Report of the Quinquennial Review Team 2018-2023

ICAR-National Institute of Agricultural Economics and Policy Research (NIAP)
Indian Council of Agricultural Research
New Delhi-110 012

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2018-2023

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ICAR-NIAP QRT Report 2018-2023

QRT Team

Dr. Mruthyunjaya, Chairman
Dr. J. V. Meenakshi, Member
Dr. A. Ganesh Kumar, Member
Dr. M. H. Wani, Member
Dr. C.S.C. Sekhar, Member
Dr. Deepak Pareek, Member
Dr. Pratap Singh Birthal, Member
Dr. Khem Chand, Member Secretary

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Preface

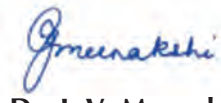
The National Institute of Agricultural Economics and Policy Research (NIAP) is a premier institution in India dedicated to conducting agricultural economics and policy research and building scientific and human capital. Since its establishment in 1991 by the Indian Council of Agricultural Research (ICAR), the Institute has made significant contributions to the advancement of agricultural economics and policy research, besides serving as a think tank for the ICAR regarding policy-related matters. It has played a key role in shaping the agricultural research agenda of the ICAR, aligning with the principles of efficiency, sustainability, and equity. In general, NIAP's research portfolio is diverse and robust, and its outputs have significantly influenced the agricultural policy landscape.

The Quinquennial Review Team (QRT) expresses its gratitude to ICAR for entrusting it with the task of evaluating NIAP's performance from 2018 to 2023 and for suggesting strategic recommendations to enhance its research portfolio, capacity building, institutional linkages, and organizational framework. The review process, conducted in accordance with ICAR's guidelines, involved multiple rounds of interactions with the scientific, technical, and administrative staff of ICAR-NIAP, as well as with internal committees and stakeholders from other ICAR Institutes and State Agricultural Universities. Furthermore, consultations were conducted with Prof. Ramesh Chand, Member, NITI Aayog, Dr. R.S. Paroda, former Secretary, Department of Agricultural Research and Education (DARE) and Director General, ICAR, Dr. M.L. Jat, Secretary, DARE and Director General, ICAR, as well as Deputy Director Generals at ICAR, to elicit their perspectives on the future strategic direction for the Institute. The QRT expresses gratitude to the faculty and staff of NIAP for their support in achieving this objective. We extend our appreciation to Dr. Arathy Ashok for her diligent efforts in compiling the necessary documents and information.

The team conducted a comprehensive review of previous research, capacity-building initiatives, policy communication activities, organizational structures, and physical facilities. Based on this analysis, the QRT has formulated recommendations for the Council's consideration. Drawing on its past performance, the QRT envisions NIAP emerging as a leading institution, facilitating the integration of agricultural research with agricultural policies through evidence-based feedback to realize the Vision of Viksit Bharat by 2047. The recommendations presented in this report aim to empower the Institute to enhance its influence on the evolving agri-food policy

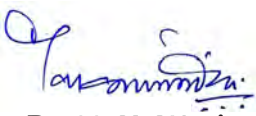
landscape. It is anticipated that the ICAR will give due consideration to these recommendations to further strengthen the NIAP.

Dr. Mruthyunjaya
(Chairman)

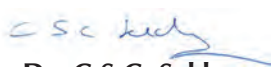


Dr. J. V. Meenakshi
(Member)

Dr. A. Ganesh Kumar
(Member)



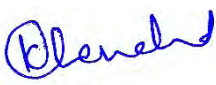
Dr. M. H. Wani
(Member)



Dr. C.S.C. Sekhar
(Member)

Mr. Deepak Pareek
(Member)

Dr. Pratap Singh Birthal
(Member)



Dr. Khem Chand
(Member Secretary)

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Executive Summary

The fifth quinquennial review of the ICAR-National Institute of Agricultural Economics and Policy Research for the period 2018-2023 was a comprehensive evaluation conducted by a distinguished panel of experts. Led by Dr. Mruthyunjaya, the review team comprised eminent academicians and professionals from various institutions across India. The review process was thorough and multi-staged, involving the examination of a detailed progress report, multiple meetings for research review and stakeholder feedback, and consultations with high-level officials from organizations such as NITI Aayog and ICAR.

The review encompassed a wide range of areas, including the Institute's research outputs, infrastructure, manpower, financial status, and management systems. It also involved engaging with staff, internal committees, and external stakeholders to gather a variety of perspectives on the Institute's performance and future directions. This process culminated in the creation of a comprehensive report that assessed research performance, capacity development initiatives, outreach efforts, and institutional governance. Such a rigorous and inclusive approach ensured a holistic evaluation of the NIAP's contributions to agricultural economics and policy research in India over the five-year period.

NIAP's research achievements, as evaluated by the QRT, demonstrate a comprehensive and impactful approach to agricultural economics and policy research. The Institute has successfully addressed critical issues such as structural transformation, agricultural diversification, regional disparities, institutional reforms, resource-use planning, value chains, research priorities, and policies for climate-resilient agriculture. Their work on doubling farmers' income and technology foresight has been particularly well received and utilized by stakeholders. The Institute's strategic focus on water management, farm mechanization, ecosystem services valuation, climate impact, agricultural research impact, commodity outlook, and agricultural trade has provided valuable inputs for strategic planning in agricultural and rural development.

The Institute has produced a substantial and diverse body of research, with 180 publications dedicated solely to the theme of 'Technology and Sustainable Agriculture.' These works encompass a broad spectrum of topics, such as technology adoption, the impacts of climate change and adaptation strategies, conservation agriculture, irrigation management, big data analytics, mechanization, crop diversification, agricultural sustainability, extension services, and indigenous knowledge systems. Furthermore, the

Institute's research under the themes of 'Markets, Trade and Institutions' and 'Agricultural Growth and Development' has yielded valuable insights into market dynamics, trade patterns, sectoral reforms, regional disparities, and rural development.

