of bearings and use of service protractor. Prismatic compass and its use. Setting a map, finding north and own position. Map to ground and ground to map. Knots and lashings, Camouflage and concealment, Explosives and IEDs.
- Field defences obstacles, mines and mine lying. Bridging, waterman ship. Field water supplies, tracks and their construction. Judging distance. Description of ground and indication of landmarks. Recognition and description of target. Observation and concealment. Field signals. Section formations. Fire control orders. Fire and movement. Movement with/without arms. Section battle drill. Types of communication, media, latest trends and developments.

National Service Scheme (NSS):

- Importance and role of youth leadership
- Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership, Life competencies
- Definition and importance of life competencies, problem-solving and decision-making, interpersonal communication. Youth development programs
- Development of youth programs and policy at the national level, state level and voluntary sector; youth-focused and youth-led organizations
- Health, hygiene and sanitation. Definition needs and scope of health education; role of food, nutrition, safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programs and reproductive health. Youth health, lifestyle, HIV AIDS and first aid. Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid. Youth and yoga. History, philosophy, concept, myths, and misconceptions about yoga; yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method

Note:

- As per the guidelines of Ministry of Youth Affairs and Sports, GOI, minimum duration for a NSS volunteer to be eligible for Certificate-A is 2 years; for Certificate-B is 3 years and for Certificate-C is 4 years.
- Hence , additional contents for Semester III and Semester IV contents (optional) may be included by the College for securing those advanced certificates if interested students are there.

Semester III (optional)

- Vocational Skill development
- To enhance the employment potential and to set up small business enterprises skills of volunteers, a list of 12 to 15 vocational skills will be drawn up based on the local conditions and opportunities. Each volunteer will have the option to select two skill-areas out of this list of issues related environment.
- Environmental conservation, enrichment and sustainability, climatic change, natural resource management (rainwater harvesting, energy conservation, forestation, waste land development and soil conservations) and waste management. Disaster management. Introduction and classification of disaster, rehabilitation, and management after disaster; role of NSS volunteers in disaster management.
- Entrepreneurship development. Definition, meaning and quality of entrepreneur; steps in opening of an enterprise and role of financial and support service institution.
- Formulation of production-oriented project. Planning, implementation, management, and impact assessment of project. Documentation and data reporting. Collection and analysis of data, documentation, and dissemination of project reports

Semester IV (optional)

- Youth and Crime
- Sociological and psychological factors influencing youth crime, cybercrime, pear mentoring in preventing crime and awareness for juvenile justice.
- Civil/self-defense. Civil defense services, aims and objectives of civil defense; needs and training of self-defense. Resource mobilization. Writing a project proposal of self-fund units (SFUs) and its establishment
- Additional life skills. Positive thinking, self-confidence, and esteem, setting life goals and working to achieve them, management of stress including time management.

Semester III

S. No	Course tilte	Total credits
1	Skill Enhancement	2(0+2)
2	Entrepreneurship Development and Business Communication	3 (2+1)
3	Physical Education, First Aid and Yoga Practices	2(0+2)
4	Principles of Genetics	3(2+1)
5	Crop Production Technology-I (Kharif crops)	3(2+1)
6	Production Technology of Fruit and Plantation Crops	2 (1+1)
7	Fundamentals of Extension Education	2(1+1)
8	Fundamentals of Nematology	2(1+1)
9	Principles and Practices of Natural Farming	2(1+1)
	Total	**21(10+11)**

Course Title : Entrepreneurship Development and Business Communication
Credits Hours : 3(2+1)
Objective:

• To provide student an insight into the concept and scope of entrepreneurship.
• To expose the student to various aspects of establishment and management of a small business unit.
• To enable the student to develop financially viable agribusiness proposal.

Theory:

Development of entrepreneurship, motivational factors, social factors, environmental factors, characteristics of entrepreneurs, entrepreneurial attributes/competencies. Concept, need for and importance of entrepreneurial development. Evolution of entrepreneurship, objectives of entrepreneurial activities, types of entrepreneurs, functions of entrepreneurs, importance of entrepreneurial development, and process of entrepreneurship development. Environment scanning and opportunity identification need for scanning–spotting of opportunity-scanning of environment– identification of product / service – starting a project; factors influencing sensing the opportunities. Infrastructure and support systems- good policies, schemes for entrepreneurship development; role of financial institutions, and other agencies in entrepreneurship development. Steps involved in functioning of an enterprise. Selection of the product / services, selection of form of ownership; registration, selection of site, capital sources, acquisition of manufacturing know how, packaging and distribution. Planning of an enterprise, project identification, selection, and formulation of project; project report preparation, Enterprise Management. Production management – product, levels of products, product mix, quality control, cost of production, production controls, Material management. Production management – raw material costing, inventory control. Personal management – manpower planning, labour turn over, wages / salaries. Financial management /accounting – funds, fixed capital and working capital, costing and pricing, long term planning

and short-term planning, book keeping, journal, ledger, subsidiary books, annual financial statement, taxation. Marketing management- market, types, marketing assistance, market strategies. Crisis management- raw material, production, leadership, market, finance, natural etc.

Practical:

Visit to small scale industries/agro-industries, Interaction with successful entrepreneurs/ agric-entrepreneurs. Visit to financial institutions and support agencies. Preparation of project proposal for funding by different agencies.

Suggested Readings:

- Charantimath P.M., 2009, Entrepreneurship Development and Small Business Enterprises. Pearson Publications, New Delhi.
- Desai V., 2015, Entrepreneurship: Development and Management, Himalaya Publishing House.
- Gupta CB. 2001. Management Theory and Practice. Sultan Chand & Sons.
- Indu Grover. 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy.
- Khanka SS. 1999. Entrepreneurial Development. S. Chand & Co.
- Mehra P., 2016, Business Communication for Managers. Pearson India, New Delhi.
- Pandey M. and Tewari D., 2010, The Agribusiness Book. IBDC Publishers, Lucknow.
- Singh D. 1995. Effective Managerial Leadership. Deep & Deep Publ.
- Singhal R.K., 2013, Entrepreneurship Development & Management, Katson Books.
- Tripathi PC & Reddy PN. 1991. Principles of Management. Tata McGraw Hill.

Vasant Desai, 1997. Small Scale Industries and Entrepreneurship. Himalaya Publ. House

Course title: Physical Education, First Aid and Yoga Practices
Credit hours: 2 (0+2)

Objectives

iii) To make the students aware about **Physical Education, First Aid and Yoga Practices**
iv) To disseminate the knowledge and skill how to perform physical training, perform firstaid and increase stamina and general wellbeing through yoga.

Practical

Physical education; Training and Coaching - Meaning & Concept; Methods of Training; aerobic and aerobic exercises; Calisthenics, weight training, circuit training, interval training, Fartlek training; Effects of Exercise on Muscular, Respiratory, Circulatory &Digestive systems; Balanced Diet and Nutrition: Effects of Diet on Performance; Physiological changes due to ageing and role of regular exercise on ageing process; Personality, its dimensions and types; Role of sports in personality development; Motivation and Achievements in Sports; Learning and Theories of learning; Adolescent Problems & its Management; Posture; Postural Deformities; Exercises for good posture.

Yoga; History of Yog, Types of Yog, Introduction to Yog,

- Asanas (Definition and Importance) Padmasan,
  Gaumukhasan, Bhadrasan, Vajrajasan, Shashankasan, Pashchimotasan, Ushtrasan, Tadasan, Padhas tasan, Ardhchandrasan, Bhujangasan, Utanpadasan, Sarvangasan , Parvatasan ,
  Patangasan, Shishupalanasan – left leg-right leg,
  Pavanmuktasan , Halasan , Sarpasan, Ardhdhanurasan, Sawasan
- SuryanamskarPranayama (Definition and Importance)
  Omkar, Suryabhedan, Chandrabhedan, AnulomVilom, Shitali, Shitkari, Bhastrika, Bhramari
- Meditation(Definition and Importance), Yogic Kriyas (Kapalbhati), Tratak, Jalneti and Tribandh
- Mudras (Definition and Importance) Gyanmudra, Dhyanmudra, Vayumudra, Akashmudra, Pruthvimudra, Shunyamudra, Suryamudra, Varunmudra, Pranmudra, Apanmudra, Vyanmudra, Uddanmudra

- Role of yoga in sports
- Teaching of Asanas – demonstration, practice, correction and practice.

History of sports and ancient games, Governance of sports in India; Important national sporting events; Awards in Sports; History, latest rules, measurements of playfield, specifications of equipment, skill, technique, style and coaching of major games (Cricket, football, table Tennis, Badminton, Volleyball, Basketball, Kabaddi and Kho-Kho) and Athletics

Need and requirement of first aid. First Aid equipment and upkeep. First AID Techniques, First aid related with respiratory system. First aid related with Heart, Blood and Circulation. First aid related with Wounds and Injuries. First aid related with Bones, Joints Muscle related injuries. First aid related with Nervous system and Unconsciousness. First aid related with Gastrointestinal Tract. First aid related with Skin, Burns. First aid related with Poisoning. First aid related with Bites and Stings. First aid related with Sense organs, Handling and transport of injured traumatized persons. Sports injuries and their treatments.

Course Title : Principles of Genetics
Credits Hours : 3 (2+1)
Objective: To make the students acquainted with both principles and practices in the areas of classical genetics, modern genetics, quantitative genetics and cytogenetics.

Theory

Pre and post Mendelian concepts of heredity, Mendelian principles of heredity, Architecture of chromosomes, chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere, special tpes of chromosomes, Chromosomal theory of inheritance- cell cycle and cell division-mitosis and meiosis. Probabilit and Chi-square. Dominance relationships, Epistatic interactions with example.

Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanism, chromosome mapping, Structural and numerical variations in chromosomes and their implications, Use of haploids, dihaploids and double haploids in Genetics, Mutation, classification, Methods of inducing mutations and CIB technique, mutagenic agents and induction of mutation. Qualitative and quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance, Genetic disorders, Nature, structure and replication of genetic material, Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Practical

Study of microscope, Stud of cell structure, Mitosis and Meiosis cell division, Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments on probability and chi-square test, Determination of linkage and croo-over analsis(through two point test cross and three point test cross data), Study on sex linked inheritance in Drsoophila. Study on models on DNA and RNA structures.

Suggested readings:

1. Fundamentals of Genetics: B. D. Singh
2. Principles of Genetics: Gardner, Simmons and Snustad.
3. Genetics: M. W. Strickberger.
4. Principles of Genetics: Sinnott, Dunn and Dobzhansky

Course Title : Crop Production Technology-I (Kharif crops)
Credits Hours : 3(2+1)

Objectives: i)To impart basic and fundamental knowledge on principles and practices of kharif crop production.

ii) To impart knowledge and skill on scientific crop production and management. .

Theory: Origin, geographical distribution, economic importance, soil and climatic requirements, varities, cultural practices and yield of Kharif crops. Cereals- rice, maize, sorghum, pearl millet and finger millet,

pulses- pigeonpea, mungbean and urdbean; oilseeds- groundnut, and soybean; fibre crops- cotton & jute; forage crops- sorghum, cowpea, cluster bean and napier.

Practical: Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean, maize, groundnut and cotton ,effect of seed size on germination and seedling vigour of Kharif season crops, effect of sowing depth on germination of Kharif crops, identification of weeds in Kharif season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of Kharif season crops, study of crop varities and important agronomic experiments at experiential farm.Study of forage experiments, morphological description of Kharif season crops, visit to research centres of related crops.

Suggested readings:

1. B. Gurarajan, R.Balasubramanian and V.Swaminathan. Recent Strategies on Crop Production. Ka Publishers, New Delhi.
2. Chidda Singh.1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. New Delhi.
3. Rajendra Prasad. Textbook of Field Crops Production - Commercial Crops. Volume II ICAR Publication.
5. S.R.Reddy. 2009. Agronomy of Field Crops. Kalyani Publishers, New Delhi.
6. S.S.Singh. 2005. Crop Management. Kalyani Publishers, New Delhi.
7. UAS, Bangalore. 2011. Package of Practice. UAS, Bangalore.
8. Subhash Chandra Bose, M. and Balakrishnan, V. 2001. Forage Production South Asian Publishers, New Delhi.

Course Title: **Fundamentals of Extension Education**
Credit Hours: 2 (1+1)

Objectives:

1. State the importance of extension education in agriculture.
2. Familiarize with the different types of agriculture and rural development programmes launched by govt. of India.
3. Classify the types of extension teaching methods.
4. Elaborate the importance and different models of communication.
5. Explain the process and stages of adoption along with adopters' categories.

Theory:

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); Reorganised Extension System (T&V system) various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc.). Social Justice and poverty alleviation programme-ITDA, IRDP/SGSY/NRLM. Women Development Programme-RMK, MSY etc. New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D.

Rural Leadership: concept and definition, types of leaders in rural context; Method of identification of Rural Leader. Extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Practical:

To get acquainted with university extension system. Group discussion- exercise; Identification of rural leaders in village situation; preparation and use of AV aids, preparation of extension literature – (leaflet, booklet, folder, pamphlet news stories and success stories); Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA/PRI and other development departments at district level; visit to NGO/FO/FPO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

Suggested readings:

1. Adivi Reddy, A., 2001, Extension Education, Sree Lakshmi press, Bapatla.
2. Dahama, O. P. and Bhatnagar, O.P., 1998, Education and Communication for Development, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
3. Jalihal, K. A. and Veerabhadraiah, V., 2007, Fundamentals of Extension Education and Management in Extension, Concept publishing company, New Delhi.
4. MuthaiahManoraharan, P. and Arunachalam, R., Agricultural Extension, Himalaya Publishing House (Mumbai).
5. Sagar Mondal and Ray, G. L., Text Book on Rural Development, Entrepreneurship And Communication Skills, Kalyani Publications.
6. Rathore, O. S. et al., 2012, Handbook of Extension Education, Agrotech Publishing Academy, Udaipur.
7. Dudhani, C.M.; Hirevenkatgoudar, L.V., Manjunath, L.; Hanchinal, S.N. and Patil, S.L. (2004). Extension Teaching Methods and Communication Technology, UAS, Dharwad.
8. Sandhu, A.S. (1993).Textbbok on Agricultural Communication : Process and Methods. Oxford and IBH Publishing Pvt.Ltd., New Delhi.
9. Singh, A.K., Lakhan Singh, R. and Roy Burman (2006). Dimensions of Agricultural Extension. Aman Publishing House, Meerut

Course Title : Fundamentals of Nematology
Credits Hours : 2(1+1)

Objectives:

i) To impart knowledge on history, economic importance of plant parasitic nematodes, morphology, biology, host parasitic relationship of nematodes.
ii) To impart knowledge on nematode pests of different crops of national and local importance and their management

Theory:

Introduction- History of phytonematology, habitat and diversity , economic importance of nematodes. General characteristics of plant parasitic nematodes. Nematode - definition, general morphology and biology. Classification of nematodes upto family level with emphasis on groups containing economically important genera. Classification of nematodes on the basis of feeding/parasitic habit. Symptomatology, role of nematodes in disease development, Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses. Nematode pests of crops: Rice, wheat, vegetables, pulses, oilseed and fiber crops, citrus and banana, tea, coffee and coconut. Different methods of nematode management: Cultural methods, physical; methods, Biological methods, Chemical methods , Plant Qurantine, Plant resistance and INM.

Practical:

Sampling methods, collection of soil and plant samples; Extraction of nematodes from soil and plant tissues following Cobb's sieving and decanting technique, Baermann funnel techinique, Picking and counting of plant parasitic nematode. Identification of economically important plant nematodes upto generic level with the help of keys and description: Meloidogyne, Pratylenchus; Heterodera, Tylenchulus, Xiphinema, and Helicotylenchus etc. Study of symptoms caused by important nematode pests of cereals, vegetables, pulses, plantation crops etc. Methods of application of nematicides and organic amendments.

Suggested readings:

1. Text book on Introductory Plant Nematology -R.K.Walia and H.K.Bajaj
2. Plant Parasitic Nematodes (Vol-1) by Zukerman, Mai, Rohde

3. Plant Parasitic Nematodes of India: Problems and Progress by - Gopal Swarup, D. R. Dasgupta, P. K. Koshy.
4. Economic Nematology-Edited by J.M.Webster

Course Title : Principles and Practices of Natural Farming
Credits Hours : 2 (1+1)

General Objectives: To provide comprehensive understanding and knowledge to students about natural farming

Specific Objectives: i) To teach students the concept, need and principles of native ecology-based production under natural farming

ii) To impart practical knowledge of natural farming and related agricultural practices in Indian and global environmental and economic perspectives

Theory: Indian Heritage of Ancient Agriculture, History of Natural Farming, Importance of natural farming in view of climate change, soil health, water use carbon sequestration, biodiversity conservation, food security and nutritional security, and sustainable development goals (SDGs), Concept of natural farming; Definition of natural farming; Objective of natural farming, Essential characteristics and Principles of natural farming; Scope and importance of natural farming. Main Pillars of natural farming; Methods/ types/schools of natural farming. Characteristics and design of a natural farm, Concept of ecological balance, ecological engineering and community responsibility in natural versus other farming systems, Introduction to concept of ecological, water, carbon and nitrogen foot prints, Concept and evaluation of ecosystem services,

Integration of crops, trees and animals, cropping system approaches, Biodiversity, indigenous seed production, farm waste recycling, water conservation and renewable energy use approaches on a natural farm,Rearing practices for animals under natural farming**,** Nutrient management in natural farming and their sources, Insect, pest, disease and weed management under natural farming; Mechanization in natural farming, Processing, labelling, economic considerations and viability, certification and standards in natural farming , marketing and export potential of natural farming produce and products. Initiatives taken by Government (central/state), NGOs and other organizations for promotion of natural farming and chemical free agriculture, Case studies and success stories in natural farming and chemical free traditional farming, Entrepreneurship opportunities in natural farming.

Practical: Visit of natural farm and chemical free traditional farms to study the various components and operations of natural farming principles at the farm; Indigenous technical knowledge (ITK) for seed, tillage, water, nutrient, insect-pest, disease and weed management; On-farm inputs preparation methods and protocols, Studies in green manuring in-situ and green leaf manuring, Studies on different types of botanicals and animal urine and dung based non-aerated and aerated inputs for plant growth, nutrient, insect and pest and disease management; Weed management practices in natural

Farming; Techniques of Indigenous seed production- storage and marketing, Partial and complete nutrient and financial budgeting in natural farming; farming; Evaluation of ecosystem services in natural farming (Crop, Field and System)..

Suggested Readings:

1. Nalini S. 1999. Krishi-Parashara (Agriculture by Parashara) by Parashara. Brig Sayeed Road, Secunderabad, Telangana: AAHF Classic Bulletin, Asian Agri-History Foundation. 104pp.
2. Shamasastry R. 1915. Kautilya's Arthashastra.
3. Ayachit SM. 2002. Kashyapi Krishi Sukti (A Treatise on Agriculture by Kashyapa). Brig Sayeed Road, Secunderabad, Telangana: Asian Agri-History Foundation 4: 205.
4. Nalini S. 1996. Vrikshayurveda (The Science of Plant Life) by Surapala. AAHF Classic Bulletin 1. Asian Agri-History Foundation, Brig Sayeed Road, Secunderabad, AP (now Telengana), India. 94pp.
5. Ecological Farming -The seven principles of a food system that has people at its heart. May 2015, Greenpeace.
6. HLPE. 2019. Agroeeological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. A report by the High Level Panel of Experts on Food Security and nutrition of the Committee on World Food Security, Rome. https://fao.org/3/ea5602en/ea5602en.pdf.
7. FAO. 2018. The 10 elements of agro-ecology: guiding the transition to sustainable food and agricultural system .https://www.fao.org/3/i9037en/i9037en.pdf Agro ecosystem Analysis for Research and Development Gordon R. Conway.1985
8. UK Behera. 2013. A text Book of Farming System. Agrotech Publishing House, Udaipur.
9. (ISBN: 978-81-8321-309-7)
10. Hill S.B and Ott. P. (eds.). 1982 Basic Techniques in Ecological Farming Berkhauser Verlag, Basel, Germany, 366 pp.
11. Nalini S. 2011. Upavana Vinoda (Woodland Garden for Enjoyment) by Sarangdhara (13th century CE): AAHF Classic Bulletin 8. Asian Agri-History Foundation, Brig Sayeed Road, Secunderabad, AP (now Telangana), India. 64p
12. Boeringa R. (ed.). 1980. Alternative Methods of Agriculture. Elsevier, Amsterdam, 199 pp.
13. Ecological Farming, The Seven principles of a food system that has people at its heart. May 2015, Greenpeace
14. Fukuoka M. 1978. The One-Straw Revolution: An Introduction to Natural Farming. Rodale Press, Emmaus, PA. 181 pp
15. Fukuoka M. 1985. The Natural Way of Farming: The Theory and Practice of Green Philosophy. Japan Publications, Tokyo, 280 pp.
16. Hill S.B. and Ott P. (eds.). 1982. Basic Techniques in Ecological Farming. Berkhauser Verlag, Basel, Germany, 366 pp.
17. INFRC. 1988. Guidelines for Nature Farming Techniques. Atami, Japan. 38 pp.
18. Khurana, A. and Kumar, V. 2020. State of Organic and Natural Farming: Challenges and Possibilities, Centre for Science and Environment, New Delhi.
19. Reyes Tirado. 2015. Ecological Farming- The seven principles of a food system that has people at its heart. Greenpeace Research laboratories. University of Exeter, OtthoHeldringstraat.
20. The Ultimate Guide to Natural Farming and Sustainable Living: Permaculture for Beginners (Ultimate Guides) by Nicole Faires (2016)
21. Plenty For All: Natural Farming A To Z PRAYOG PARIWAR METHODOLOGY by Prof. Shripad A. Dabholkar and Prayog Pariwar Prayog Pariwar (2021)
22. Natural Farming Techniques: Farming without tilling by Prathapan Paramu (2021)
23. Natural Asset Farming: Creating Productive and Biodiverse Farms by David B. Lindenmayer, Suzannah M. Macbeth, et al. (2022)
24. कमलागतप्राकृततककृतिः आचार्यदेवव्रत, pp 1-166.
25. Malhotra R. and S.D. Babaji. 2020. Sanskrit Non Translatable- The importance of Sanskritizing English. Amaryllis, New Delhi India.
26. Das, P., Das, S.K., Arya, H.P.S., Reddy, G. Subba, Mishra, A. and others: Inventory of Indigenous Technical Knowledge in Agriculture: Mission mode Project on Collection, Documentation and Validation of Indigenous Technical Knowledge, Document 1 To 7, Indian Council of Agricultural Research, New Delhi

Semester IV

S. No	Course tilte	Total credits
1	Skill Enhancementcourse	2(0+2)
2	Agri informatics	3(2+1)
3	Production Technology of Vegetables and Spices	2(1+1)
4	Principles of Agricultural Economics and Farm Management	2(2+0)
5	Crop Production Technology-II (Rabi Crops)	3(2+1)
6	Farm Machinery and Power	2 (1+1)
7	Water Management	2 (1+1)
8	Problematic Soils and their management	2(1+1)
9	Basics of Plant Breeding	3(2+1)
	Total	**21(12+9)**

Course Title : Agri Informatics
Credits Hours : 3 (2+1)
Objective

i) To acquaint student with the basics of computer applications in agriculture, multimedia, database management, application of mobile app and decision- making processes,etc.
ii) To provide basic knowledge of computer with applications in Agriculture.
ii) To make th students familiar with Agricultural-Informatics, it scomponents and applications in agriculture.

Theory

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System: Definition and types, Applications of MS-Office forcreating, Editing and Formatting a document, Data presentation, Tabulation and graph creation, Statisticalanalysis,Mathematicalexpressions, Database,conceptsandtypes,creatingdatabase, Uses of DBM Sin Agriculture, Internet and World Wide Web (WWW): Conceptsand components.

Computer programming: General concepts, Introduction to Visual Basic, Java, Fortran, C/ C++, etc. concepts and standard input/ output operations.

e-Agriculture, Concepts, design and development, Application of innovative ways to use information and communication technologies (IT) in Agriculture, Computer Models in Agriculture: Statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation, IT applications for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smart phone mobile apps in agriculture for farm advice: Market price, post harvest management etc.,Geospatial technology: Concepts, techniques, components and uses for generating valuable agri-information, Decision support systems: Concepts, components and applications in Agriculture, Agriculture Expert System ,Soil Information Systemsetc .for supporting farm decisions. Preparation of contingent crop-planning and crop calendars using IT tools, Digital India and schemes to promote digitalization of agriculture in India.

Practical

Study of computer components, accessories, practice of important DOS Commands, Introduction of different operating systems such as Windows, Unix/ Linux, creating files & folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting as cientific documents, MS-EXCEL-Creating as pread sheet, Use of statistical tools, Writinge xpressions, Creating graphs,Analysis of scientific data, Handling macros. MS-ACCESS: Creating Database, preparing queries and reports, Demonstration of

Agri- information system, Introduction to World Wide Web (WWW) and its components, Introduction of programming languages such as Visual Basic, Java, Fortran, C, C++, Hands on practice on Crop Simulation Models (CSM), DSSAT/ Crop-Info / Crop Syst/ Wofost, Preparation of inputs file for CSMandstudyofmodeloutputs,computationof waterand nutrient requirements of crop using CSMand ITtools,Use of smart phones and other devices in agro-advisory and dissemination of market information, Introduction of Geospatial Technology, Hands on practice on preparation of Decision Support System, Preparation of contingent crop planning, India Digital Ecosystem of Agriculture (IDEA)

SuggestedReadings

1. Fundamentals of Computer by V. Rajaroman.
2. Introductionto Information Technologyby Pearson.
3. Introductionto Database Management System by C. J.Date.
4. Concepts andTechniques of Programming in C by DhabalPrasad SethiandManoranjan,WileyIndia.
5. Introductory AgriInformatics by Mahapatra, SubratK et al, Jain Brothers Publication.

Course Title :Production Technology of Vegetables and Spices
Credits Hours :2 (1+1)

Objectives:

1. To educate about the different forms of classification of vegetables
2. To educate about the origin, area, climate, soil, improved varieties and cultivation practices of vegetables and spices.
3. To educate about the physiological disorders of vegetables and spices

Theory

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil , improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chili, Capsicum, Cucumber, Melons, Gourds, Pumpkin ,French bean, Peas; Cole crops such as Cabbage, Culiflower, Knol-Khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak, Perennial vegetables)

Practical

Identification of vegetables & spice crops and their seeds. Nursery raising. Direct seed sowing and transplanting. Study of morphological characters of different vegetables &spices. Fertilizers applications. Harvesting & preparation for market. Economics of vegetables and spices cultivation**.**

Suggested readings:

- Vegetable crops by J. Kabir, T.K. Bose, M.G. Som
- Olericulture, Fundamentals of Vegetable Production (Vol.1) by K.P. Singh, Anant Bahadur
- Vegetable crops (Production technology, Vol II) by M.S. Fagaria, B.R. Choudhury, R.S. Dhaka

Course Title : Principles of Agricultural Economics and Farm Management
Credits Hours : 2(2+0)

Objectives: 1.To aware the students about broad areas covered under agricultural Economics and farm management
2. To impart knowledge on judicious use of resources for optimum production

Theory:
Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.Demand: meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input output relationship. Laws of returns: Law of variable proportions and law of returns to scale. Cost: Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning. Forms of business organizations, international trade and balance of payments.GST and its implication on Indian economy.

Suggested readings:

1. S. Subha Reddy, P. Raghu Ram, T.V. Neelakanta and I. Bhvani Devi .2004. Agricultural Economics. Oxford & IBH publishing Co. Pvt. Ltd
2. Johl, S.S nd T.R Kapur. 2009. Fundamentals of Farm Business Management. Kalyani Publishers

Course Title : Crop Production Technology-II (Rabi Crops)
Credits Hours : 3(2+1)

Objectives: i) To impart basic and fundamental knowledge on principles and practices of rabi crop production.
ii) To impart knowledge and skill on scientific crop production and management. .

Theory: Origin, geographical distribution, economic importance, soil and climatic requirements, varities, cultural practices and yield of Rabi crops; cereals- wheat and barley, pulses- chickpea, lentil, peas , oilseed-rapeseed, mustard and sunflower; sugar crops-sugarcane; medicinal and aromatic crops- mentha, lemon grass and citronella ,Forage crops –berseem, lucerne and oat.
Practical: Sowing methods of wheat and sugarcane, identification of weeds in rabi season crops, study of morphological characteristics of rabi crops, study of yield contributing characters of rabi season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of rabi crops at experimental farms. Study of rabi forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

Suggested readings:

B. Gurarajan, R. Balasubramanian and V.Swaminathan. Recent Strategies on Crop Production. Kalyani Publis

New Delhi.

Chidda Singh.1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd.,

Delhi.

Rajendra Prasad. Textbook of Field Crops Production - Commercial Crops. Volume II ICAR Publication.

Rajendra Prasad. Textbook of Field Crops Production - Foodgrain Crops. Volume I ICAR Publication.

S.R.Reddy. 2009. Agronomy of Field Crops. Kalyani Publishers, New Delhi.

S.S.Singh. 2005. Crop Management. Kalyani Publishers, New Delhi.

UAS, Bangalore. 2011. Package of Practice. UAS, Bangalore.

Rajendra Prasad 2002. Text Book of Field crops Production,ICAR, New Delhi.

Reddy, S.R. 2004. Agronomy of Field crops, Kalyani Publishers, Ludhiana.

Subhash Chandra Bose, M. and Balakrishnan, V. 2001. Forage Production South

Asian Publishers, New Delhi.

Course Title : Farm Machinery and Power
Credits Hours : 2(1+1)

Objectives: To enable the students to understand the need of farm power , basic principles and parts of IC engine , different tillage, sowing, intercultural, plant protection equipment ,working principles of threshers, harvesting of field and horticultural crops .

Theory: Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement, Criteria for selection of tractor and machine implements. Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practical:
Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow . Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivation equipment, Familiarization with harvesting and threshing machinery. Calculation of power requirement for different implements.

Suggested readings:

1. Jagdiswar Sahay – Elements of Agricultural Engineering
2. Surendra Singh- Farm machinery –Principles and applications, ICAR, New Delhi
3. Jain, S.C. and C.R.Rai. Farm Tractor and maintenance and repair. Standard Publishers, 1705- B, Naisarak,. Delhi- 110006
4. Ojha, T.P. and A.M.Michael, A.M. Principles of Agricultural Engineering. Vol.I. Jain brothers, 16/893, East Park Road, Karol Bagh, New Delhi -110005

Course Title : Water Management
Credits Hours : 2(1+1)

Objectives: i)To study the important properties of soil affecting water availability to crops and water requirement for optimum growth and development
ii) To study different methods of irrigation and water management practices of both field and horticultural crops and drainage.
iii) To study the soil moisture conservation practices including management of rain water, watershed and command areas

Theory:

Irrigation: definition and objectives, Importance function of water for plant growth, water resources and irrigation development for different crops in India; Soil plant water relationships; Available and unavailable soil moisture – distribution of soil moisture – water budgeting – rooting characteristics – moisture extraction pattern, effect of moisture stress on crop growth.. Methods of soil moisture estimation, evapotranspiration and crop water requirement; effective rainfall, different approaches of scheduling of irrigation; Methods of irrigation: surface and sub-surface, pressurized methods viz., sprinkler and drip irrigation, their suitability, merits and limitations, fertigation, economic use of irrigation water; Layout of different irrigation systems, Irrigation efficiency and water use efficiency, conjunctive use of water, irrigation water quality and its management. Water management of different crops (rice, wheat, maize, groundnut, sugarcane, mango, banana and tomato); Agricultural drainage. Water management problem, soils quality of irrigation water, irrigation management practices for different soils and crops., drip, sprinkler. Layout of underground pipeline system.

Practical:

Determination of bulk density by field method; Determination of soil moisture content by gravimetric method, tensiometer, electrical resistance block and neutron moisture meter; Determination of field capacity by field method; Determination of permanent wilting point; Measurement of irrigation water by using water measuring devices viz., flumes and weirs; Calculation of irrigation water requirement (Problems); Determination of infiltration rate; Demonstration of furrow method of irrigation; Demonstration of check basin and basin method of irrigation; Visit to farmers field and cost estimation of drip irrigation system; Demonstration of filter cleaning, fertigation, injection and flushing of laterals; layout for different methods of irrigation, Erection and operation of sprinkler irrigation system; Measurement of emitter discharge rate, wetted diameter and calculation of emitter discharge variability; Determination of EC, pH, carbonates, bio-carbonates, Ca++ and Mg++ in irrigation water (quality parameters).