The Quinquennial Review Team (QRT) advocates for a comprehensive expansion of the research focus, emphasizing **the need to address demand-side factors, rural market dynamics, and emerging policy challenges** in the agricultural sector. This broadened scope aims to provide a more holistic understanding of the agricultural sector and its interconnected systems to develop more effective strategies to tackle complex issues facing modern agriculture, such as market fluctuations, changing consumer preferences, and the impact of global economic trends on rural economies. **Additionally, the team highlights the importance of research on the valuation and payment of ecosystem services, economic viability for farmers, and mainstreaming gender into agricultural policy.**

ICAR-NIAP has demonstrated significant progress in agricultural economics and policy research capacity building through numerous training programs and community-focused activities. Their efforts have reached both national and international audiences, including agricultural economists, policymakers and disadvantaged communities. The Institute has also excelled in outreach, dissemination, and partnerships, collaborating with various international organizations, government departments, NGOs, and private institutions.

ICAR-NIAP has adopted a decentralized, participatory, and activity-based management approach, marked by efficient administrative operations and a strong scientific team that fosters a commendable institutional culture. Nevertheless, some governance challenges persist, such as staffing issues, limited delegation of authority, and inadequate infrastructure and research tools.

The key recommendations of the QRT are as follows:

i. By providing data-driven insights and policy recommendations within the science-policy-practice framework, the ICAR-NIAP plays a crucial role in informed decision-making across various governance levels. Therefore, it is recommended that ICAR either establish a new Subject Matter Division (SMD) for Policy and Planning or place ICAR-NIAP under the direct administrative oversight of the Secretary, DARE, and the Director General of ICAR to ensure effective coordination of policy-related matters. Given its unique status within the ICAR System, the position of the Director of ICAR-NIAP should be elevated to the level of Directors of ICAR Deemed Universities.

ii. In addition to the existing two Divisions, a new Division of Growth and Modelling should be created at the Institute. The proposed creation of a new division aims to enhance the organization's research capabilities in areas such as growth dynamics through the application of advanced modelling tools, potentially incorporating techniques such as computational simulations, predictive analytics, and machine learning algorithms.

iii. To support and strengthen the Institute's overall capacity to conduct cutting-edge research using a socio-economic and ecological framework, the QRT recommends increasing the scientific cadre strength to 50, and consequently, the number of technical and administrative staff positions should be increased as per ICAR norms.

iv. The QRT also emphasizes the need to fill all vacant positions across the scientific, technical, and administrative domains to enhance the Institute's ability and improve operational efficiency.

v. There is a need to establish a comprehensive data hub at the ICAR-NIAP to enhance research capabilities and decision-making processes. This centralized repository would aggregate and integrate diverse datasets from various sources.

vi. Establish an Internal Ethics Review Committee to ensure the quality and ethical compliance of the data collected and utilized. By institutionalizing such a review process, the ICAR-NIAP can maintain high standards of data integrity, foster trust among stakeholders, and ensure that research outcomes are both scientifically sound and ethically responsible.

vii. Undertake a visioning exercise in the backdrop of Institute's Vision 2050 and prepare a roadmap outlining strategic priorities along with actionable recommendations.

viii. Establish a Monitoring, Evaluation, Learning, and Impact Assessment (MELIA) unit to evaluate agricultural technologies, programs, and policies through systematic data collection, analysis, and feedback mechanisms. A long-term network project may be undertaken to meet these objectives.

ix. Establish a Market Intelligence Unit to provide real-time insights into market trends, price fluctuations, and demand-supply dynamics, enabling farmers and policymakers to make informed decisions.

x. To effectively implement these initiatives, the Director of the Institute should be permitted to engage specialized agencies/consultants/post-doctoral fellows as needed, ensuring access to expertise in specific areas crucial for the success of these projects.

xi. ICAR-NIAP should strengthen its outreach activities through regular workshops, brainstorming sessions and print and social media. Establish a

dedicated Outreach and Policy Communication unit to develop targeted communication strategies, create user-friendly policy briefs, and manage media relations to ensure that complex research findings are translated into accessible information for various stakeholders. This should also include access to all published research on the NIAP website.

xii. ICAR-NIAP should strengthen its engagement with states to address region-specific agricultural challenges, and tailor its policy recommendations to suit diverse agro-climatic zones and socio-economic conditions.

xiii. Promote partnerships with advanced international and domestic Institutes for collaborative research and capacity building and strengthen collaboration with state governments.

xiv. The QRT strongly recommends that ICAR provide space and funds to ICAR-NIAP for a dedicated residential complex, guest house, training hostel, and expansion of office building to accommodate the additional recommended staff.

1 Introduction

1.1 Quinquennial Review in ICAR

The Quinquennial Review Team (QRT) was established by the Indian Council of Agricultural Research (ICAR) for a quinquennial review of all its institutions and schemes to strengthen the mechanism of accountability and transparency. The team mainly consists of external experts to ensure transparency in the review process and recommendations. In the review process, the team focuses on the relevance and quality of research programs carried out in the institution to identify research gaps or areas of need and recommends key measures to augment the research system.

For ICAR-NIAP this is the Fifth review, the First was in 2000. The Institution made sincere efforts to implement most of the recommendations suggested by previous QRTs in the areas of Technology & Sustainable Agriculture, Markets, Trade & Institutions and Agricultural Growth and Development. The present QRT was constituted to review the institutional performance for the period of 2018-23.

1.2 Terms of Reference

Terms of Reference (ToR) provides basic outlines to examine the stated compliance with research and development programs as envisaged by ICAR.

Research achievements and their impact

- To critically examine the research achievements of the Institute on research themes and ascertain its significant influence on key stakeholders, besides physical and economic outputs.

Research relevance

- To examine extent of conformity of the Institute's objective, scope and relevance of programs, and resources provision to accomplish overall national priorities and also long-term vision.

Relationship/collaboration/linkages with SAUs and other stakeholders

- To take stock of collaborations and MoUs developed by the Institute with various research organizations to prioritize the research activities.

- To examine the **mechanism built-in to provide necessary inputs** to policy makers at various levels of governance viz., SAUs, State, ICAR HQ, central government and **private sector**.

Proposed changes in organizations, programs and budget

- To deliberate on the organizational structure, human and budgetary resources, infrastructure, and resource mobilization/generation efforts of the Institute, and recommend changes, if any, needed to fulfill the mandate of the Institute.

Constraints

- To recognize the constraints deterring the Institute from achieving any of its objectives/goals/mandates and suggest ways to minimize or eliminate them.

Way Forward

- To examine any other matter(s) specified by the ORT, which are necessary to realize the stated mandate and objectives of the Institute.