Suggested readings:

1. Rao, Y.P. and Bhaskar, S.R. Irrigation technology. Theory and practice. Agrotech publishing Acac Udaipur.
2. DilipkumarMujmdar. Irrigation water management: Principles and Practices. Prentice Hall of India Pvt.
S.V. Patil &Rajakumar, G. R., Water Management in Agriculture and Horticultural Crops. Satish publishing House, Delhi.
4. Carr M. K. V. and Elias Fereres. Advances in Irrigation Agronomy. Cambridge University Press.
5. Michael, A.M. Irrigation Theory and practice. Vikas publishing house Pvt, Ltd.

Course Title : Problematic Soils and their management
Credits Hours : 2 (1 + 1)

Objectives:

1. Toacquaint the students about various problem soils like degraded soils, acid soils, saline soils, alkali soils, eroded soils, submerged soils, polluted soils. Also to impart knowledge about remote sensing, GIS, Multipurpose tree and Land capability classification

2. To give hands on training about estimation of various soil and water quality parameters associated with problem soils.

Theory

Soil quality and health, Distribution of Waste land and problem soils in India with special reference to Assam and North Eastern Region. Categorization of Problem soils based on properties. Reclamation and management of Acid soils, Saline, Sodic soils, Acid Sulphate soils, Eroded and Compacted soils, polluted soils. Management of Riverine soils, Waterlogged soils, Contaminated soils (Pesticide contamination, Heavy metal contamination), Mined soils (Coal mined, Oil mined),

Irrigation water – quality and standards, utilization of saline water in agriculture. Use of Remote sensing and GIS in diagnosis and management of problem soils. Irrigation and water quality.

Multipurpose tree (MPT) species, bio remediation through MPTs of soils, land capability and classification, land suitability classification.

Practical :

Determination of pHs and EC of saturation extract of problematic soil. Determination of redox potential in soil, Estimation of water soluble and exchangeable cations in soil and computation of SAR and ESP and characterization of problematic soil. Determination of Gypsum requirement of alkali / sodic soil. Determination of lime requirement of acidic soil. Determination of Quality of irrigation water (pH, EC, Ca, Mg, Na, CO_3, HCO_3, Cl, SAR and RSC), Determination of nitrate (NO_3-) from irrigation water, Determination of dissolved oxygen and free carbon dioxide levels in water samples,

Suggested readings:

1. Srivastava, V. C., 2002. Management of Problem Soils -Principles and Practices. AGROBIOS (India).
2. Osman, Khan Towhid, 2018, Management of Soil Problems. Springer publication
3. Indian Society of Soil Science, 2002. Fundamentals of Soil Science. IARI, New Delhi.
4.Brady Nyle C and Ray R Well, 2014. Nature and properties of soils. Pearson Education Inc., New Delh i.
5. Cirsan J. Paul, 1985, Principles of Remote Sensing. Longman, New York
6. Agarwal, R.R., Yadav, J.S.P. and Gupta, R.N. (1982). Saline Alkali soils of India, ICAR, New Delhi

Course Title : Basics of Plant Breeding
Credits Hours : 3(2+1)

Objectives: To aquaint with different different techniques ranging from simply selecting plants with desirable characteristics for propagation, to more complex molecular techniques for breeding new varieties which are higher yielding, resistant to biotic and abiotic stresses for ensuring food security.

Theory:

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in rlation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male-sterility-genetic consequences, cultivar options, Domestication, Acclimatization and Introduction; Centres of origin/diversity, Components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self pollinated crops-mass and pur line selection, hybridization techniques and handling of segregating population; Multiline concept, Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross-pollinated crops, modes of selection; Population movement schemes- Ear to Row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Propert Rights, Patenting, Plant Breeders & Farmer's Rights.

Practical:

Plant Breeder's kit, Study of germplasm of various crops, Study of floral structures of self-pollinated and cross-pollinated crops, Emasculatiopn and hybridization techniques in self & cross pollinated crops, Consequences of inbreeding on genetic structure of resulting populations, Study of male sterility system, Handling of segregating populations, Mathods of calculating mean, range, variance, standard deviation, heritability, Designs used in plant breeding experiments, analysis of Randomized Block Design, To work out the mode of pollination in a given crop and extent of natural out-crossing, Prediction of performance of double cross hybrids.

Suggested readings:

1. Principles of Plant Breeding (1st & 2nd Edition) by RW Allard,
2. Plant Breeding: Principles & Practices by JR Sharma,
3.Plant Breeding- B.D. singh
4. Principles and Procedures of Plant Breeding - Biotechnical and Conventional Approachesby GS Chahal and SS Gosal
5. Principles of Plant Genetics and Breeding by George Acquaah

Semester V

S. No	Course tilte	Total credits
1	Agricultural Marketing and Trade	3 (2+1)
2	Introduction to Agro-meteorology	2(1+1)
3	Fundamentals of Crop Physiology	3(2+1)
4	Pest management in Crops and Stored Grains	3 (2+1)
5	Diseases of Field & Horticultural Crops & their Management	3(2+1)
6	Crop Improvement - I	2 (1+1)
7	Weed Management	2(1+1)
8	Ornamental Crops, MAPs and Landscaping	2 (1+1)
9	Introductory Agro forestry	2 (1+1)
	Total	**22(13+9)**

Course Title : Agricultural Marketing and Trade
Credits Hours : 3(2+1)

Objectives:

- To understand the fundamentals of agricultural marketing and trade.
- To analyze the factors influencing supply and demand in agricultural markets.
- To explore different marketing channels and strategies in agriculture.
- To examine the role of government policies and regulations in agricultural markets.

Theory:

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – meaning, merits and demerits; marketing process and functions: Marketing process concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labelling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs;

Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for innovations in agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR. Role of government in agricultural marketing. Role of APMC and its relevance in the present day context.

Practical:

Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions –NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning. Application of principles of comparative advantage of international trade.

Suggested Readings:

- Acharya, S.S. and Agarwal, N.L., 2006, Agricultural Marketing in India, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- Chinna,S.S., 2005, Agricultural Economics and Indian Agriculture. Kalyani Pub, N Delhi.
- Dominic Salvatore, Micro Economic Theory
- Kohls Richard, L. and UhlJosheph, N., 2002, Marketing of Agricultural Products, Prentice-Hall of India Private Ltd., New Delhi.
- Kotler and Armstrong, 2005, Principles of Marketing, Pearson Prentice-Hall.
- Lekhi, R. K. and Jogindr Singh, 2006, Agricultural Economics. Kalyani Publishers, Delhi.
- Memoria, C.B., Joshi, R.L. and Mulla, N.I., 2003, Principles and Practice of Marketing in India, Kitab Mahal, New Delhi.
- Pandey Mukesh and Tewari, Deepali, 2004, Rural and Agricultural Marketing, International Book Distributing Co. Ltd, New Delhi.

Sharma, R., 2005, Export Management, LaxmiNarain Agarwal, Agra.

Course Title : Introduction to Agro-meteorology
Credits Hours : 2(1+1)

Objectives:

1.To introduce the students to the concept of weather and climate and the underlying physical processes occurring in relation to plant and atmosphere

2.To impart the theoretical and practical knowledge of instruments/equipments used for measurement of different weather variables in an agrometeorological observatory

3.To study the meteorological aspects of climate change in agriculture and allied activities

Theory

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture; Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave; Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and

livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical

Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording, Measurement of total, shortwave and long wave radiation, and its estimation using Planck's intensity law, Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS; Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis, Measurement of soil temperature and computation of soil heat flux, Determination of vapor pressure and relative humidity, Determination of dew point temperature, Measurement of atmospheric pressure and analysis of atmospheric conditions, Measurement of wind speed and wind direction, preparation of windrose, Measurement, tabulation and analysis of rain, Measurement of open pan evaporation and evapotranspiration, Computation of PET and AET.

Suggested readings:

1. Introduction to Agrometeorology & Climate Change by Alok Kumar Patra
2. Fundamentals of Agrometeorology and Climate Change by G. S. Mahi & P. K. Kingra
3. Text Book of Agricultural Meteorology by MC Varshneya& PB Pillai
4. Introduction to Agrometeorology by H. S. Mavi
5. Agricultural Meteorology by G.S.L.H.V. Prasado Rao

Course Title : Fundamentals of Crop Physiology
Credits Hours : 3(2+1)

Objectives:

To explain about the basic physiological process of plant viz. plant cell and water relations, mineral nutrition, carbon metabolism, reproductive physiology and plant growth and development.

Theory:

Definitions of plant physiology and crop physiology, Importance of crop physiology, Relationship of crop physiology with other branches of crop science

Diffusion and osmosis, Physiological roles of water to crop plants, Definition of water potential and components of water potential, Water absorption by plants: Concept of active and passive absorption, Water loss by plants: Types of water loss: transpiration, stomatal physiology and guttation, Water use efficiency and factors affecting WUE.

Classification of mineral elements: Essential and beneficial elements, Passive and active transport of mineral element: Nernst equation, ion transport, ion pump and channels, Functions of essential elements and their deficiency and toxicity symptoms, Hydroponics and sand culture.

Brief outline of: Photosynthetic apparatus, pigment system, quantum requirement and quantum yield: Structure of chloroplast, Examples of different photosynthetic pigments (chlorophyll, carotenoids, phycobilins etc.), Difference between chlorophyll a and chlorophyll b, Structure of chlorophyll a and chlorophyll b, Short discussion on quantum requirement and quantum yield, Red drop and Emerson enhancement effect, Pigment system I & II.

Introduction to light reaction of photosynthesis, Light absorption by photosynthetic pigments and transfer of energy, Source of O_2 during photosynthesis: Hill reaction, Brief introduction to cyclic and non-cyclic photo-phosphorylation: production of assimilatory powers.

Introduction to C_3, C_4 and CAM pathways: Calvin Cycle, Hatch & Slack Cycle, CAM Cycle, Significance of these pathways (concept of photorespiration, absence of photorespiration in C_4 plant: Productivity of C_4 plant, CAM: an adaptive mechanism), Factors affecting photosynthesis (light, temperature, CO_2, O_2etc).

Outline of the process of respiration: Definition and importance, Glycolysis, Kreb Cycle and ETC, Factors affecting respiration (O_2, temperature, CO_2 etc.).

Terminologies / Definitions: Growth, Development and Differentiation. Measurement of plant growth (fresh weight, dry weight, linear dimension, area etc). Introduction to CGR, RGR, NAR etc. Short discussion on factors affecting growth and development.

Photoperiodism: Classical works of Garner and Allard. Photoperiodic Classification of plants: Short Day Plant, Long Day Plant, Day Neutral plant etc. Introduction to Photoperiodic induction Site of photo-inductive perception, Role of Phytochrome Introduction to Vernalization (What is vernalization, devernalizationetc).
Meaning, classification (seasonal, sequential etc), relation with abscission. Physiological and biochemical changes during senescence, Abscission and its significance, Concept of stay green, Hormonal regulation of senescence.
Terminologies / Definitions: Plant hormone, Plant growth regulators (PGR), Plant growth inhibitor. Recognized classes of PGR (Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic acid) and their major physiological roles, Agricultural uses of PGRs (IBA, NAA, 2, 4 –D, GAs, Kinetin etc).

Practical:

Study on structure and distribution of stomata; Demonstration of imbibition, osmosis, plasmolysis, estimation of water potential, relative water content; Tissue test for mineral nutrients, identification of nutrient deficiency and toxicity symptoms in plant; Estimation of photosynthetic pigments, rate of photosynthesis, respiration and transpiration; Plant growth analysis; Study on senescence and abscission, hormonal regulation of senescence;Demonstration of the effects of different PGRs on plants.

Suggested readings:

- Plant Physiology by Robert M. Devlin and Francis H. Witham
- Plant Physiology by Lincoln Taiz and Eduardo Zeiger
- Plant physiology by Frank B. Salisbury and Cleon W. Ross
- Fundamentals of Plant Physiology by Lincoln Taiz, Eduardo Zeiger, Ian Max Mølle and Angus Murphy
- Devlin's Exercises in Plant Physiology by Robert Devlin, Francis H. Witham and David F. Blaydes

Course Title : Pest management in crops and stored grains
Credits Hours : 3(2+1)

Objectives: Diagnosis and management of major insect and non- insect pests of crops in field and storage

Theory

General description on nature and type of damage by different arthropod pests; Scientific name, order, family, host range, distribution, biology and bionomics; Nature of damage and management of major insect pests of various field crops, vegetable crops, fruit crops, plantation crops, ornamental crops, spices and condiments. Structural entomology and important household pests, their nature of damage and management. Factors affecting loss of stored grains. Insect pests, mites, rodents, birds and microorganisms associated with stored grains and their management. Storage structures and methods of grain storage and fundamental principles of stored grains management.

Practical

Field visit, identification of major insect pests and their damage symptoms. Collection and preservation of major insect pests; collection of damage samples, their identification and herbarium preparation. Methods of monitoring of pest incidence in situ. Management strategies of insect pests of different crops. Study on structural entomology and household pests. Storage structures and methods of grain storage. Spraying techniques for selected field and horticultural crops. Vertebrate pest management.

Suggested readings:

3. Pest Management: Methods, Applications and Challenges, Tarique Hassan Askary, Agriculture, Agriculture Issues and policies, Books, Nova, Pest Control, Science and Technology,**2022**
4. Essentials of Pest Management: Key Information on Pest Identification and its Management, 2022. Prakash Rambhat Thalya and Ravi Chandra
5. A Textbook of Insect Pest and Disease Management, 2021. Somnath Sen, and Mohd. Sameer, S. Kataria & Sons publish.
6. Agricultural Pests of India and South east Asia, A.S.Athwal, Kalyani Publsh.
7. A Textbook of Applied Entomology, K.P.Srivastava and G,S. Dhaliwal, Kalyani Publish.

Course Title : Diseases of Field & Horticultural Crops & their Management
Credits Hours : 3 (2+1)

Objectives:

1. To study the symptoms produced on the host
2. To study the etiology of the diseases
3. To know about the disease cycle of the pathogens during pathogenesis
4. To study the epidemiological factors responsible for disease development
5. To study the management techniques for curbing the major diseases of field and horticultural crops

Theory:

Symptoms, etiology, disease cycle, epidemiology and management of major diseases of the following field and horticultural crops:

Fieldcrops- Rice (Blast, Brown Spot, Sheath Blight, False smut, Bacterial Leaf Blight, Bacterial Leaf Streak, Tungro, Khaira); Wheat (Rusts, Loose smut, Karnal Bunt); Maize (Banded Leaf and Sheath Blight, Southern and Northern blight, Downy mildew); Sorghum (Smuts, Grain mold, Anthracnose); Bajra (Downy mildew, Ergot) and Finger millet (Blast, Leaf Spot); Groundnut (Early and Late leaf spots, Rust, Wilt); Soybean (Rhizoctonia blight, Bacterial Spot, Seed and Seedling rot, Mosaic); Grams (Ascochyta blight, Wilt, Grey mold); Pea (Downy Mildew, Powdery Mildew, Rust); Black gram and Green gram (Web blight, Cercospora Leaf Spot, Anthracnose, Yellow Mosaic); Sugarcane (Red rot, Smut, Grassy Shoot, Ratoon Stunting, PokahBoeng); Mustard (Alternaria blight, White Rust, Downy Mildew, Sclerotinia Stem Rot) and Sunflower (Sclerotinia Stem Rot, Alternaria blight); Cotton (Anthracnose, Vascular wilts, Black Arm).

Horticulturalcrops: Citrus (Canker, Gummosis) and Guava (Wilt, Anthracnose);

Banana (Sigatoka, Panama wilt, Bacterial wilt, Bunchy top); Papaya (Foot rot, Leaf Curl, Mosaic) and Pomegranate (Bacterial blight); Apple (Scab, Powdery Mildew, Fire Blight, Crown Gall) and Peach (Leaf Curl); Grapevine (Downy mildew, Powdery mildew, Anthracnose) and Strawberry (Leaf Spot); Coconut (Bud rot, Ganoderma Wilt), Tea (Blister blight) and Coffee (Rust); Mango (Anthracnose, Malformation, Bacterial blight, Powdery mildew); Potato (Early and Late blight, Black scurf, Leaf roll, Mosaic) and Tomato (Damping off, Wilt, Early and Late blight, Leaf curl, Mosaic); Brinjal (Phomopsis blight and fruit rot, Sclerotinia blight) and Chilli (Anthracnose and Fruit rot, Wilt, Leaf Curl); Cucurbits (Powdery and Downy mildew, Wilts) and Cruciferous vegetables (Alternaria leaf spot, Black rot, Cauliflower mosaic); Beans (Anthracnose, Bacterial blight) and Okra (Yellow vein mosaic); Ginger (Soft rot), Turmeric (Leaf Spot) and Coriander (Stem gall); Rose (Dieback, Powdery mildew, Black Leaf Spot) and Marigold (Botrytis blight, Leaf spots).