1.3 Composition of the Present QRT

Chairman	:	Dr. Mruthyunjaya, Former National Director, ICAR-NIAP, New Delhi
Members	:	Dr. J. V. Meenakshi, Professor, IIIT, Delhi
		Dr. A. Ganesh Kumar, Professor, IGIDR, Mumbai
		Dr. M. H. Wani, Former Chair Professor Rajiv Gandhi Chair and Registrar, SKUAST-K, Shalimar, J&K
		Dr. C.S.C. Sekhar, Professor, IEG, Delhi
		Mr. Deepak Pareek, Founder Managing Director, HnyB Tech-Incubation Pvt. Ltd.
		Dr. Pratap Singh Birthal, Director, ICAR-NIAP, New Delhi
Member Secretary	:	Dr. Khem Chand, Principal Scientist, ICAR-NIAP, New Delhi

1.4 The Process of Review

The review process detailed below was carefully undertaken following the guidelines laid down by ICAR to take stock of the achievements of the preceding years (2018-23).

1.4.1 Review steps

i. **Background information:** The Institute prepared an Institute Progress Report document containing major highlights of the research and other activities of the Institute during the review period (2018-23). The report also includes brief notes on infrastructure, human resources, financial situation, and management systems and was made available to members of the QRT in June 2024.

ii. **Preliminary meeting:** The team was constituted on February 07, 2024, by the ICAR. The first meeting of the Vth QRT of ICAR-NIAP was conducted on June 27-28, 2024, at the Institute. In the first meeting, a review of the research work undertaken by the ICAR-NIAP during 2018-23 was done. Interactions were carried out with the scientific, technical, and administrative staff of the Institute to discuss various aspects. It was also decided that the Institute needs to get feedback from different stakeholders about its work by the next meeting. The second meeting of the Vth QRT of the ICAR-NIAP was conducted on October 24-25, 2024, at the Institute. The major purpose of this meeting was to seek feedback from different stakeholders regarding ICAR-NIAP's future agendas related to research, capacity building, and policy advocacy. Prior to the meeting, an opinion survey was conducted among various stakeholders using Google Forms. Approximately 52 stakeholders participated in the online survey, and 27 stakeholders attended the meeting (both online and offline) on October 24, 2024. The suggestions provided by the stakeholders were compiled. A meeting was also arranged to discuss the performance of different committees constituted at the Institute as per the ICAR mandate and to facilitate Institute activities. The review process took key input and necessary suggestions from all scientific, technical, and administrative staff to make it more inclusive. The third meeting of the Vth QRT of ICAR-NIAP was held on April 21, 2025, in a hybrid mode. The main purpose of the meeting was to discuss the progress of the draft QRT report and additional inputs required for the same. The progress of the work done under each chapter assigned to different members was reviewed by the chairman, and suggestions regarding the key recommendations were discussed by the members. The penultimate meeting of QRT was convened on 15-17 May 2025, during which Interactions with key stakeholders of the Institute including Prof. Ramesh Chand, Member, NITI Aayog, Director General, ICAR, Deputy Director Generals/Assistant Director Generals of ICAR and Dr. R. S. Paroda, Former Secretary DARE/ Director General, ICAR were held. Major recommendations for the fifth

QRT of ICAR-NIAP were finalized during the final meeting of the QRT held on 19-20 August 2025.

iii. **Interaction:** The QRT engaged in consultations with the ICAR HQ and other peer groups. The team interacted with the scientists of the ICAR-NIAP on June 27, 2024. Scientists at the Institute made presentations on various research themes, followed by intensive discussions by the QRT team. Feedback from various stakeholders of NIAP was presented in meetings held during October 24-25, 2024. In addition, feedback was sought from Prof. Ramesh Chand, Member, NITI Ayog, Director General, ICAR and Dr. R. S. Paroda, Former Secretary DARE/DG, ICAR.

Inputs were also obtained from several categories of stakeholders. The discussion centered around (a) views on current research, capacity building, and policy advocacy activities of ICAR-NIAP; (b) suggestions for future activities of ICAR-NIAP; (c) linkages and collaborations with NIAP sought; and (d) strategies for better outreach of NIAP publications and their usefulness. Their feedback was very helpful to the QRT in formulating its views on the NIAP. The groups of stakeholders were as follows:

- Deputy Director Generals (DDGs) of ICAR
- Assistant Director Generals (ADGs) of ICAR
- Secretaries/Heads of Development Departments
- Directors of ICAR Institutes
- Vice Chancellors of Agricultural Universities
- Research Advisory Committee (RAC) Chairman of ICAR-NIAP
- Agricultural Economists from SAUs/ICAR-Institutes
- Network project partners
- Former Trainees of ICAR-NIAP capacity building programmes
- Representatives of private sector, NGOs
- Farmer representatives

iv. **Interaction with in-house committees of the NIAP:** The QRT assessed the functioning and effectiveness of the management system through various committees. The interactions were held with the chairpersons of each committee, and the QRT identified issues and constraints related to the following committees.

- Institute Research Council (IRC)
- Priority Setting, Monitoring and Evaluation (PME) Cell
- Budget Committee

- Purchase Committee
- Official language committee
- Deputation committee
- Women Cell
- Grievance Cell
- Intellectual Property Right (IPR) & Technology Commercialization Cell
- Academic planning and policy committee
- Publication Committee
- Landscape and maintenance committee
- Library committee
- Staff welfare committee
- ISO implementation Committee
- Institute Corpus fund committee
- Agricultural Knowledge Management Unit (AKMU)

v. **Taking stock of physical infrastructure:** Along with interaction with different committees, the team took brief stock of the facilities in the Institute, such as the library, AKMU lab, computer cell, staff rooms, auditorium, meeting rooms, guest rooms, outdoor and indoor recreation facilities, reception center, and dining hall.

vi. **Documents reviewed and consulted:** To identify issues for further discussions with the Director, ICAR-NIAP, and among members of the QRT, the following reports, publications, and documents were reviewed by the QRT.

- Guidelines for QRT by ICAR
- Background material prepared for QRT
- Annual reports of Institute during previous years
- Past QRT and RAC reports
- Vision 2050
- Other publications include peer-reviewed research papers, policy papers, and policy briefs.

vii. **Report preparation:** Based on the review of documents, formal and informal interactions with various stakeholders, and internal discussions among the QRT members, emerging issues were identified. The team formulated an annotated structure for the report. Further discussions

among the QRT members about refining the issues and formulating suggestions/recommendations continued through e-mails, telephonic conversations, and subsequent meetings with scientists, staff, and the Director of ICAR-NIAP.

1.5 Structure of the Report

The report is presented in five chapters. The introductory chapter provides insights into the review and assessment processes developed by the QRT. The second chapter provides details of the organizational structure, composition, and functioning of institutions at various levels. The third chapter highlights the research priorities, programs, and achievements under various organized themes along with human resource development, outreach/linkages, organization/management, and overall assessment. Chapter 4 proposes a way forward to further improve the outputs and outcomes of the ICAR-NIAP for a larger impact. The key recommendations of the QRT are summarized in the last chapter.

2 ICAR-NIAP: Organization and Management

2.1 Genesis and Evolution

Establishment of ICAR-NIAP came into being owing to the process of opening of the economy in early 1990s. The early 1990s witnessed an increasingly complex technology-growth interface; the need to reconcile somewhat conflicting interests of farmers and consumers in agricultural policies; the requirements of research inputs for resource allocation decisions; the need for priority setting and for making the agricultural sector competitive to face challenges of its integration with the rest of the economy and world markets; and the need for a strong base of agricultural economics and policy research within the National Agricultural Research System (NARS). As a follow-up, the National Centre for Agricultural Economics and Policy Research (NCAP) was established by the Indian Council of Agricultural Research (ICAR) in March 1991 to strengthen agricultural economics and policy research within the NARS. In 2014, the Institute was renamed the National Institute of Agricultural Economics and Policy Research (NIAP). Two divisions, *namely* Technology and Sustainable Agriculture, Agricultural Market and Trade, and Agricultural Growth and Development Unit, were established in ICAR-NIAP in 2021. The Institute has played a leadership role, especially in addressing research and development (R&D) policy challenges.

The Institute has completed three decades of existence and has contributed significantly to the growth of agricultural economics and policy research within NARS. The Institute assisted ICAR in prioritizing its research agenda to improve efficiency and equity in agricultural research and understand the contemporary issues and challenges for achieving higher inclusive agricultural growth and attaining food security. Specifically, the Institute has made notable contributions in areas such as research priority setting, domestic market reforms, international trade, agricultural diversification, groundwater, livestock policy issues, investments and subsidies, price policy, technological change, agriculture insurance, service delivery systems, institutional innovations, natural resource management, and demand-supply forecasts.

2.2 Vision, Mission and Mandate

Vision

Leveraging innovations for attaining efficient, inclusive, and eco-friendly agricultural growth through agricultural economics and policy research.

Mission

Strengthening agricultural economics research for providing economically viable, socially acceptable and environmentally feasible policy options for science-led agricultural growth.

Mandate

The Institute's mandate has constantly evolved to discharge the research and administrative responsibilities. The current mandate of the Institute includes the following:

- Agricultural economics and policy research on markets, trade and institutions
- Growth and development models for sustainable agriculture
- Technology policy, evaluation and impact assessment

2.3 Organizational Structure

The Institute's administrative structure has evolved carefully in a decentralized manner, with an activity-based approach. The research programs of the Institute are guided by a high-powered Research Advisory Committee (RAC), comprising eminent professionals from outside and within the ICAR system. Research thrusts and strategies, initiatives in human resource development, and approaches to improve policy dialogues and evaluations are guided by the RAC. The Institute is guided and supervised by the Institute Management Committee (IMC), and its activities are directed and coordinated by the Director. In addition, a few internal committees and cells, including those mandated by the ICAR, are operating for the efficient and decentralized management of the Institute. The Director conducts regular meetings with the staff, mostly every month, to discuss problems and difficulties, if any, faced by the staff and to elicit their suggestions for the cordial functioning of the Institute.

2.4 Human Resources

The success of the ICAR-NIAP may be attributed to the hard work, dedication, and talent of the scientists who have served the Institute since 1991. The Institute has nurtured many leaders and plays a leadership role at the national

level. Table 2.1 provides details of the various scientists who served the Institute during the QRT period (2018-2023).