Practical:

To study the symptoms of different diseases of field and horticultural crops: Blast and Brown spot of rice, Sheath blight and Bacterial leaf blight of rice, Downy mildew and Powdery of Cucurbits, Rhizoctonia and Cercospora leaf spot of Green gram / Black gram, Alternaria blight and Downy mildew of Mustard, Early blight of Late blight of Potato and Tomato, Phomopsis blight of Brinjal, Powdery mildew and rust of Pea, Stem Gall of Coriander, Anthracnose and Fruit rot of Chilli, Taphrina leaf spot of Turmeric, Red rot of Sugarcane,

Acquaintance with fungicides, Antibiotics and Biopesticides and their use in management of diseases of horticultural crops. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.
Field visit for the diagnosis of field problems, Collection and preservation of plant diseased specimens for herbarium.
Students should submit 50 pressed and well mounted specimens

Suggested readings:

1. Plant Diseases (By: R.S. Singh)
2. Plant Disease Management: Principles and Practices (By: HridayChaube)
3. Integrated Plant Disease Management (By: R.C. Sharma)
4. Plant Pathology (By: G.N. Agrios, 2010)

Course Title : Crop Improvement - I
Credits Hours : 2(1+1)

Specific Objectives:1. To provide knowledge about Self-pollinated and cross pollinated Kharifcrops
2. To learn about origin and distribution of Kharif crops
3. To design breeding objectives of major kharifcrops
4. To impart information on different crop varieties forKharifseason

Theory:
Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and other horticultural crops; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self-pollinated, cross-pollinated and vegetatively propagated crops. Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl Millet and Pigeopea etc. Ideotype concept, climate resilient crop varieties for future.

Practical:
Floral biology, emasculation and hybridization techniques in different crop species viz. Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeopea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Castor, Cotton, Cowpea, Tabacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of different kharif crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seed production in kharif crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP breeding plots of different crops.

Suggested readings:

1. Breeding field crops-I by V.L. Chopra
2. Genetic improvement of field crops by C.B. Singh and D. Khare
3. Genetics and Breeding of Pulse crops by D.P. Singh
4. Vegetable breeding – Principles and Practices by Hari Har Ram
5. Breeding field crops by D.A. SleperandJ.M.Poehlman
6. Plant Breeding –theory and practice by S.K. Gupta
7. Breeding Asian field crops by J.M. Poehlman and D.N. Barthakur
8. Practical manuals on Crop Improvement I (Kharif crops) by Rajendra Kumar Yadav

Course Title : Weed Management

Credits Hours : 2 (1 + 1)

Objectives:

1.To teach students about principles of weed science
2. To impart practical knowledge of weed management in field and horticiulral crops

Theory: Introduction to weeds, characteristics of weeds,; their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds, crop-weed completion, factors of competition, losses on growth and yield of crops; factors affecting growth and development. Concepts of weed management: physical, cultural, chemical and biological; principles and methods, integrated weed management, Implements for weed control, robotic weed control, weed management in organic/ natural farming.

Herbicide classification and properties of important herbicides, concept of adjuvants, surfactants, herbicide formulation and their use. Mode of action of herbicides and selectivity phenomenon. Concept of herbicide mixture and utility in agriculture, Herbicide compatibility with agro-chemicals and their application, Herbicide resistance and its management. Weed management in different field and horticultural crops; aquatic weed management

Practical: Techniques of weed preservation, Weed identification and losses caused by weeds. Biology of important weeds. Study weeds in different situations, Study on shift in weed flora in long term trials, Study of herbicide formulations and mixture of herbicide. Study methods of herbicide application, Herbicide spraying equipments, their parts, use and maintenance. Weed control implements, Calculation of herbicide doses and requirement, weed control efficiency and weed index.

Suggested readings:

Crafts, A.S. and Robbins, W.W. 1973. Weed Control. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
Gupta, O.P. 1984. Scientific Weed Management. Today and Tomorrow Printers and Publishers, New Delhi.
Gupta, O.P. 2015. Modern Weed Management. Agro Bios (India), Jodhpur.
Naidu, V.S.G.R., Handbook of Weed Identification. Directorate of Weed Research, Jabalpur.
Rajagopal, A., Aravindan, R. and Shanmugavelu, K.G., 2015. Weed management of Horticultural Crops. Agr (India), Jodhpur.
Ramamoorthy, K. and Subbian, P., Predominant Weed flora in hill –ecosystems. Agrobios (India), Jodhpur.
Rao, V.S. 2000. Principles of Weed Science. Oxford & IBH Publishing Co., New Delhi.
Subramanian, S., Mohammed Ali, A. and Jayakumar, R. 1991. All About Weed Control. Kalyani Publis Ludhiana.
Tadulingam, C. and Venkatnarayana, D. 1955. A Handbook of Some South Indian Weeds. Government l Madras.
Thakur, C. 1977. Weed Science. Metropolitan Book Co. Pvt. Ltd., New Delhi.

Course Title :Ornamental Crops, MAPs and Landscaping
Credits Hours :3 (2+1)
Objectives:

1. To educate in detail about origin, area, climate, soil, improved varieties production technology of flowers and MAPs
2. To educate about concept,designing principles and components of landscaping
3. To educate about the physiological disorders of commercial flowers
4. To educate about the post-harvest management and value addition in flower crops and MAP

Theory:

Production technology of ashwagandha, costus, isabgolandgeranium; Production technology of mint, aloe and ocimum; Production technology of plants like lemongrass, citronella, vetiver and palmarosa. Importance and scope of ornamental crops; Importance and scope of medicinal and aromatic plants and landscaping; Principles of landscaping; Landscape uses of trees, shrubs and climbers, Production technology of important cut flowers like rose, gerbera and orchids; Production technology of gladiolus, tuberose and lilium; Production technology of chrysanthemum and carnation; Package of practices for loose flowers like marigold and jasmine under open conditions;; Brief concept of Home landscaping, Carpet bedding, Topiary, Bonsai, Lawn, flower arrangement, Herbaceous Border, Hedge, Edge etc.; Processing and value addition imp ornamental crops; Processing and value addition of MAPs produce.

Practical:
Identification MAPs and Ornamental plants (trees, Shrubs, Climbers, seasonal flower and house plants). Propagation of MAP, Bed preparation and planting of MAP. Nursery bed preparation and sowing of seasonal flower seeds; Propagation of ornamental plants by terminal/herbaceous cuttings; Propagation of Anthurium and orchids; Propagation of Bougainvillea; Planting of Gerbera suckers; Gladiolus corms; Establishment and maintenance of lawn; Preparation of flower preservatives and their use in extending the vase life of cut flowers; Training and pruning of ornamental plants and raising of hedge and edge; Planning and layout of garden.

Suggested readings:

1. Floriculture in India by G.S. Randhawa and Mukopadhyay
2. Introduction to spices, plantation crops, medicinal and aromatic plants by N.Kumar, Abdul Khadder, P. Rangaswamy, I. Irulappam
3. Textbook of floriculture and landscaping by Anil K. Singh and Anjana Sisodia
4. Commercial flowers (Vol 1 and 2) by T.K. Bose

Course Title : Introductory Agro forestry
Credits Hours : 2(1 + 1)

Objectives: 1. To study Agro forestry as an alternate system of land use
2. To study different types of Agro forestry for soil and water conservation
3.To study the characteristics of Agro forestry in terms its potential for soil moisture conservation practices

Theory: Agro-forestry**:** Definition and scope of Agroforestry system, Type of Agroforestry system, potential of Agroforestry in India, Prevailing agroforestry system in NE India, MPTS- definition, role of MPTS in agroforestry system, its selection for different agroforestry system, MPTS of NE India, Ecological aspects of Agroforestry system, tree -crop interaction – competition, nutrient recycling, Traditional Agroforestry as a viable choice to conserve Agro biodiversity in North-East India.Management of Agro-forestry system**,** Role of agroforestry in soil and water conservation, windbreak, shelterbelt–definition, objectives., Socio- economic aspects of Agroforestry system, Design and Diagnostic study of agroforetry system, Silviculture**:** Defination and scope of silviculture system, Propagation of tree species**,** Regeneration by seed, coppice, root suckers , Transplanting, stamp, branch cutting, rhizomes, Nursery bed preparation and management, Cultural practices for bare root and seedling, field handling of nursery stock, Management of tree species**,** Silviculture of important tree species, choice of species- site factors, root, crown and bole characteristics, phenology ,nutritional and water requirement, ground operation, tending, harvesting utility etc.

Practical: Study of tree growth measurement, Study of environmental parameters affecting AF System .Plant propagation methods, Pre-sowing seed treatment, preparation of nursery bed exercise, practicing students experience in vegetation, aforestation method, practical training, pruning, coppicing, pollarding etc. natural and artificial regeneration. Design and diagnostic survey of agro-forestry system. Evaluation of agro-forestry system in different agro climatic zones. Exposure Visit to prevailing agroforestry systems of the state and related important institutions.

Suggested readings:
Nair, P.K.R : 1993.An Introduction to Agroforestry, Kluar Academic Publisher

Semester VI

S. No	Course tilte	Total credits
1	Fundamentals of Agri Biotechnology	3(2+1)
2	Basic and Applied Agril. Statistics	3(2+1)
3	Crop Improvement - II	2(1+1)
4	Renewable energy in Agriculture and Allied Sector	2(1+1)
5	Dryland agriculture/ Rainfed agriculture and watershed management	2(1+1)
6	Agricultural Microbiology and Phyto -remediation	2(1+1)
7	Agricultural Finance & Cooperation	2(1+1)
8	Essentials of Plant Biochemistry	3 (2+1)
9	Fundamentals of Seed Science & Technology	2(1+1)
	Total	**23(13+10)**

Course Title : Fundamentals of Agricultural Biotechnology
Credits Hours : 3(2+1)

Objectives: To familiarize the students with the fundamental principles of biotechnology, various developments in biotechnology and its potential applications.

Theory:

Introduction to Plant Tissue Culture & Genetic Engineering: History; Cellular totipotency & cytodifferentiation; Callus culture, Single-cell/suspension culture and their applications,Organogenesis& somatic embryogenesis,Somaclonal variation and its use in crop improvement, Embryo rescue technique and its significance in hybrid development, In vitro fertilization, ovule culture and its significance in hybrid development, Protoplast isolation, culture and regeneration, Somatic hybridization (somatic hybrids & cybrids) and its application in crop improvement, Anther and pollen culture for haploid production; Development of disease-free (virus free) plants through apical meristem culture, Micropropagation technique for the generation of quality planting material,

Introduction to Molecular Biology**:**DNA structure, structure & function; DNA replication, transcription and translation, RNA, types and function, Nucleic acid hybridization, PCR and its applications,

Introduction to recombinant DNA technology**:**DNA modifying enzymes & vectors, Plant genetic transformation – physical (Gene gun method), chemical (PEG mediated) and Agrobacterium-mediated gene transfer methods, Transgenics and its importance in crop improvement with successful stories,

Introduction to various molecular markers: RFLP, RAPD, SSR, SNP etc., Marker-assisted breeding in crop improvement

Practical:

Introduction to Plant Tissue Culture Laboratory, Good Laboratory Practices; Media Preparation & sterilization, Glassware sterilization; Micropropagation, Callus induction and culture, Anther culture, Apical meristem culture, Preparation of synthetic seeds, Isolation of plasmid DNA, Quantification of DNA; Agarose Gel Electrophoresis & visualization of plasmid DNA; Restriction digestion of plasmid DNA and agarose gel electrophoresis; Isolation of Plant genomic DNA; PCR amplification of DNA, Gel electrophoresis of amplified DNA

Suggested readings:

Bhojwani SS. 1983. Plant Tissue Culture: Theory and Practice. Elsevier.

Singh BD. 2007. Biotechnology: Expanding Horiozon. Kalyani

Christou P & Klee H. 2004. Handbook of Plant Biotechnology. John Wiley & Sons.

Lewin B. 2008. Gene IX. Peterson Publications/ Panima. W.H. Freeman & Co.

Primrose SB. 2001. Molecular Biotechnology. Panima.

Course Title : Basic and Applied Agril. Statistics
Credits Hours : 3(2+1)

Objectives: To provide an idea on Statistical concepts of both descriptive and inference Statistics which will be useful to do statistical analysis.

Theory

Introduction to Statistics and its Applications in Agriculture. Types of Data. Scales ofmeasurements of Data. Summarization of Data. Classification of Data. Frequency Distribution. Methods of Classification. Definition of Grouped and Ungrouped Data. Definition of Class Interval (formula for determining the no. of class interval), Width of CI, Class Limits (Boundaries), Mid Points. Types of Frequency Distribution.Diagrammatic Presentation of Data. Bar Diagrams – Simple, Multiple, Sub-divided and Percentage Bar Diagrams. Pie-diagram. Graphical Presentation of Data – Histogram, Frequency Polygon and Ogives.

Measures of Central Tendency. Requisites for an Ideal Measure of Central Tendency. Different Types of Measure. Arithmetic Mean– Definition, Properties, Merits, Demerits and Uses. A.M. (examples) for Grouped and Ungrouped Data. Step-deviation Method. Weighted Mean. Definition of Geometric Mean and Harmonic Mean. Relationship between A.M., G.M. and H.M.Median- Definition, Merits, Demerits and Uses. Graphical Location of Median. Mode- Definition, Merits, Demerits and Uses. Graphical Location of Mode. Relationship between Mean, Median and Mode.

Measures of Dispersion. Characteristics for an Ideal Measure of Dispersion. Different Types of Measures of Dispersions.Definition of Range, Interquartile Range, Quartile Deviation and Mean Deviation. Standard Deviation- Definition, Properties. S.D. and Variance for Grouped and Ungrouped Data. Variance of Combined Series. Co-efficients of Dispersions. Co-efficient of Variation.

Measures of Skewness and Kurtosis. Definition of Symmetrical Distribution. Definition of Skewness, Measures of Skewness. Definition of Kurtosis. Measure of Kurtosis. Relationship between Mean, Median and Mode for Symmetrical and Skewed Distribution.

Probability Theory and Normal Distribution. Introduction to Probability. Basic Terminologies. Classical Probability-Definition and Limitations. Empirical Probability- Definition and Limitations.AxiomaticProbability.Addition and Multiplication Theorem (without proof). Conditional Probability. Independent Events. Simple Problems based on Probability. Definition of Random Variable. Discrete and Continuous Random Variable.Normal Distribution- Definition, Prob. Distribution, Mean and Variance. Assumptions of Normal Distribution. Normal Probability Curve.

Correlation and Regression. Definition of Correlation. Scatter Diagram. Karl Pearson's Coefficient of Correlation. Types of Correlation Coefficient. Properties of Correlation Coefficient.Definition of Linear Regression. Regression Equations. Regression Coefficients. Properties of Regression Coefficients.

Tests of Significance. Definition. Null and Alternative Hypothesis. Type I and Type II Error. Critical Region and Level of Significance. One Tailed and Two Tailed Tests. Test Statistic.One Sample, Two Sample and Paired t-test with Examples. F-test for Variance.

ANOVA and Experimental Designs. Definition of ANOVA. Assignable and Non-assignable Factors. Analysis of One-way Classified Data.Basic Examples of Experimental Designs. Terminologies. Completely Randomized Design (CRD).

Sampling Theory. Introduction. Definition of Population, Sample, Parameter and Statistic. Sampling Vs Complete Enumeration. Sampling Methods. Simple Random Sampling with Replacement and without Replacement. Use of Random Number Table.

Practical:

Diagrammatic and Graphicalrepresentation of data. Calculation of A.M., Median and Mode (Ungrouped and Grouped data). Calculation of S.D. and C.V. (Ungrouped and Grouped data). Correlation and Regression analysis. Application of t-test (one sample, two sample independent and dependent). Analysis of variance one way classification. CRD. Selection of random sample using simple random sampling.

Suggested readings:

1. Fundamentals of Statistics by D. N.Elhance, Kitab Mahal Publishers.
2. Fundamentals of Applied Statistics by S.C. Gupta and V. K. Kapoor, Sultan Chand and Sons.
3. Basic Statistics by B. L.Agarwal, New Age International Publishers.
4. Agricultural Statisticsby S.P. Singh and R.P.S. Verma, Rama Publishing House.
5. Agriculture and Applied Statistics-I by P.K. Sahu, Kalyani Publishers.
6. Agriculture and Applied Statistics-II by P. K. Sahu and A. K. Das, Kalyani Publishers.

Course Title : Crop Improvement - II
Credits Hours : 2(1+1)

Objectives: i) To provide knowledge about Self-pollinated and crosspollinated Rabicrops
ii) To learn about origin and distribution of Rabi crops
iii) To design breeding objectives of major rabicrops
iv) To impart information on different crop varieties for Rabiseason

Theory:

Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and other horticultural crops; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self-pollinated, cross-pollinated and vegetatively propagated crops. Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional); Hybrid seed production technology in Wheat, Oat, Chickpea, Rapeseed & Mustard etc. Ideotype concept, climate resilient crop varieties for future.

Practical:

Floral biology, emasculation and hybridization techniques in different crop species viz. Wheat, Oat, Rapeseed & Mustard, Pulses, Potato, Sugarcane, Tomato, Chilli, Onion etc. Study of field techniques for seed production and hybrid seed production in rabi crops; Estimation of heterosis, inbreeding depression and heritability;; Study of quality characters, donor parents for different characters in tomato; Visit to seed production plots; Visit to AICRP breeding plots of different crops.

Suggested readings:

1. Breeding field crops-I by V.L. Chopra
2. Genetic improvement of field crops by C.B. Singh and D. Khare
3. Genetics and Breeding of Pulse crops by D.P. Singh
4. Vegetable breeding – Principles and Practices by Hari Har Ram
5. Breeding field crops by D.A. SleperandJ.M.Poehlman
6. Plant Breeding –theory and practice by S.K. Gupta
7. Breeding Asian field crops by J.M. Poehlman and D.N. Barthakur
8. Practical manuals on Crop Improvement I (Rabi crops) by Rajendra Kumar Yadav

Course Title : Renewable energy in Agriculture and Allied Sector
Credits Hours : 2(1+1)

Objectives:

1. To gain the knowledge on different types of materials used in Renewable Energy
2. To understand the importance of Renewable Energy technology and its applications.
3. To train the studentson the applications of solar thermal technology.

Theory:
Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application. Availability of bio mass and their application in different places

Practical:
Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond. Solar Wind hybrid system. Field visit to Solar –Wind farm.

Suggested readings:

1. CS Solanki: Solar Photovoltaic – Fundamentals, Technologies and Applications, PHI Learning Pvt. Ltd., 2011.
2. S. Sukhatme and J.Nayak: Solar Energy: Principles of Thermal Collection and Storage, Third Edition (Tata McGraw-Hill, 2008)
3. V.V.N. Kishore, Renewable Energy Engineering and Technology: principles and practice, Teri, India, 2008.

Course Title : Dryland agriculture/ Rainfed agriculture and watershed management
Credits Hours : 2 (1+1)

Objectives:

1. To learn about characteristics and conditions of dryland/rainfed agriculture
2. To gain knowledge about drought and its mitigation
3. To impart knowledge on water harvesting and watershed management

Theory: Dryland/Rainfed agriculture: Introduction, types and characteristics; History of dry land/rainfed agricu in India; Problems and prospects of dry land/rainfed agriculture in India ; Soil and climatic conditions preval dry land/rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on ph morphological characteristics of the plants, Crop adaptation and mitigation to drought; Water harvesting: import its techniques, Efficient utilization of water through soil and crop management practices, Crops and cropping sy in dry land/rainfed areas; Management of crops in dry land/rainfed areas, Contingent crop planning for ab weather conditions, Concept, history, objective, principles and components of watershed management, fa affecting watershed management.

Practical: Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and patte onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country demarcation of rainfed area on map of India. Interpretation of meteorological data and scheduling of supplem irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought p in the country. Effective rainfall and its calculation. Studies on cultural practices for mitigating moisture including mechanical and agronomic measure. Soil moisture determination under different land situations, Impor of seed priming to mitigate drought. Assessment of meteorological drought. Characterization and delineation of r watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on constructi water harvesting structures. Visit to rainfed research station/watershed**.**

Suggested readings:

1. A.K.Srivastava and P.K.Tyagi, 2011. Practical Agricultural Meteorology. New Delhi Publishing Agency, Delhi.
2. D.Lenka, 2006. Climate, Weather and Crops in India. Kalyani Publishers, New Delhi.
3. G.S. L.H .V.Prasad Rao, 2008. Agricultural Meteorology. Prentice Hall of India Pvt. Ltd., New Delhi.
4. H.S.Mavi and Graeme J.Tupper, 2005. Agrometeorology – Principles and applications of climate stud agriculture. International Book Publishing Co., Lucknow.
5. H.S.Mavi, 1994. Introduction to Agrometeorology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
6. H.V.Nanjappa and B.K.Ramachandrappa, 2007. Manual on Practical Agricultural Meteorology. Agr India. Jodhpur.
7. S.R.Reddy, 1999. Principles of Agronomy. Kalyani Publishers, New Delhi.
8. T.Yellamanda Reddy and G.H.SankaraReddi, 2010. Principles Of Agronomy. Kalyani Publishers, New I

Course Title :Agricultural Microbiology and Bio -remediation
Credits Hours :2(1+1)

Objectives:

1.To get an introduction to microbiology with specific focus on its significance in agriculture science
2.To get acquainted with the bacterial structure and the function of the different bacterial components
3.To get highlights on different fields of microbiology
4.To get highlights on the Bioremediation of polluted soils using microbial mediators and phytoremediation
5.To get a concept of biological control and the role of biopesticides in plant disease management

Theory:

Introduction to Microbiology: Definition, applied areas of Microbiology and Importance of Microbiology.
History of Microbiology: Discovery of microorganisms, spontaneous generation theory, Germ theory of diseases, Immunization, fermentation, and origin of life
Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination- transformation, conjugation and transduction
Genetic Engineering: Plasmids, episomes, and genetically modified organisms
Air Microbiology: Phyllosphere microflora, Phylloplane microflora, microflora of floral parts etc.
Food Microbiology: Microbial spoilage and principles of food preservations, Food poisoning
Water Microbiology: Types of water, water microorganisms, and microbial analysis of water e.g. coliform test, Purification of water.
Industrial Microbiology: Microbial products, Biodegradation, Biogas production, Biodegradable plastics etc.
Biological control: Microbial biopesticides for plant disease management

Concepts of rhizosphere microbiology- Rhizodeposits -biochemical nature, release mechanism in rhizosphere, function, Carbon flow in rhizosphere, Rhizosphere microbiome-residents and their roles
Potential of plant growth promoting rhizobacteria (PGPR) and endophytes on soil health and sustainability
Bioremediation of polluted soils using microbial mediators
Phytoremediation of polluted soils

Practical:

Study of the microscope,Acquaintance with laboratory material and equipments, Microscopic observation of different groups of microorganisms: moulds (Fungi), Direct staining of bacteria by crystal violet, Negative or indirect staining of bacteria by nigrosin, Gram staining of bacteria, Study of phyllosphere and rhizosphere microflora, Measurement of microorganisms, Preparation of culture media, Isolation and purification of rhizospheric microbes, Isolation and purification of N-fixers, Isolation and purification of Nutrient solubilizers, Isolation and purification of Endophytes.

Suggested readings:

1. Pelczar, M.J., Chan, E.C.S. &Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
2. Rangaswami, G. &Bagyaraj, D. J. (2005) Agricultural Microbiology. Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Mukherjee, N. & Ghosh, T. (2004). Agricultural Microbiology. Kalyani Publishers, Calcutta
4. Dubey, H.C. (2007). A Textbook of Fungi, Bacteria and Viruses. Vikas Publishing House Ltd.,New Delhi – 10014
5. Salyers, A. A., & Whitt, D. D. (2001). Microbiology: diversity, disease, and the environment. Fitzgerald Science Press, Inc.
6. Prescott, L. M. (2002). Microbiology 5th Edition.McGraw-Hill Inc.,US

Course Title : Agricultural Finance & Cooperation
Credits Hours : 2(1+1)

Objectives: To impart knowledge on issues related to lending to priority sector credit management and financial risk management.

Theory:

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and noninstitutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reportsBank norms – SWOT analysis. Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED. 3 R's, 5 C's and 7 P's of credit. Crop insurance: its scope, significance and limitations and the potential of the newly launced 'Pradhan Mantri FasalBimaYojana' (Prime Minister's Crop Insurance Scheme). Successful cooperative systems in Gujarat (AMUL), Tamil Nadu (Aavin), Karnataka (Nandini), Maharashtra and Punjab.

Practical:

Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to

acquire firsthand knowledge of their management, schemes and procedures. Estimation of credit requirement of farm business – A case study. Preparation and analysis of balance sheet – A case study. Preparation and analysis of income statement – A case study. Appraisal of a loan proposal – A case study. Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Seminar on selected topics. Different types of repayment plans.

Suggested readings:

Gittinger JP 1982. Economic Analysis of Agricultural Projects**.** The Johns Hopkins Univ. Press.

Reddy S. S and Ram P.R 1996. Agricultural Finance and Management. Oxford & IBH.

Course Title : Fundamentals of Seed Science & Technology
Credits Hours : 2(1 + 1)

s: i) To impart basic and fundamental knowledge on principles and practices seed science and technology
ii) To impart practical skills on scientific seed production and post harvest quality management. .

Theory: Introduction to seed technology, definition and importance. Seed quality -definition, characters of good quality seed, Causes of deterioration of varietal purity and assessment of genetic purity, different classes of seed. Foundation and certified seed production of important cereals, pulses and oilseed, field inspection, importance and procedures**,** post harvest seed quality management, seed processing procedures, seed drying Seed treatment, its importance, method of application and seed packing ;seed storage - general principles, stages and factors affecting seed longevity during storage, Seed health management during storage. Seed Certification and legislation, Seed Act and Seed Act enforcement, duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, basics of seed quality testing

Practical: Seed Structure, Seed sampling, Physical purity, Moisture determination, Germination test,Seed and seedling vigour test, Seed Viability, Genetic purity test: Grow out test , Field inspection, seed health testing using blotter and agar plate method. Visit to seed production farms, seed testing laboratories and seed processing plant.

Suggested Readings

1. Agarwal, R.L (1995). Seed Technology (2nd edition). Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, India
2. Khare, D., Bhale, M.S. (2019). Seed Technology (2nd revised & enlarged edn), Scientific Publishers, ISBN: 978-81-72338-84-8, New Pali Road, P.O. Box 91, Jodhpur, India
3. Vanangamudi, K. (2014). Seed Technology (An illustrated book), New India Publishing Agency, New Delhi, India
4. Bhojwani SS & Bhatnagar SP. 1999. The Embryology of Angiosperm. Vikas Publ
5. McDonald MB Jr & Copeland LO. 1997. Seed Production: Principles and Practices. Chapman & Hall.
6. Tunwar NS & Singh SN. 1988. Indian Minimum Seed Certification Standards. CSCB, Ministry of Agriculture, New Delhi.

Semester VII

S. No	Course tilte	Total credits
1	5 Elective Courses each of 4(3+1) credits/ Research Project with related courses	20
	Total	**20**

ELECTIVE COURSES

Sl. No	Title
1.	Agri-Business Management
2.	Management of natural resources
3	Agrochemicals
4.	Agricultural Journalism
5.	Landscaping
6.	Commercial Plant breeding
7.	Food safety and standards
8.	Bioformulation and Nanoformulation
9.	Biopesticides and Biofertilizers
10.	System Simulation and Agroadvisory
11.	Hi-tech Horticulture
12.	Protected cultivation
13.	Climate Resilient Agriculture
14.	Biotechnology of Crop Improvement 3 (2+1)
15.	Geoinformatics and Remote Sensing, precision farming
16.	Micro-propagation Technologies
17.	Commercial Seed Production
18.	Principles and Practices of Organic Farming/ Conservation Agriculture
19.	Food Science and Nutrition
20.	Post Harvest Technology and Value Addition

- **More electives to be included by the universities / institutions, based on the facilities available such as nano feetilizers, drones use in agriculture etc**

Elective course 1
Course Title : Agri-Business Management
Credits Hours : 4(3+1)

Objectives: To impart knowledge on understanding the concepts processes, significance, and role of management and organizational behaviour.

Theory

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries. Institutional arrangement , procedures to set up agro based industries. Constraints in establishing agro-based industries, Agri-value chain: Understanding primary and support activities and their linkages. Business environment : PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. Capital management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behavior analysis, Product Life Cycle(PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

Study of agri –input markets: Seed, fertilizers pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product market, retails trade commodity trading , and value added products. Study

of financing institutions- Cooperative, Commercial Bank, RRBs, Agribusiness Finance Limited, NABARD. Preparations of projects and Feasibility reports for agribusiness entrepreneur. Appraisal /evaluation techniques of identifying viable project- Non discounting techniques. Case study of agro- based industries. Trend and growth rate of price of agricultural commodities. Net present worth technique for selection of viable project. Internal rate of return.

Suggested readings:

1. Broadway, A.C. and Broadway Arif A 2002 A textbook of Agri-Business Management. Kalyani Publishers
2. Bairwa, S.L. 2016. Objective on fundamentals of Agri-business Management. Kalyani Publishers
3. Anjan Nishra, Debasish Biswas and Arunangshu Giri, 2019. Agribusiness Management:,Himalaya Publishing House, 220p.
4. Shoji Lal Bairwa, Chandra Sen, L.K.Meena and Meera Kumari, 2018. Agribusiness Management Theory And Practices:,Write And Print Publications
5. Virender Kamalvanshi , Agribisness Management:, Random.

Elective course 2

Course Title : Management of natural resources
Credits Hours : 4(3+1)

Objectives: 1. To enlighten students about available natural resources and their relationship with crop production
2. To impart the knowledge of principles and practices of natural resource management

Theory: Introduction to Natural Resource Bases: Concept of resource, classification of natural resources. Factors influencing resource availability, distribution and uses. Interrelationships among different types of natural resources. Concern on Productivity issues. Ecological, social and economic dimension of resource management. Land resources: Land as a resource. Dry land, land use classification, land degradation, man induced landslides, soil erosion and desertification. Landscape impact analysis, wetland ecology & management. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Water ecology and management. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.Resource Management Paradigms: Resource management the evolution and history of resource management paradigms. Resource conflicts: Resource extraction, access and control system. Approaches in Resource Management: Ecological approach; economic approach; ethnological approach; implications of the approaches; integrated resource management strategies. Introduction to soil and water conservation and causes of soil erosion., Definition and agents of soil erosion, water erosion - Forms of water erosion, Gully classification and control measures.Soil loss estimation by universal soil loss equation - Soil loss measurement techniques.Principles of erosion control - Introduction to contouring, strip cropping.Contour bund - Graded bund and bench terracing.Wind erosion - Mechanics of wind erosion, types of soil movement - Principles of wind erosion control and its control measures, Water harvesting techniques - Lining of ponds, tanks and canal systems.

Practical: Identifying natural resources and their utilityPracticing survey - Principles and educating to use pacing technique for measurement. Area calculations through chain survey - GPS demo for tracking and area measurement. Estimation of soil loss and calculation of erosion index.Leveling concepts and practical utility in agriculture. Preparation of contour maps.Concept of vegetative water ways and design of grassed water ways. Wind erosion and estimation process.Different irrigation pumps and their constructional differences. Farm pond construction and its design aspects. Visit to nearby farm pond. Visit to an erosion site. Exposure to strip cropping/contour bunding.

Suggested readings:

1. Sustainable Natural Resource Management by Danill R. Lynch
2. Management of Natural Resource for Sustainable Development, by Vijay Singh Rathor and B S Rathor , Daya Publishing House

3. Managing Natural Resources : Focus On Land And Water**:** Ed**.** Harikesh N. MishraPHI, 2014Learning, 496p.
4. Management of Resources for Sustainable Development: Sushma Goel, The Orient Blackswan 2016,284p.
5. Natural Resources: Their Conservation and Management: Arvindrai Upadhyay, Aspiration Academy, 320p.
6. Natural Resource Management for Growth Development and Sustainability**:** Vasudeva Srishti Pal, 2023, Today & Tomorrows Printers And Publishers, 336p.