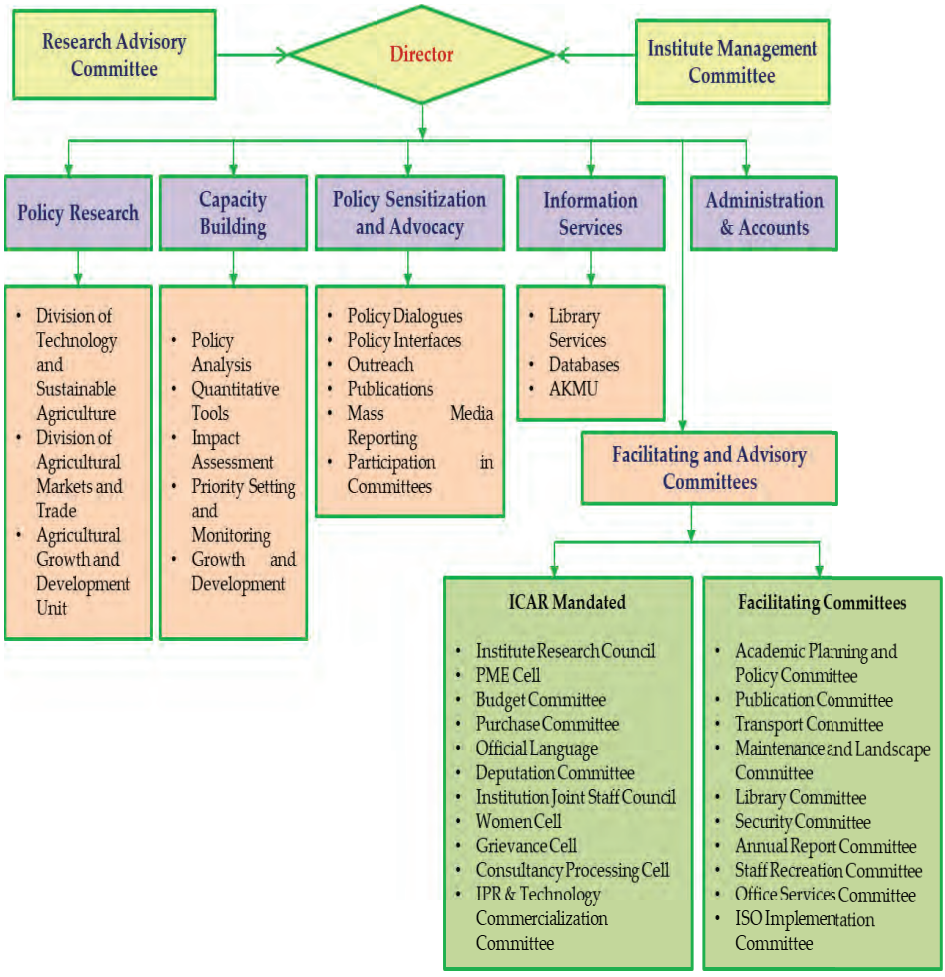

Figure 2.1. Organizational chart of ICAR-NIAP

Table 2.1 Name of the scientists who served the Institute during 2018-2023

S. No.	Name	Designation
1.	Dr. Suresh Pal	Former Director (Upto 31-03-2022)
2.	Dr. Pratap Singh Birthal	Director (Since April 2022)
3.	Dr. Usha Rani Ahuja	Principal Scientist (Ag. Economics) (Upto-31-08.2019)
4.	Dr. Nalini Ranjan Kumar	Principal Scientist (Ag. Economics)

S. No.	Name	Designation
5.	Dr. Khem Chand	Principal Scientist (Ag. Economics)
6.	Dr. I. Sekar	Principal Scientist (Ag. Economics)
7.	Dr. Rajni Jain	Principal Scientist (Computer Application in Agriculture)
8.	Dr. Subhash Chand	Principal Scientist (Ag. Economics)
9.	Dr. Naveen Prakash Singh	Principal Scientist (Ag. Economics)
10.	Dr. Anil Kumar	Principal Scientist (Livestock Production and Management)
11.	Dr. Sant Kumar	Principal Scientist (Ag. Economics)
12.	Dr. Shiv Kumar	Principal Scientist (Ag. Economics)
13.	Dr. Raka Saxena	Principal Scientist (Ag. Economics)
14.	Dr. Purushottam Sharma	Principal Scientist (Ag. Economics)
15.	Dr. Prem Chand	Senior Scientist (Ag. Economics)
16.	Dr. Vikas Kumar	Senior Scientist (Ag. Economics)
17.	Dr. Shivendra Kumar Srivastava	Senior Scientist (Ag. Economics)
18.	Dr. Kingsly Immanuelraj T	Senior Scientist (Ag. Economics)
19.	Dr. Dinesh Chand Meena	Senior Scientist (Ag. Economics)
20.	Dr. Arathy Ashok	Scientist (Ag. Extension)
21.	Dr. Vinayak Ramesh Nikam	Senior Scientist (Ag. Extension)
22.	Mrs. Pavithra Srinivasamurthy	Scientist (Ag. Economics)
23.	Ms. Jaya Jumrani	Scientist (Ag. Economics)
24.	Mr. Subash S. P.	Scientist (Ag. Economics)
25.	Dr. S. J. Balaji	Scientist (Ag. Economics)
26.	Mr. S. V. Bangararaju	Scientist (Ag. Economics)
27.	Dr. Prabhat Kishore	Scientist (Ag. Economics)
28.	Dr. Ankita Kandpal	Scientist (Ag. Economics)
29.	Dr. Kiran Kumara T. M.	Scientist (Ag. Economics)
30.	Mr. Dilip Kumar	Scientist (Computer Application & IT)
31.	Dr. Abimanyu Jhajhria	Scientist (Ag.Economics)

As of March 31, 2023, besides the Director, the Institute had 10 Principal Scientists, 6 Senior Scientists, and 10 Scientists. In addition, there were five technical staff, nine administrative staff, and one supporting staff member. Of the sanctioned posts, three Senior Scientists and two Scientists were vacant. Table 2.2 provides details on sanctioned posts and staff in positions as of March 31, 2023.

Table 2.2 Number of sanctioned posts and staff in position (March 31, 2023)

S. No.	Name of Post	Sanctioned	Filled	Vacant
1.	Research Management Position	1	1	0
2.	Head of Division	2	0	2
3.	Principal Scientist	1	3	0
4.	Senior Scientist	6	3	3
5.	Scientist	21	19	2
6.	Technical Assistant	4	3	1
7.	Technician (T-1)	1	1	0
8.	Administrative Officer	1	1	0
9.	Assistant Administrative Officer	1	1	0
10.	Finance & Accounts Officer	1	1	0
11.	Private Secretary	1	0	1
12.	Assistant	4	3	1
13.	Personal Assistant	2	1	1
14.	Upper Division Clerk	1	0	1
15.	Lower Division Clerk	2	2	0
16.	Skilled Supporting Staff	2	1	1
	Total	**51**	**40**	**13**

2.5 Physical Infrastructure

2.5.1 Agriculture Knowledge Management Unit (AKMU)

The Agricultural Knowledge Management Unit (AKMU) at the ICAR-National Institute of Agricultural Economics and Policy Research (NIAP) serves as a critical operational unit dedicated to enhancing agricultural research, education, and extension through the strategic application of information and communication technologies. Its overarching objective is to promote a robust information management culture within the National Agricultural Research and Education System (NARES) and to extend its impact beyond national boundaries.

The key objectives and recent activities of the AKMU at ICAR-NIAP include:

i. **Facilitating enhanced access to information:** The AKMU prioritizes providing seamless access to pertinent and timely agricultural information for a diverse group of stakeholders, including scientists, researchers, extension personnel, and policymakers. To achieve this, ICAR-NIAP maintains a comprehensive and regularly updated website (http://www.niap.icar.gov.in) (In 2025, the website address had been changed to https://niap.res.in/ due to some technical issues in the previous website). This digital platform serves as a virtual interface for the Institute, showcasing staff profiles, infrastructure, research projects, publications, collaborations, Right to Information (RTI) disclosures, tender notices, recruitment updates, and various announcements. Hosted by the ICAR data center, the website's content and structure have undergone regular updates over the past five years, ensuring adherence to the Government of India Guidelines for Websites (GIGW) and bilingual accessibility. Its global reach extends to over 140 countries, with increasing access and significant interest in NIAP publications, particularly workshop proceedings, policy papers, and policy briefs.

ii. Beyond the website, AKMU leverages social media platforms such as Facebook, YouTube, X (formerly Twitter), and LinkedIn for broader information dissemination. Recognizing the complexities of website development and maintenance in compliance with stringent GIGW standards, ***it is recommended to include comprehensive website maintenance and social media content management within an Annual Maintenance Contract (AMC), supported by a resident engineer for technical aspects and a communication specialist for content creation. Furthermore, considering recent cybersecurity incidents affecting the ICAR data center, adherence to recommended data center security and management protocols is imperative.***

iii. **Building capacity for information management:** The AKMU is dedicated to developing the necessary skills and infrastructure for the effective organization, storage, retrieval, and utilization of agricultural knowledge within the Institute.

iv. **Enhancing research efficiency and effectiveness:** By providing a robust IT infrastructure and consistent support, AKMU significantly contributes to improving the planning, execution, monitoring, and evaluation processes for research programs conducted at ICAR-NIAP.

v. **Promoting knowledge sharing and collaboration:** The AKMU actively fosters seamless information exchange and collaborative opportunities among ICAR Institutes, agricultural universities, and both national

and international partners. This is facilitated through online platforms such as Zoom and Google Meet, leveraging the National Knowledge Network (NKN). To support these virtual interactions, AKMU upgraded two committee rooms and an auditorium with essential infrastructure, including webcams, LCD screens, and compatible audio-visual systems. ***Strengthening technical assistance for the operation and management of these systems is necessary.***

vi. **Supporting E-governance and administrative processes:** The AKMU plays a crucial role in implementing and managing IT systems that streamline various administrative functions, including finance, human resources, and procurement. Over the past five years, significant advancements in e-governance have been witnessed, including the migration of human resource management from an Enterprise Resource Planning (ERP) system to the more user-friendly and centralized Electronic Human Resource Management System (EHRMS) 2.0. Additionally, office file movement and management have transitioned towards a virtual environment via e-office, and biometric attendance systems have been implemented in accordance with government directives.

vii. **Providing IT infrastructure and LAN services:** This core function of the AKMU involves the management of local area networks (LANs), internet connectivity, email services, video conferencing facilities, and the ongoing maintenance of associated hardware and software. ***Recognizing the increasing reliance on wireless connectivity with newer computing infrastructure lacking physical LAN ports, the establishment of a centralized Wi-Fi facility throughout the ICAR-NIAP building is essential to ensure uninterrupted connectivity.***

viii. **Ensuring data security:** Safeguarding user data is a paramount concern for the AKMU. Regular updates to antivirus and firewall security software are consistently implemented and must continue without interruption. ***Exploring the provision of online cloud storage services to individual researchers would facilitate secure and seamless data access.***

ix. **Managing software resources:** ICAR-NIAP utilizes a range of data analysis software, including SPSS, STATA, GAMS, ARC-GIS, and MS-Office, along with other specialized software based on the researcher's needs. AKMU manages timely upgrades of these software packages, contingent upon budget allocations and requirements. The challenge of maintaining access to perpetually licensed software like SAS, which has become incompatible with newer operating systems, necessitates the ***upkeep of older systems***.

x. **Maintaining the AKMU lab and server room:** The server room, which houses the Institute's central computing and network infrastructure, undergoes periodic upgrades. To address the past issues of excessive heat generation, smart racks and UPS systems were installed. To protect valuable equipment from potential damage due to weather-related factors, ***regular civil repairs and maintenance of the server room are essential***.

xi. **IT manpower**: Since its establishment, the Institute's IT requirements have grown significantly. Consequently, to ensure the smooth operation of the AKMU and its expanding role within the Institute***, augmenting the available IT manpower*** is essential. This can be effectively achieved by engaging ***contractual support through specialized agencies***, such as the empanelled vendors of the National Informatics Centre Services Incorporated (NICSI).

In conclusion, the AKMU at ICAR-NIAP functions as the vital IT backbone of the Institute, playing a pivotal role in modernizing agricultural research and knowledge dissemination, thereby contributing significantly to the advancement of Indian agriculture and beyond.

Website of ICAR-NIAP: Analysis of hits and access

The ICAR-NIAP website (https://niap.icar.gov.in) provides the latest information about the activities of the Institute, particularly about its staff, infrastructure, research projects, publications, and linkages. The website is accessed worldwide. Over the years, access has increased and now covers more countries. All NIAP publications, such as policy papers, policy briefs, working papers, PME notes, and workshop proceedings, were uploaded on the website and are available in PDF format. Data on access to NIAP publications revealed the increasing popularity of these publications. Among the publications, workshop proceedings, policy papers, and policy briefs were the most referred to.

Some performance parameters of the NIAP website are listed in Table 2.3. These observations reveal the wider acceptance and visibility of the Institute worldwide. The NIAP website was regularly updated in terms of data as well as coding during 2018-2023.

Table 2.3 Some performance parameters of NIAP website during 2018-2023

Average sessions per day	562.50	Average sessions per IP address	2.10
Average hits per day	4211.25	Average visitors at one moment	1.64
Average number of pages viewed per session	1.49	Average time spent per session	250.50

2.5.2. Library and Information System

The library of ICAR-NIAP has a collection of print, electronic, and digital resources. It operates innovative information platforms, J-Gate, and a consortium for e-resources in agriculture. The library houses books, journals, bulletins, databases, and research reports. It has a separate section for official language Hindi books. It disseminates scientific and technical information on research via document delivery service, current awareness service, newspaper clipping service, and resource sharing activities. Currently, the library houses 5802 books, including 417 Hindi books, 11 journals, and publications from ICAR-NIAP and other ICAR Institutes.

The library received a budget of ₹ 14 lakhs, on average, per year, but there was no consistency in the fund for library support. During the QRT period, the expenditure on the library aggregated to ₹ 69.98 Lakhs (Table 2.4).

Table 2.4 Expenditure on Library

(₹ Lakhs)

Head	2018-19	2019-20	2020-21	2021-22	2022-23
Library	11.71	5.39	9.15	24.91	18.82

Details of the major journals subscribed to between 2018-2023 are given in Table 2.5.