Elective course 3

Course Title : Agrochemicals
Credits Hours : 4(3+1)

Objectives: To impart knowledge on different classes of agrochemicals

Theory :An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health ,merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.
Herbicides -Major classes, properties and important herbicides. Fate of herbicides.
Fungicides- classification –Inorganic fungicides-characteristics, preparation and use of sulphur and copper, Mode of action- Bordeaux mixture and copper oxychloride.
Organic fungicides –Mode of action –Dithiocarbamates- characteristics, preparation and use of Zineb and maneb.
Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim,characteristics and use. Introduction and classification and insecticides: inorganic and organic insecticides organochorine, Ogranophosphates, Carbamates, Synthetic pyrethriods Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, fate of insecticides in soil &plant.IGR Biopesticides, Reduced risk insecticides, Botanical, Plant and animal systemic insecticides their characteristics and uses.
Fertlizers and their importance. Nitrogenous fertilizers:Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate.Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate.
Mixed and complex fertilizers: Sources and compatibility- preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistic and marketing.
Plant bio-pesticides for ecological agriculture, Bio-insect repellent.
Practical: Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer.calculation of doses of insecticides to be used.To study and identify various formulations of insecticide available kin market. Estimation of nitrogen in Urea. Estimation of water soluble P_2O_5 and citrate soluble P_2O_5 in single super phosphate. Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content

Suggested readings:

2. Buchel KH (Ed.) 1992. Chemistry of pesticides. John Wiley & Sons
3. Panda H. 2022.The Complete Technology Book on Pesticides, Insecticides, Fungicides and Herbicides (Agrochemicals) with Formulae, Manufacturing Process, Machinery & Equipment Details 2nd Revised Edition. NPCS
4. Biswas D. R. 2021. A Text Book of Fertilizers. New India Publishing Agency
2. Singh, A., 2022 Basics of Agrochemical Formulations:, Brillion Publishing, 176p.
3. Larramendy, M.L 2017Toxicity and Hazard of Agrochemicals:,INTECH, 170p.

Elective course 4
Course title: Agricultural Journalism
Credits Hours:4(3+1
Objectives: To impart knowledge and skill in agricultural journalism
Theory

Journalism – Meaning, nature, importance, and types of journalism. Agricultural Journalism – Meaning, definition, principle, objectives, types, and scope. Similarities and difference between agricultural journalism and other types of journalism. Role of agricultural journalist, Training of agricultural journalist. Qualities of journalist, Role of journalist /journalism in agricultural development and development of newspaper and magazines readers. Newspaper and magazines as communication media: Characteristics, kinds and functions of newspaper and magazines, Characteristics of newspaper and magazines readers. Form, content, style and language of newspaper and magazines, Standard part of newspaper and magazines. The agricultural story: Types of Agriculture stories, subject matter of the agricultural story, structure of the agricultural story. Gathering farm information-Sources of farm information: abstracting from research and scientific materials, interviews, coverage of events, Other sources: electronic media, field study. Success stories-definition, nature, components, guidelines of writing a success story Writing a news story difference between news and feature story, the principle of writing a news story, Inverted pyramid structure. Organizing the material, treatment of the story, writing the news lead and the body Readability measure-readability ease score, automated readability index, gunning fog index How to improve readability of articles and stories. Use of photograph in agricultural journalism- Basic principles of photography – composition, exposure, lens, light Use of artwork (Graphs, charts maps, etc) Writing the captions Editorial mechanism: Copy reading, headline and title writing Proofreading: definition, signs and symbols of proofreading, level of proofreading, duties of a proof-reader Layout – meaning, principles of layout and design.

Practical

Practice in writing an agricultural news story. Practice in writing an agricultural feature story. Covering agricultural events for the information collection. Practice in interviewing for the information collection. Abstracting stories from research and scientific materials and wire services. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading. Practice in headline and title writing Practising proof reading. Practice in lay outing of newspaper. Testing copy with a readability formula. Visit a publishing office

Suggested readings

1. Introduction to Journalism-Book by Carole Fleming, Emma Hemmingway, and Gillian Moore
2. Basic Journalism Book by Rangaswami Parthasarathy
3. News Reporting and Editing Book by K. M. Shrivastava
4. Professional Journalism Book by MV Kamath
5. The Journalist's Handbook Book by MV Kamath.
6. Farm Journalism and Media Management – Bhaskaran et al,
7. Agricultural Extension and farm Journalism – A K Singh,
8. Farm Journalism – Jana and Mitra.
9. Web Materials
10. Prepared You Tube videos

Elective course 5
Course Title :Landscaping
Credits Hours:4(3+1)

Objectives:

1.To educate the students on designing different styles and types of gardens
2.To enable the students to identify different ornamental plants and their utilization in landscaping design.

3.To enable students to design landscapes in softwares like AUTOCAD, ARCHCADE etc.

Theory

Importance and scope of landscaping. Principles of landscaping, garden styles and types terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme. Other garden plants:palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions, Bonsai principles and management, lawn: establishment and maintenance.CAD application.

Practical

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens /parks /institutes.

Suggested readings:

1. Textbook of floriculture and landscaping by Anil K. Singh and Anjana Sisodia
2. Principles Of Landscape Gardening: Y. Chandrasekhar and Hemla Naik B., 2020. ICAR,
3. Introductory Ornamental Horticulture and Landscape Gardening: Rajaneesh Singh and Brijendra Kumar Singh, 2020, Bio-Green Books.
4. Principles Of Landscape Architecture: Pragnyashree Mishra and Bhimasen Naik, 2022, New India Publishing Agency.
5. Landscape Gardening: Sudhir Pradhan, 2018, Scientific Publishers India.

Elective course 6

Course Title : Commercial Plant breeding
Credits Hours : 4(3+1)

Objectives:

1. To discuss about hybrid development and various crop improvement aspects of field crops viz., rice, wheat, maize, pearl millet, sorghum, pigeonpea, chickpea, green gram, black gram, lentil, soybean, groundnut, rapeseed-mustard , cotton etc.

2. To provide understanding on tissue culture and biotechnological approaches as alternative strategies for development of line and cultivars.

3. To impart knowledge on seed production, release and notification of varieties and PPV&FR Act, 2001.

Theory

Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production. Genetic test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of the line cultivators: haploid inducer, tissue culture techniques and biotechnological tools. IPR issues in commercial plant breeding: DUS testing and registration of verities under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Practical

Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system. Learning techniques in hybrid seed production using male- sterility in field crops. Understanding the difficulties in hybrid seed production. Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot.

Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz. grading and packaging. Visit to public private seed production and processing plants.

Suggested readings:

1. Commercial Plant Breeding at a glance by Phundan Singh, PratibhaBisen, Reshu Tiwari. Daya Publishing House
2. Plant Breeding: Principles and Methods by B. D. Singh. Kalyani Publishers
3. Principles of Plant Breeding (1st & 2nd Edition)" by RW Allard.
4. Breeding Field Crops by JM Poehlman.
5. Commercial Plant Breeding Objective: Phundan Singh, Mridula Billore and Monika Singh, 2021, Astral Publishing, 160p.
6. Breeding and Crop Production: H. Padmalatha, Random
7. Biotechnology for Agricultural Breeding: Mangal, S K, GeneTech Books

Elective course 7

Course Title :Food safety and standards

Credits Hours : 4(3+1)

Objectives:

6. To develop the skills to convert raw materials into safe, attractive food products
7. To manage the production of food products
8. To use scientific knowledge to develop new products

Theory

Food safety –Definition , Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Type of Hazards - Biological, Chemical Physical hazards. Management of hazars – Need. Control of Parameters. Temperature Control. Food Storage. Production Design. Hygine and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control .Personnel Hygiene .Food safety Measures. Food Safety Management Tool- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP.ISO series. TQM- concept and need for quality ,components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygine. Food laws and Standards Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food. Recent concerns-New and Emerging Pathogens. Packging ,Product labelling and Nutritional labelling. Genetically modified food/transgenic. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

Water quality analysis physico – chemical and microbiological. Preparation of different types of media. Microbiological examination of different food samples. Assessment of surface sanitation by swab/rinse method. Assessment of personal hygiene. Biochemical tests for identification of bacteria. Scheme for the detection of food borne pathogens. Preparation of plants for Implementation of FSMS-HACCP,ISO:22000.

Suggested readings:

1.Text book of Food Science and Technology by Avantina Sharma
2. Handbook of Food Safety: D.S.L. Khatekar and N. Sarkate, 2023, Step Up Academy, 576p.
3. Food And Beverage Management: Bernard Davis, Andrew Lockwood, Ioannis Pantelidis, Peter Alcott , 2011, Routledge
4. Food safety and Quality Control: Pulkit Mathur, 2018, The Orient Blackswan.332p.
5. Safe Food Handling: HACCP booklet for food handlers, Cletus Fernandes, Notion Press.

Elective course 8

Course Title : Bioformulation and Nanoformulation

Credits Hours :4(3+1)

Objectives:

1. To enable students to acquire expertise and skill to develop bioformulation and Nanoformulation
2. To know the importance of biopesticides and biofertilizers
3. To make the students know about various techniques involved in biofertilizers and biopesticides production
4. To get knowledge on essential oils, botanicals, predators, parasitoids, Pheromones, and parapheromone and their application in insect pest management
5. To get concepts on agrochemical formulations with nanoparticles and acquaint them with nanotechnology

Theory:

Introduction and history of biological control of pests and diseases, Microbial biopesticides: the global and Indian market scenario; biopesticides for organic agriculture, Different phytopathogenic biocontrol agents: Mode of action, Different entomopathogenic biocontrol agents: Mode of action, Microbial inoculants as biofertilizer candidates, Production, quality assessment and methods of application of biopesticides and biofertilizers, Regulatory system of biopesticides in India, Formulations of plant essential oils, botanicals, Pheromone, and parapheromone and their application in insect pest management, Use of predators and parasitoids for insect pest management, Nanotechnology: its applications in pest and disease diagnosis and management, Nano biopesticides: Concept and importance, different techniques of producing nano biopesticides, Nano Fertilizers: Concept and importance, Types of nano fertilizers, Different techniques of producing nano fertilizers, Green synthesis of nano fertilizers, green slow-release fertilizer composition based on urea-modified hydroxyapatite nanoparticles

Practical:
Introduction & acquaintance with biopesticide laboratory, Preparation of culture media, Isolation and purification of bioagent from soil and infected insects, Microscopic study of different microbial bioagents, In vitro assay of microbial bioagents against plant pathogens

In vitro compatibility study among different microbial bioagents, Mass multiplication of biopesticides, Population enumeration of biocontrol agents in different biopesticides, Preparation of plant extracts and their efficacy test against insect pests, Use of pheromone parapheromone for monitoring and management of insect pests, Bioassay of Entomopathogenic biocontrol agents on insect pests, Preparation of microbial inoculants of biofertilizer microbes, Compatibility of biofertilizer microbes, Preparation of solid & liquid consortia of biofertilizer microbes

Suggested readings:

1. Baker, E.F. and James, R.C. 1982. Biological Control of Plant Pathogens. American Phytopathological Society
2. Borkar,S.G. 2015.Beneficial Microbes as Biofertilizers and its Production Technology
3. Boland, G.J. and David, L.1998. Plant microbe interactions and Biological Control. Kuykendall Marel Dekker, INC.
4. Ciancia, A. and Mukerji, K.J. 2007. General Concepts of Integrated Pest and Disease Management. Edited Published by Springer.
5. Cincholkar, S.B. and Mukherji, K.G. 2007. Biological Control of Plant Diseases. Hawarth Food and Agricultural products.
6. Gnanamanickam, S.S. 2002. Biological control of crop Disease. Kuykendall Marel Dekker, INC.
7. Ramanujam, B. and Rabindra, R.J. 2006. Current Status of Biological Control of Plant Disease usingAntagonistic Organisms in India. Precision Fototype Services Bangalore.
8. Singh, S.P. and Hussanini, S.S. 1998. Biological Suppression of Plant Disease, PhytoparasiticNematodesand Weeds. Precision Fototype Services Bangalore.
9. Allhoff, Fritz and Lin, Patrick (Eds) 2009. Nanotechnology and Society, ISBN: 978-1-4020- 6208-7 Springer Publications, UK

10. Prasad, Ram, Vivek Kumar, Manoj Kumar and Devendra Choudhary Eds, 2019.Nanobiotechnology in Bioformulations, Kindle Edition
11. Koul, Opender Ed, 2019. Nano-biopesticides taoday and future perspectives, Academic Press
12. Shah, MA and Tokeer Ahmad Nano Science & Technology, Wiley India

Elective course 9

Course Title : Biopesticides and Biofertilizers

Credits Hours :4(3+1)

Objectives:

1. To provide knowledge on principles, methods, and mechanisms of bio-control agents and their use against plant diseases
2. To provide knowledge on principles, methods, and mechanism of biofertilizers and their use in agriculture

Theory

History and concept of bio pesticides. Importance, scope and potential of bio pesticides. Definitions, concepts and classification of bio pesticides viz. Pathogen, botanical pesticides, and bio rationales. Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes, Methods of application of bio pesticides. Methods of quality control and Techniques of bio pesticides. Impediments and limitation in production and use of bio pesticides. Biofertilizers - Introduction, status and scope. Structure and characteristics features of bacterial biofertilizers – Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia; Cynobacterial bio fertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers – AM mycorrhiza and ectomycorhiza. Nitrogen fixation –Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilisation and phosphate mobilization, K solubilisation. Production Technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCO specifications and quality control of biofertilizers . Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers-Storage, shelf life, quality control and marketing. Factors influencing the efficiency of biofertilizers.

Practical

Isolation and purification of important biopestisides: trichoderma Pseudomonas, Bacillus, Metarhyziumetc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides.

Isolation and purification of Azospirillum, Azotobactor, Rhizobium, P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of AM fungi- Wet sieving method and sucrose gradient method. Mass production of AM inoculants**.**

Suggested readings:

<u>Biopesticides</u>

1. Baker, E.F. and James, R.C. 1982. Biological Control of Plant Pathogens. American Phytopathological Society
2. Boland, G.J. and David, L.1998. Plant microbe interactions and Biological Control. Kuykendall Marel Dekker, INC.
3. Borkar,S.G. 2015.Beneficial Microbes as Biofertilizers and its Production Technology
4. Ciancia, A. and Mukerji, K.J. 2007. General Concepts of Integrated Pest and Disease Management. Edited Published by Springer.
5. Cincholkar, S.B. and Mukherji, K.G. 2007. Biological Control of Plant Diseases. Hawarth Food and Agricultural products.
6. Gnanamanickam, S.S. 2002. Biological control of crop Disease. Kuykendall Marel Dekker, INC.
7. Ramanujam, B. and Rabindra, R.J. 2006. Current Status of Biological Control of Plant Disease usingAntagonistic Organisms in India. Precision Fototype Services Bangalore.
8. Singh, S.P. and Hussanini, S.S. 1998. Biological Suppression of Plant Disease, PhytoparasiticNematodesand Weeds. Precision Fototype Services Bangalore.

Biofertilizers

1. Handbook of Microbial Biofertilizers- Dr. Awani Kr. Singh, Agrotech Press, Jaipur,India
2. Biofertilizers for Sustainable Agriculture- Sampat Nehra, Aavishkar Publishers, Jaipur,India
3. Organic Farming- A.K. Singh, New India Publishing Agency,New Delhi
4. Earthworm Vermiculture and Vermicomposting, R.K. Bhatnagar, R.K. Palta, Kalyani Publishers
5. Organic Farming: Standards, Accreditation, Certification and Inspection- Dushyent Gehlot, Agrobios (India)
6. Fungal Biopesticides and VAM applications-P.C.Trivedi, Pointer publishers, Jaipur,India

Elective course 10

Course Title : System Simulation and Agroadvisory

Credits Hours : 4(3+1)

Objectives:

1. To impart the knowledge of statistical and simulation modeling in crop yield estimation
2. To get acquainted with different weather forecasting techniques and their usability analysis
3. To study about the preparation and dissemination of agro-advisory bulletin

Theory

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production- concept and modeling, techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop- Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro- advisory and its effective dissemination.

Practical

Preparation of crop weather calendars. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts. Working with statistical and simulation models for crop growth. Potential & achievable production; yield forecasting, insect & disease forecasting models. Simulation with limitations of water and nutrient management options. Sensitivity analysis of varying weather and crop management practices. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast. Feedback from farmers about the agro advisory.

Suggested readings:

1. Introduction to Agrometeorology by H. S. Mavi
2. Agricultural Meteorology by G.S.L.H.V. Prasado Rao
3. Advances in Plant Atmospheric Interactions (Eds. Rao, V.U.M., Rao, A.V.M.S., Rao, G.G.S.N., Ramana Rao, B.V., Vijaya Kumar, P. and Venkateswarlu, B), Central Research Institute for Dryland Agriculture (CRIDA), Santoshnagar, Hyderabad.
4. Text Book of Agricultural Meteorology. ICAR by MC Varshneya& PB Pillai
5. Principles of Agricultural Meteorology by OP Bishnoi

Elective course 11

Course Title :Hi-tech Horticulture
Credits Hours: 4(3+1)

Objectives:

1. To educate the students on the latest technology of hi-tech horticulture
2. To educate students on the concepts and prospects of hi-tech horticulture

Theory

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods, Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding,Components of precision farming :Remote sensing ,Geographical Information System (GIS),Different ial Geo-positioning System(DGPS) ,Variable Rate Applicator(VRA),application of precision farming in horticultureal crops(fruits,vegetables and ornamental crops); mechanized harvesting of produce.