Table 2.5 Number of journals subscribed during 2018-2023

Year	Number of journals
2018	14
2019	18
2020	7
2021	10
2022	15
2023	19

The major journals subscribed during the review period are as follows:

i. Agriculture and Human Values
ii. Agricultural Economics
iii. American Economic Review
iv. Agricultural Economics Research Review
v. American Journal of Agricultural Economics
vi. American Economic Journal: Applied Economics
vii. American Economic Journal: Economic Policy

viii. American Economic Journal: Macroeconomics
ix. American Economic Journal: Microeconomics
x. American Journal of Agricultural Economics
xi. Ecological Economics
xii. Economic Development and Cultural Change
xiii. Food Policy
xiv. Food Security
xv. Indian Journal of Agricultural Economics
xvi. Journal of Agricultural Economics
xvii. Journal of Development Economics
xviii. Journal of Development Studies
xix. Journal of Economic Literature
xx. Journal of Economic Perspectives
xxi. Science and Public Policy
xxii. Structural Change and Economic Dynamics
xxiii. World Development

ICAR-NIAP should join "One Nation One Subscription" initiative to expand access to larger array of journals to reduce library expenditures.

2.6 Finance

Research projects and other ICAR-NIAP programs are primarily funded by the ICAR. In addition to ICAR, external funding is raised through consultancies and capacity-building programs from other national and international agencies, such as Ministries under Government of India, NITI Aayog, NABARD, FAO, CGIAR centers (IFPRI, ICRISAT, ILRI, *etc.*), WHO, and foreign universities. The financial budget details of the Institute during 2018-2023 are presented in Table 2.6, and the expenditure details are presented in Table 2.7.

It may be seen that the total budget marginally increased from ₹15.77 crore in 2018-19 to ₹18.32 in 2022-23. However, the budget under the plan remained nearly stagnant, while the non-plan budget generally increased to meet the committed expenditure on salary, allowances, and core maintenance charges, and external funding fluctuated in between. **It is important that the budget under the plan to meet research expenditure may have to increase to maintain the research momentum of the Institute, as discussed and recommended in the report**.

Table 2.6 ICAR-NIAP budget (2018-19 to 2022-23)

(₹ Lakhs)

Year	Budget				
	Plan*	Non plan*	External funding	Source of funding	Total
2018-19	690.46	790.79	96.47	ICAR, GoI, IFPRI, NABARD, WHO, MCX of India.	1577.72
2019-20	743.57	786.62	128.36	ICAR, GoI, IFPRI, NABARD, WHO, MCX of India.	1658.55
2020-21	582.88	793.77	112.43	ICAR, GoI, IFPRI, NABARD, WHO, MCX of India.	1489.08
2021-22	721.08	815.70	158.86	ICAR, GoI, IFPRI, NABARD, WHO, MCX of India, Govt. of Uttarakhand.	1695.63
2022-23	592.65	1120.63	119.33	ICAR, GoI, IFPRI, NABARD, Govt. of Uttarakhand, Cornell University, IRRI, ICRAF	1832.60

Note: Plan budget include Plan projects also; Non plan budget includes salary and pension

Table 2.7 ICAR-NIAP expenditure (2018-19 to 2022-23)

(₹ Lakhs)

Year	Plan	Non plan	External funding	Total
2018-19	650.69	767.37	56.78	1474.85
2019-20	695.56	785.99	77.38	1558.93
2020-21	491.90	790.56	60.37	1342.84
2021-22	653.45	815.52	139.98	1608.95
2022-23	553.71	1119.94	57.67	1731.32

Table 2.8 Revenue generation of ICAR-NIAP (2018-19 to 2022-23)

(₹ Lakhs)

Year	Revenue Target	Achievement	% Achievement
2018-19	18.89	2.18	11.54
2019-20	1.93	8.82	456.99
2020-21	1.93	13.19	683.42
2021-22	16.00	27.90	174.38
2022-23	27.71	8.20	29.59

In view of the almost stagnant budget under the Plan, revenue generation from external sources is crucial. However, as shown in Table 2.8, revenue generation over the years is inconsistent and does not match the target planned in some years. **This requires priority attention to meet revenue generation targets.**

Table 2.9 HRD allocation and expenditure under Plan of ICAR-NIAP

(₹ Lakhs)

S. No.	Year	2018-19	2019-20	2020-21	2021-22	2022-23
i.	Utilized	3.13	1.34	0.20	0.04	0.82
ii.	Per Scientist	0.14	0.05	0.007	0.0014	0.03
iii.	Per Scientist + Technical Staff	0.11	0.04	0.006	0.0012	0.026
iv.	Per Scientist + Technical Staff + Administrative Staff	0.08	0.03	0.005	0.0009	0.0205

It may be seen in Table 2.9 that the HRD allocation under Plan is very low, and its utilization is dismally low, **which needs greater attention and action to keep the workforce up to date in skills, knowledge and new advances and to keep them refreshed and vibrant in increasing their productivity**.

3 Priorities, Programs, Achievements and Assessment

This section provides a brief account of NIAP's priorities, programs, achievements, and assessments with respect to its mandate/core priority areas based on the review of progress, achievements, and emerging needs by the Team during the QRT period 2018-2023.

3.1 Research Programs, Achievements and Assessment

Agricultural economics and policy research are the major mandates of the NIAP. NIAP is a unique flagship Institute for ICAR for socio-economic and impact assessment studies and a think tank for policy advice. The Institute has adopted a systematic process of prioritizing its research at short-, medium-, and long-term levels. The QRT feels that NIAP has adequately focused its research on priority areas identified for the 5-year period under review. The Institute has developed new research-based knowledge that is directly useful for policymakers, research managers, planners, and development administrators. In addition, the Institute's contributions to structural transformation, regional disparity, and institutional reforms in agriculture; resource use planning for sustainable agriculture; policy imperatives for promoting the value chain of agricultural commodities; research priorities and policies for climate-resilient agriculture; doubling of farmers' income; and technology foresight in agriculture are well received and widely used. The Institute has established a Decision Support System (DSS) to help the country make rational and timely policy decisions related to the production, finance, trade, and marketing of agricultural commodities. In view of the emerging importance of agricultural growth and development in attaining *Viksit Bharat* by 2047, as mentioned in the stated strategy and framework suggested in NIAP Vision 2050 (NAIP Vision 2050: page 13), and looking to the good contributions made by NIAP during the QRT period in this theme area, it is suggested to ICAR to **elevate the status of the Agricultural Growth and Development Unit in NIAP to a new Division of Growth and Modelling**. The required human resources and other resources are suitably augmented, and a proposal is immediately submitted to ICAR for approval. In view of the strategic importance of NIAP outputs for planning a demand-driven research agenda for agricultural research for development in the country and providing supportive policy formulation and directions

for accelerating the speed and direction of agricultural development in the country, as repeatedly suggested by earlier QRTs, the NIAP may be placed under the administrative jurisdiction of Secretary, DARE/DG, ICAR. Given its unique status within the ICAR System, the position of the Director of ICAR-NIAP should be elevated to the Directors of ICAR Deemed Universities.