Practical

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery- portrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

Suggested readings:

1. Hi-tech Horticulture by T.A. More
2. Greenhouse operation and management by Paul V. Nelson
3. Hi Tech Horticulture (Pb), S. Prasad, Dharam Singh and R'L, Bharadwaj, 2020, Agrobios
4. Instant Horticulture, S.N.Gupta, Jain Brothers,2023, 488p.
5. Hydroponics for Beginners and Advanced: The Ultimate Hydroponic and Aquaponic Gardening Guide, Tom Garden, Webb Eleanor

Elecive course 12
Course Title :Protected cultivation
Course code :Hort (ED) 413
Credits Hours : 3 (2+1)
Objective:

To educate students on the scientific and commercial cultivation of important value added products in protected cultivation

Theory

Protected cultivation- importance and scope, status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/poly house. Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers, Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops-rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants etc. Cultivation of economically important medicinal and aromatic plants. Off- season production of flowers and vegetables. Insect pest and disease management.

Practical

Raising of seedlings and saplings under protected conditions, use of portrays in quality planting material production, Bed preparation and planting of crop for production. Inter cultural

operations, Soil EC and pH measurement. Regulation of irrigation and fertilizers through drip, fogging and misting.

Suggested readings:

1. Greenhouse operation and management by Paul V. Nelson
2. Protected cultivation of Horticultural crops by Madan Kr. Jha, SujanSinghPaikra, Manju Rani Sahu
3. Protected Cultivation of Horticulture Crops by Itigi Prabhakar, 2020, IBPSS.
4. Advances in Protected Cultivation byBrahma Singh and Balraj Singh, 2015, NIPA,252p.
5. Protected Cultivation and Smart Agriculture by Eds. Sagar Maitra, Dinkar J. Gaikwad and Tanmoy Shankar, 2020 New Delhi Publishers, 263p.
6. Textbook Of Protected Cultivation and Precision Farming For Horticultural Crops by B. Ashok Kumar, Eggadi Ramesh and Sindhu V, 2022, Jain Brothers.

Elective course 13
Course Title : Climate Resilient Agriculture
Credits Hours : 3(2+1)

Objectives:

1. To impart the concept of climate resilient agriculture under the present context of climate change
2. To study the integrated role of different sectors in building resilience to climate change in agriculture

Theory

Climate change and impacts of climate change on agriculture and food security; crop productivity under different climate change scenarios including extreme events such as drought, flood, pest and disease outbreak etc.

Basics of adaption and mitigation in the agricultural sectors; analyzing and assessing climate vulnerability to identify vulnerable sectors and possible adaptation options in agriculture; assessing biophysical and socio-economic impacts on agricultural sector; risk assessment strategies, preparedness for weather and climate risks in agriculture; application of geospatial tools and techniques for sustainable agriculture.

Climate resilient agriculture (CRA) – concept, scope and importance with special reference to India, climate resilient technologies for enhancing crop productivity and sustainability – role of weather & climatic information, agro-advisories, ICTs and simulation models; climate resilient agronomic practices – crop/cultivar selection, crop diversification/ crop mixtures; water management practices – rain water harvesting, micro-irrigation, deficit irrigation and drainage management, organic/natural farming, integrated farming systems (IFS); site specific nutrient management (SSNM), conservation agriculture technologies to build soil organic carbon, harnessing microbial biodiversity, biomass recycling; use of renewable sources of energy; climate resilient pest-disease management strategies.

Breeding strategies for development of climate change resilient crops and varieties, development of biotic and abiotic stress tolerant/resistant cultivars under changed climatic scenarios including extreme weather events.

Practical

Acquaintance with meteorological instruments including AWS, Statistical techniques to study trend of climatic parameters, Analysis of extreme weather events using non-parametric tests, Building climate change scenarios under different futuristic emission of GHGs, Designing strategies to mitigate the effect of climate change using climate resilient crops/cultivars, climate resilient technologies and manipulation of cropping patterns, Acquaintance with ICTs for effective dissemination of local weather information and agroadvisories, Analysing carbon sequestration potential of different agro-ecosystems; Designing 'climate smart village' model considering the availability of resources. Awareness programme on climate change and climate resilient agriculture among farming community.

Suggested readings:

1. Climate Resilient Animal Agriculture by GSLHV Prasada Rao (New India Publishing Agency)
2. Climate Resilient Agriculture Adaptation and Mitigation Strategies by Bhan Manish, New India Publishing Agency

3. Climate-Smart Agriculture Sourcebook, FAO (2013).
4. Implications for Climate Smart Agriculture, Wahid Hasan, Sachin G. Mundhe, Abdul Majid Ansari and Shivani Kumari, Biotech Books, 357p.
5. Climate Resilient Agriculture, Adaptation and Mitigation Strategies, Manish Bhan, 2018, New India Publishing Agency, 294p.
6. Climate Change & Agriculture Over India by Prasad Rao ,2010, PHI Learning, 352p.
7. Climate Smart Agriculture for Sustaining Crop Productivity and Improving Livelihood Security by Prakash M.2022, Satish Serial Publishing House, 178p..

Elective course 14
Course Title : Biotechnology of Crop Improvement 3 (2+1)
Credits Hours : 4(3+1)

Objectives:

1. To acquaint with biotechnological tools of crop improvement
2. To know about direct and indirect methods of gene transfer
3. To introduce about gene editing in plants
4. To provide knowledge about marker assisted breeding and genomic selection

Theory:

Impact of Biotechnology on crop improvement and the perspective of society; Various biotechnological techniques available for crop improvement – Plant Tissue Culture, Genetic Engineering, Genome editing, Marker Assisted breeding and Genomic Selection. Biosafety regulations and their application in Agricultural Biotechnology.

Somaclonal variation and its use in crop improvement; embryo culture; anther/pollen culture; somatic embryogenesis; artificial seeds; techniques of protoplast culture, regeneration and somatic cell hybridization, achievements and limitations, utility in the improvement of crop plants.

Direct and Indirect methods of gene transfer in plants - Agrobacterium-mediated gene transfer in dicots and monocots; DirectDNA delivery methods (microinjection, particle gun method, electroporation); gene targeting; Gene silencing techniques; introduction to siRNA; siRNA technology; Micro RNA; construction of siRNA vectors; principle and application of gene silencing; creation of transgenic plants; debate over GM crops; introduction to methods of genetic manipulation in different model systems.

Introduction to genome editing – Various tools of genome editing; CRISPR-Cas9 with specific emphasis on Indian regulations; Cloning genomic targets into CRISPR/Cas9 plasmids; electroporation of Cas9 plasmids into cells; purification of DNA from Cas9 treated cells and evaluation of Cas9 gene editing; in vitro synthesis of single guide RNA (sgRNA); using Cas9/sgRNA complexes to test for activity on DNA substrates; evaluate Cas9 activity by T7E1 assays and DNA sequence analysis; Applications of CRISPR/cas9 technology in crop plants.

Marker Assisted Breeding & Genomic Selection: Introduction to various DNA-based markers and their use in marker-assisted breeding; Foreground Selection, Recombinant Selection and background Selection; Marker-assisted backcross breeding, marker-assisted selection – success stories; Introduction to Genomic Selection.

Practical:

Agrobacterium-mediated transformation in Tobacco – preparation of construct, transfer to binary vector, transform Agrobacterium, prepare explant, Inoculation and Co-cultivation, antibiotic based selection of putative transformants, validation using PCR; Genome editing- preparation of CRISPR/Cas construct, direct transfer to plant, analysis of the targets; Planning of a MABB programme – selection of parents, crossing strategies, marker analysis

Suggested readings:

1. Old, R. W., Primrose, S. B., & Twyman, R. M. (2001). Principles of Gene Manipulation and Genomics, 7th Edition: Oxford: Blackwell Scientific Publications.

2. Green, M. R., & Sambrook, J. (2012). Molecular Cloning: a Laboratory Manual. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
3. Brown, T. A. (2006). Genomes (3rd ed.). New York: Garland Science Pub.
4. Sander JD and Joung JK. (2014). CRISPR-Cas systems for Editing, Regulating and Targeting Genomes. Nat Biotechnol. 32:347-355.
5. Gene Cloning and DNA Analysis, 2010 Retrieved from http://biolab.szu.edu.cn/otherweb/lzc/genetic%20engineering/courseware/b1.pdf
6. Pranav Kumar and Usha Mina, 2015. Biotechnology: A Problem Approach , Pathfinder Publication,
7. K.H.Singh, Ajay Kumar and Nehanjali Parmar, 2019. Agricultural Biotechnology At a Glance:, science technology.
8. Hari Har Ram, 2019,.Crop Breeding And Biotechnology: Kalyani Publications
9. S.C. Rastogi, 2020. Biotechnology: Principles and Applications,Narosa.
10. Slater, 2008. Plant Biotechnology: The Genetic Manipulation of Plants: Oxfeord, 400p.

Elective course 15
Course Title :Geoinformatics and Remote Sensing, precision farming
Credits Hours : 4(3+1)

General Objectives: Enabling students acquire knowledge on basics of remote sensing technique for precision farming applications
Specific Objectives: To provide a comprehensive knowledge of remote sensing, precision farming and its benefits in improving crop production and soil health management
Theory :

Introduction and history of remote sensing; sources, Principles of remote sensir propagation of radiations in atmosphere; Interaction with matter, Applicati of remote sensing techniq s land use soil surveys, crop stress and yield forecasting, Advantages and disadvantages of remote sensir Remote sensing institutes in India, Basic Concepts about geoinformatics.

What is artificial intelligence; History of artificial intelligence, Fundamentals of big data & machine learning (ML), Use of artificial intelligence in autonomous systems: agricultural robots and drone monitoring systems, driverless tractors, automated sprinklers and self-harvesting machines etc.; Use of AI in crop analysis: monitoring soil quality, promoting organic crops, monitoring weeds, precision agriculture, using drones for crop analysis; Role of AI for sustainability and climate change, yield and demand forecasting, food tech/wider value chain including impact of blockchain, AI use for in the emerging markets; Technology deployment like sensors , AI and agricultural technologies and How to scale AI for agricultural technologies applications, Responsible AI in agriculture, Data sharing; Expert System: Introduction to expert system, Characteristics and features of expert system, Applications of Expert System, Importance of Expert system, Rule based system architecture; Software Agents.

Practical:

Familiarization with different remote sensing equipments and data products, Interpretation of aerial photographs and satellite data for mapping of land resources, Global positioning system (GPS), Basics of Geographic Information System (GIS), Georeferencing of toposheets,

Live examples and case study of AI use in Agriculture, Search and Control strategies: Blind search, Breadth - first search, Depth First search, Hill climbing method, Best First search, Branch and Bound search, Programming in Prolog Syntax and meaning of Prolog Programs. Using Data Structures. Controlling Back-tracking. Input and Output. Built-in Predicates, Using Prolog Grammar Rules. Higher level assignments/exercises for implementation using Prolog.

Suggested readings:

1. Data Analytics in Bioinformatics: A Machine Learning Perspective. Editor(s):.RabinarayanSatpathy, Tanupriya Choudhury, SuneetaSatpathy, Sachi Nandan .

2. Machine Learning Approaches to BioinformaticsBy Zheng Rong Yang
3. Text Book of Remote Sensing and Geographical Information Systems By M. Anji Reddy
4. Precision Agriculture Technologies for Food Security and Sustainability By A El-Kader, M Sherine, M El-Basioni, M Basma.
5. Principles and Theory of Geoinformatics P.K.Garg Khanna Publishers,2019, 296
6. Advances in Geoinformatics Remote Sensing and GIS by Bhunia, Gouri Sankar & Uday Chatterjee & Gopal Krishna Panda, BIO GREEN
7. Artificial Intelligence: Machine Learning, Deep Learning, and Automation Processes, John Adamssen,2020, Efalon Acies
8. Remote Sensing and Image Interpretation, 6ed (WSE) Paperback – 1 January 2011, Willey Student Edition
9. Remote Sensing and Geographic Information: A.M.Chandra and S.K.Ghosh, Narosa

Elective course 16
Course Title : Micro-propagation Technologies
Credits Hours : 4 (3+1)

Objectives: To educate the students in detail about the sterilization techniques for explants,preparation of stocks and working solution, culturing of explants, regeneration of whole plants from different explants and hardening procedures.

Theory

Introduction, History, Advantages and limitations. Types of cultures(seed, embryo, organ, callus, cell), Stages of micro propagation, Axillary bud proliferation(Shoot tip and meristem culture, bud culture), Organogenesis(calluys and direct organ formation), Somatic embryogenesis, cell suspension cultures, production of secondary metabolites, Somaclonal variation, Cryopreservation.

Practical

Identification and use of equipments in tissue culture Laboratory, Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques for explants, Preparation of stocks and working solution, Preparation of working medium, Culturing of explants: Seeds, shoot tip and single node, Callus induction, Induction of somatic embryos regeneration of whole plants from different explants, Hardening procedures.

Suggested readings:

1. Basics of Horticulture by Jitendra Singh
2. Introduction to Horticulture by N. Kumar
3. Handbook of Horticulture by K.L. Chadda
4. Plant Tissue Culture : Basic and Applied by Timir Baran Jha and Biswajit Ghosh, 2016, Platinum Publishers,439p.

Elective course 17
Course Title : Commercial Seed Production
Credits Hours : 4(3+1)

Objectives: To introduce the basic principles of planting material production at commercial scale and seed quality evaluation.

Theory

General Principles of Seed Production**:** Raising the seed crop, Introduction, Procurement of a class of Improved seeds, Reporting to Monitoring or certification Agency, Principles and practices of selection of area and agronomic requirement of seed production of field crops, Importance of isolation distance and Rouging, Principles of hybrid seed production in field crops, Principles and practices of selection of area and agronomic requirement of seed production of horticultural crops, Concept of apomixis, male sterility and self incompatibility and its application in hybrid seed production of horticultural crops

General Principles of Seed Processing: Introduction, Objectives of Seed Processing, Seed Drying, Principles of Drying, Water vapour equilibrium, Methods of drying seeds, Cleaning and grading, Air and screen machines, Dimensional separators, Density separators, Surface texture separators, Colour separators, Spiral

separators, Electric separators, Vibrator separators, Separation based on Affinity to liquids, Seed treatment, Temperature treatment, Chemical treatment, Bagging and Labelling

General Principles of Seed Testing: Seed testing-Introduction, Procedure of Seed testing, components of seed quality testing genetic, physical, physiological and seed health testing, Seed sampling, Types of seed sampling, Requirements of sampling, Concept of seed viability and vigour ; dormancy, types and principles of seed dormancy, Physiological quality of seed, Principles of seed Germination ,types of germination, biochemical and genetic basis

Seed Certification: History, concept and objectives of seed certification; seed certification agency/organization and staff requirement Indian Minimum Seed Certification Standards (I.M.S.C.S.) - general and specific crop standards including GM varieties, field and seed standards

Seed Industry and Seed Marketing : Introduction, Evolution of the seed industry, Development of the vegetable and Flower seed industry, Seed marketing – concept, definition and purpose, importance and promotion of quality seed, formal and informal seed supply systems, Seed marketing intelligence and product mix, sales promotion, distribution channels, marketing costs and margins; packaging and labeling, Seed Associations, Factors influencing seed marketing, Seed marketing programs, Seed industry organizations, Marketing of public versus private players,Demand and supply of seed; role of seed replacement rate (SRR), seed multiplication ratio (SMR), economics of seed production; determining seed needs, Seed pricing and price policy, seed processing and /packaging, demand forecasting and factors affecting demand for seeds, effect of price and farm income on seed demand

Biotechnology in Seed Technology: History of plant tissue culture, Laboratory organization, Composition of nutrient medium, Micro-propagation, Axillary bud proliferation approach, Meristem and shoot tip culture, Bud culture, Advantages of Micro-propagation, Problems associated with micro-propagation, Synthetic seed production, Types of synthetic seeds, methods of development of synthetic seeds, Components of nutrient media for synthetic seed development**,** Storage of synthetic seeds, Advantages and limitations of synthetic seed production

Practical

Planning of Seed Production, requirements for different classes of seeds in field crops - unit area and rate

Operation and handling of mechanical drying equipments; effect of drying temperature and duration on seed germination and storability seed processing equipments; seed treating equipments

Seed production in cross pollinated crops with special reference to land, isolation, Planting ratio of male and female lines, synchronization of parental lines and methods to achieve synchrony; supplementary pollination, pollen storage, hand emasculation and pollination in tomato, Hybrid seed production in Maize, detasseling in maize, identification of rogues and pollen shedders, Pollen collection, storage, viability and stigma receptivity; gametocide application and visits to seed production plots etc., Visit to seed processing plant and commercial controlled and uncontrolled Seed Stores, Seed industries and local entrepreneurships visit to nearby areas, Different methods of examination of seeds to assess seed-borne microorganisms and to quantify infection percentage, detection of seed borne fungi, bacteria and viruses, identification of storage fungi, control of seed borne diseases, seed treatment methods.**,** Maintenance of aseptic conditions and sterilization techniques, Preparation of nutrient stocks for synthetic media**,** Selection of explants for callus induction, Preparation of MS medium for micro-propagation and Callus induction**,** Selection of explants for callus induction**,** Preparation of MS medium for micro-propagation and Callus induction**,** Inoculation of explants for micro-propagation, Inoculation of explants for callus induction and subsequently regeneration of plantlets from matured seeds of field and horticultural crops**,** Synthetic seed preparation

Suggested readings:

1. Agarwal RL. 1997. Seed Technology. 2nd Ed. Oxford & IBH.
2. McDonald MB Jr & Copeland LO. 1997. Seed Production: Principles and Practices. Chapman & Hall
3. Thompson JR. 1979. An Introduction to Seed Technology. Leonard Hill.
4. Singhal NC. 2003. Hybrid Seed Production in Field Crops. Kalyani.
5. Justice OL & Bass LN. 1978. Principles and Practices of Seed Storage. Castle House Publ. Ltd.
6. Tunwar NS & Singh SN. 1988. Indian Minimum Seed Certification Standards. CSCB, Ministry of Agriculture, New Delhi.
7. Chawla H.S. (2008) Introduction to Plant Biotechnology second edition, Oxford &IBH publishing Co. Ltd. 113-B Shahpur Jat, New Delhi-110049

Elective Course 18
Course Title : Principles and Practices of Organic Farming andConservation Agriculture
Credits Hours : 2 (1+1)

Objectives: 1. To teach students the principles of crop production under organic and conservation agriculture situation
2. To impart practical knowledge of organic and conservation agriculture practices

Theory: Concept of organic farming, principles and its scope in India; Choice of crops and varieties in organic farming; Nutrient management in organic farming and their sources, Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP; Certification process and crop standards of organic farming; Processing, labelling, economic considerations and viability, marketing and export potential of organic products. Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture. Conservation agriculture: definition, origin, principles, advantages, challenges,primary practices in conservation agriculture: minimum soil disturbance, crop residue retention, and crop diversification, complementary practices, conservation agriculture vis a vis Climate smart Agriculture, .

Practical: Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost and their quality analysis; Method of application of bio-fertilizers; Indigenous technology knowledge (ITK) for nutrient, insect-pest and disease management; Studies in green manuring in-situ and green leaf manuring, Studies on different type of botanicals for insect-pest management; Weed management in organic farming; Cost of organic production system; Practices of conservation agriculture

Suggested readings:

1. A.C.Gaur. Handbook of Organic farming and biofertilizers.
2. A.K.Dahama. Organic farming for sustainable agriculture. Agrobios (India), Jodhpur.
3. Arun. K. Sharma. Handbook of Organic farming. Agrobios (India), Jodhpur.
4. S.P. Palaniappan and K.Annadurai. Organic farming – Theory and Practice. Scientific Publishers. Jod
5. U.Thapa and P. Tripathy. Organic farming in India- Problems and Prospects. Agrotech publishing ag Udaipur.
6. G.K.Veeresh. Organic farming. Foundation Books. New Delhi.
7. Purshit,S.S.TrendsinOrganic Farming in India.AgrosBios(INDIA), Jodhpur.
8. Thampan,P.K. Organic Agriculture.PeckaytreeCrops Development Foundation, Cochin, Kerala.
9. Sathe,T.V.Vermiculture and Organic Farming. Days Publishing House, NewDelhi.
10. Abhinandan Singh Pankaj Kumar Ojha & Rahul Kumar, 2018. Conservation Agriculture Technologies, Biotech Books
11. Acharya Sankar Kr, Sreemoyee Bera, Cornea Saha, Prabhat Kumar, Monirul Haque, Riti Chatterjee and Anwesha Mandal, 2022Conservation Agriculture Approach and Application, Scholars World,292p.

Elective Course 19

Course Title : Food Science and Nutrition
Credits Hours : 4(3+1)

Objectives: To impart knowledge on the biochemical aspects of various nutrients and their interactions in foods during processing, storage and deterioration

Theory : Introduction on fundamentals of foods and human nutrition; Basic food groups; Concept of balanced diets; Recommended Daily Allowances (RDA) for various age groups; Biochemical composition, energy and food value of various food grains, fruits and vegetables; Carbohydrates, proteins, fats as nutrients and their interactions; Physio-chemical, functional and nutritional characteristics of essential nutrients- sources and functions, Nutritional requirements, malnutrition, inborn errors of metabolism, deficiency diseases; Digestion, absorption, transport and metabolism of nutrients in human system; Protein quality evaluation. Biochemical and nutritional aspects of vitamins, minerals, nutraceuticals, antioxidant, antinational factors and biochemistry of post harvest storage, losses during processing.
Effect of cooking, processing and preservation on nutrients of different food products, biochemical aspects of food spoilage; Food fads, food safety and quality standards.
Enzymes in food industry, food additives, nutritional quality of plant, animal, dairy, marine and fermented products.
Practical: Proximate analysis of foods; calorific value of foods, Estimation of vitamins, phenols & flavonoids , carotenoids, antinutrients like Phytate/ Oxallate, Trypsin and Chymotrypsin inhibitor activities, limiting amino acids in food stuff

Suggested readings:

1. Damodaran S. and Parkin KL (ed.) 2017. Fennema's Food Chemistry. CRC Press
2. Gibney MJ, Lanham-New SA, Cassidy, A and Voster HH (ed.) 2009. Introduction to Human Nutrition. Wiley-Blackwell
3. Trueman, P. 2007. Nutritional Biochemistry. MJP Publishers
4. Rekhi, Tejmeet and Heena Yadav, 2014. Fundamentals of Food and Nutrition by,Elite Publishing House, 257p.
5. Dharmesh Kumar, Food Science and Nutrition by, RANDOM.

Elective Course 20
Course Title : Post Harvest Technology and Value Addition
Credits Hours : 2 (1+1)

Objectives:

1. To educate about the different pre-harvest, harvest and post harvest factors affecting the post harvest life of fruits and vegetables
2. To educate about preparation techniques of value added products
3. To educate about the different dehydration techniques of horticultural crops

Theory

Importance of post –harvest processing of fruits and vegetables, extent and possible causes of post harvest losses: Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; Harvesting and field handling ;Storage (ZECC, cold storage, CA, MA and hypobaric); Value addition concept; Principles and methods of preservation; Intermediate moisture food –Jam ,Jelly ,marmalade, Preserve, candy-Concepts and Standards; Fermented and non-fermented beverages. Tomato products-Concepts and Standards; Drying /Dehydration of fruits and vegetables –concept and methods, osmotic drying. Canning –Concepts and standards, packaging of products.

Practical

Applications of different types of packing, containers for shelf life extension. Effect of temperature on shelf life and quality of produce. Demonstration of chilling and freezing injury in vegetables and fruits. Extraction and preservation of pulps and juices. Preparation of jam, Jelly, RTS, nectar, squash, osmotically dried products, fruit bar candy and tomato products ,canned products. Quality evaluation of products- Physico-chemical and sensory. Visit to processing unit/industry.

Suggested readings:

1. Post harvest technology of horticultural crops by S.K. Sharma and M.C Nautiyal
2. Post-Harvest Technology by Suja Nabi Qureshi, Kounser Javeed and Abhay Kumar Sinha,2018, Bioscientific Publishers.
3. Postharvest Technology of Horticultural Crops by K.P. Sudheer and V. Indira,2020, New India Publishing Agency,320p.
4. Postharvest Management and Value Addition by Aswini Kumar Goel, Rajender Kumar and Satwinder S. Mann, 2014, Daya Publishing House.
5. Postharvest Management and Value Addition of Fruits and Vegetables by Kureel M.K., Biotech, 181p.

Semester VIII

S. No	Course tilte	Total credits
1	For student opting 4year BSc.(Hons.) degree Student READY (RAWE / Experiantial Learning / Hands on Training / Industrial Attachment /Project Work / Internship	20
	Total	**20**

SKILL ENHANCEMENT COURSE (SEC)

A student admitted into 1st year of B.Sc (Hons) Agriculture degree programme will take 2 skill enhancement courses each of 2 credits in each semester of first year. Likewise the student continuing his study into 2nd year of B.Sc (Hons) Agriculture will undergo 1 skill enhancement course of 2 credits in each of the 2 semesters of 2nd year.

The student can select these courses from a basket of skill enhancement courses as indicated below or courses offered by a college. The courses may be offered as module of complementing courses to help the student to achieve skill in a specific area of his interest.

The University/HAEIs may offer such skill enhancement courses in which it has strength/expertise as well as there is prospect of local employment and entrepreneurship development. The courses included in the list are indicative and the University/HAEIs may add more need based courses in the list depending on their strength and expertise.

Indicative skill Enhancement courses:

Sl. No	Title	Credits
1.	Biofertlizer and biopesticide production	2(0+2)
2.	Production Technology of Bioagents	2(0+2)
3.	Seed Production and Testing Technology	2(0+2)
4.	Mushroom Production Technology	2(0+2)
5.	Soil, Plant and Water Testing	2(0+2)
6.	Post harvest processting technology	2(0+2)
7.	Beneficial insect farming	2(0+2)
8.	Plantation Crop Production and Processing	2(0+2)
9.	Poultry Production Technology	2(0+2)
10.	Piggery Production Technology	2(0+2)
11.	Commercial Horticulture	2(0+2)
12.	Floriculture and Landscpaing	2(0+2)
13.	Food Processing	2(0+2)

14.	Agriculture Waste Management	2(0+2)
15.	Organic Production Technology	2(0+2)
16.	Commercial Sericulture	2(0+2)
17.	Video Production	2(0+2)

ONLINE COURSES

The students will have to take aminimum of 10 credits of online courses (any one or more courses totaling at least 16 weeks or 30 hours' duration) as a partial requirement for the B.Sc (Hons) Agriculture

The online courses can be from any field such as Basic Sciences, Humanities, Commerce, Business Management, Languages including foreign language, Communication skills,Music, etc. and can be taken from SWAYAM, Diksha, NPTEL, mooKIT, edX, Coursera, or any other portal.

The objective is to allow the students to groom their passion or strengthen their knowledge and competency in any field beyond prescribed courses.

The students will take prior approval of the courses they opt from the concerned Dean/Assoc. Dean/Pricipal of the Faculty/College/Institute.

The courses will be non-gradial as separate certificates would be issued by the Institute/ University offering the courses.

However, the University/ institute will keep a record of such courses registered and completed by each student and will indicate the title of the (successfully completed) courses in final transcript issued to the student.

ACKNOWLEDGEMENT

Acknowledgement is extended to the following teachers and administrators for their invaluable inputs in finalizing this report.

1. Dr. TejPartap, Chairman of the Sixth Deans' Committee and Former Vice-Chancellor, GBPUAT, Pant Nagar
2. Dr. Rakesh Chandra Agarwal, Deputy Director General, Agricultral Education and National Director, NAHEP, ICAR, KAB II, New Delhi
3. Dr.P. S. Pandey, Vice Chancellor, RPCAU, Pusa, Bihar and Former Assistant Director General [EP&HS], Education Division, ICAR, KAB-II, Pusa, New Delhi
4. Dr. S. K. Sankhyan, Former Member Secretary of the Sixth Deans' Committee & PS (EQR), Education Division, ICAR, KAB-II, Pusa, New Delhi
5. Dr. Ajit Singh Yadav, Assistant Director General (ADG), Education Quality Assurance and Reforms (EQAR), Agricultural Education Division, ICAR, KAB-II, Pusa, New Delhi
6. Dr. K. P. Tripathi, Principal Scientist, Agriculture Education Division, ICAR, KAB II, New Delhi
6. Dr. K. M. Bujarbaruah, Former Vice Chancellor, Assam Agricultural University, Jorhat
7. Dr. Bidyut Chandan Deka, Vice-Chancellor, Assam Agricultural University, Jorhat
8. All Deans of Faculty of Agriculture, SAUs and CAUs.
9. All Heads of Departments, Faculty of Agriculture, AAU, Jorhat.
10. All esteemed members of VI Deans' Committee, ICAR

ICAR NEP

MULTIPLE

ENTRY-EXIT SYSTEM

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

Indian Council of Agricultural Research (ICAR)
(Agricultural Education Division)
Krishi Anusandhan Bhawan-II,
Pusa, New Delhi - 110 012
Phone: 91-11-2584 1473 (O) Fax: 91-11-2584 3403

F. No:5/14/2020-EQR (e-80728) Dated: 10.08.2023

OFFICE ORDER

Subject: Relaxation in residential requirement and adoption of multiple entry/exit in Agricultural Universities-reg.

The National Education Policy-2020 (NEP-2020) has opened the gateway to introduce various changes in the education system, including higher agricultural education. One of the main focuses of this policy is to re-orient the academic structure in ways that include multiple exit and entry points for students. With this background, the Competent Authority of ICAR has approved the "Implementation Strategy for National Education Policy-2020 in Agricultural Education System" during 2021, which includes multiple exit and entry to be made available by all Agricultural Universities under NARS and relaxation in residential requirements of UG, PG and Ph.D. programs for enhancing Gross Enrolment Ratio (GER) in Agricultural Universities.

This may be implemented by taking the approval of Academic Councils / BoM of the University, as per the provisions, Act and Statute of the respective universities.

(KUMAR RAJESH)
Director (Agril. Edn.)

कुमार राजेश/KUMAR RAJESH
निदेशक (कृषि शिक्षा)/Director (Agril. Edn.)
भारतीय कृषि अनुसंधान परिषद/I.C.A.R.
कृषि अनु. भवन-II, पूसा, नई दिल्ली-110012
KAB-II, Pusa, New Delhi-110012

Distribution:

1. ADG EQR, Agril. Education Division with a request to circulate all SAUs for necessary action and coordination at their end.
2. All ADGs, Agril. Education Division, ICAR for kind information.
3. PPS to DDG (Agril. Education), ICAR for kind information.
4. ACTO, Agril. Education Division, with a request to upload this on website.
5. Guard File.

Academic Council

Notification

NEP 2020

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

OFFICE OF THE REGISTRAR
RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWAVIDYALAYA
GWALIOR (M.P.)

Anil Saxena
Registrar

Ph- : 0751-2970519
E-mail- registrar@rvskvv.net

No./Reg./Estt. /Noti./ 2024-25/ 936 Dated: 28.06.2024

//NOTIFICATION//

The Acadamic Council of the University in its 63nd Meeting, held on dated 06.06.2024 under agenda item No. 09 has approved that following committee tasked with formulating a comprehensive roadmap and strategic plan for the effective implementation of NEP 2020-

1. Dr. Mridula Billore, DFA	Chairman
2. Dr. N.S. Bhadoriya, DI	Member
3. Dr. S.K. Sharma, DRS	Member
4. Dr. Y.P. Singh, DES	Member
5. Dr. S.S. Tomar, Dean, CoA, Gwalior	Member
6. Dr. R.N. Sharma, Dy. Reg. (Acd)	Member Secretary

This committee shall be made responsible for drafting guidelines to enforce mandatory changes in the academic structure of the University in alignment with the provisions of NEP and as per the directives issued by the Indian Council of Agricultural Research.

By order of the Hon'ble Vice-Chancellor

Registrar

No./Reg./Estt. /Noti./ 2024-25/ 937 Dated: 28.06.2024

Copy for information & necessary action:-

1. Dean Faculty of Agriculture, RVSKVV, Gwalior.
2. Director Instruction & Student Welfare, RVSKVV, Gwalior.
3. Dean, College of Agriculture/Horticulture, Gwalior, Indore, Sehore, Khandwa, Mandsaur.
4. Deputy Registrar (Acd./Estt.), RVSKVV, Gwalior.
5. PS to Hon'ble Vice-Chancellor, RVSKVV, Gwalior.
6. Guard file

Registrar