The research project portfolio of the Institute is comprehensive and impressive. As expected, the research outputs of NIAP have provided insights into general economic policymaking as well as for re-orienting agro-biological research, research policy, and research management in the country. The Institute has also addressed some strategic research issues, such as water management and farm mechanization, carbon markets and valuation of ecosystem services, climate, trade and sustainability linkages, R&D investment, innovations and impact of agricultural research, sustainability assessment, regional crop and resource use planning, management issues, tracking poverty, food inflation, and buffer stock norms, which generated valuable inputs for strategic planning for agricultural and rural development. It has maintained a fair balance between basic, strategic, and applied research. The quality of output/outcome of NIAP is no doubt superior to other similar institutions in the NARS and matches well with similar reputed social science institutions/universities in the country like IEG, IGIDR, ISEC, DU, and JNU; however, there is scope for improvement.

The demand for NIAP's output is increasing exponentially because of its previous work. No doubt, the Institute has come to the expectations of ICAR, NITI Aayog, etc., and may serve as a provider of real policy advice to ICAR and other policy-making bodies like NITI Aayog, *etc.*, for its work on supply demand projections and expecting policy inputs on collection, analysis, and dissemination of market intelligence, cost of non-adoption of game-changing technologies like GM crops, policies and actions for converting/ substituting subsidies to investments, linking farmers to markets, impact of NIAP studies suggesting changes in research agenda of ICAR/NARS, studies on whether farmers are rewarded for performance (efficiency), capitalizing the global markets for export, whether allied sectors/specialty sectors/secondary agriculture are receiving the due attention or not, etc. ICAR has also rightly responded to the earlier recommendation of QRT to elevate the status of the institution from a National Research Centre to an Independent ICAR Institute in 2021. However, it needs to be recognized that the potential of contribution of NIAP is much higher. Stakeholders feel that the best of NIAP is yet to come. The QRT, after identifying some issues, concerns, and rising demand for its quality output, is recommending the following suggestions, which, if attended to, can help in further upgrading the outputs, outcomes, and stature of NIAP.

To play a much critical role of providing science/evidence- based policy formulation/recommendation and direction/suggestions to transform Indian agriculture to attain the national goal of *Viksit Bharat* by 2047, now is the right time that the administrative jurisdiction of NIAP be directly brought under Secretary DARE and DG, ICAR instead of under other SMD like DDG (Education) now, DDG, Animal Sciences some years back. This is obvious since the NIAP is a one-stop apex institution that connects different works across ICAR SMDs/Institutes. This has also been recommended by earlier QRTs. In fact, the 3rd QRT recommended that if it is necessary to raise the status of the Director of NIAP (then called NCAP) to the status of DDG in ICAR, it may have to be done.

Some useful policy-oriented projects/studies should be conducted regularly after a well-defined interval of two, three, five, or ten years. The Institute should plan such studies and develop a strategic plan in this regard. Some examples may include trends in R&D investment and total factor productivity; capital formation and investment in agriculture; prioritization of agricultural research investment across sectors and regions; cost to the nation of not adopting some major game changing technologies like GM crops, non-spread of area under conservation agriculture, not replacing paddy area in Punjab, Haryana and western UP, not passing the important bills like Seed Bill, IPM, etc., legal and regulatory framework for agriculture and tracking sources of agricultural growth, strengthening market research and capacity development jointly working with NIAM, Jaipur, continuous provider of market intelligence and analysis, implications of increasing involvement of people in agriculture particularly increasing participation/involvement of women in agriculture, implications of increasing mechanization in agriculture and its effects on women's health, wage differentials and gender equality, scenario building and visioning, rising role of prices, not technology as source of growth and its implications to reorientation of research system, study of sectoral human resource representation in ICAR and suggestions, long term EXIM policy, harms of adhoc, switch on-off EXIM policies, study of why we import mozzarella cheese when we produce maximum buffalo milk, why we export soybean (and import soybean oil!) which has 40% protein when our children are seriously deficient in protein.

Since the NIAP has no AICRPs, network projects are permitted by the ICAR on the recommendation of the earlier QRT. However, the success is limited because there is no separate cell for its management in the NIAP. It should be established with adequate staff and funding support from the ICAR. Development of a matrix of social scientists/economists/Community

of Practice (group of individuals who share common interest or passion and regularly interact to learn, share knowledge and improve their skills in a specific area, a structured social network focused on collective expertise and skill development within a particular domain) and synergizing them under NIAP leadership is necessary.

The NIAP is known for steering systematic PME systems in the NARS. ***Establishing a monitoring, evaluation, and learning impact assessment unit in the NIAP is necessary to remain a role model for institutionalizing the PME system/culture in the ICAR.*** For this, adequate and systematic reporting/recording of output/outcome and likely impact should be made compulsory for each scientist in respect of his/her projects/studies, and this should be monitored by the relevant committees of NIAP for compliance.

Policy communication should receive priority attention in the future. The dissemination of findings in policy papers with different ministries is crucial. It would be useful to plan a half-day workshop involving all key stakeholders.

A further theme-wise assessment of research programs is summarized below:

3.1.1 Technology and Sustainable Agriculture

Ensuring sustainability in agriculture, which is multi-dimensional in nature, is challenging and has broader environmental, agro-climatic, social, and economic implications. Although the share of agriculture in Gross Domestic Product (GDP) has been declining over the decades, it still generates close to two-fifth of employment and contributes nearly one-fifth of the national income. A major challenge is the region-specific factors affecting sustainability. Farmers often rely on cheaper chemical inputs over costlier sustainable alternatives, leading to soil health issues owing to a non-linear fertilizer-soil relationship. This highlights the need to make sustainable inputs more affordable for long-term sustainability.

Achievements and Assessment

The research publications under the theme 'Technology and Sustainable Agriculture' are categorized under various sub-themes and summarized in Table 3.1.

Table 3.1 Research publications: Technology and Sustainable Agriculture (2018-2023)

S. No.	Theme/ Sub-theme	Research publications
i.	Technology adoption, economic viability and impact assessment	74
ii.	Conservation agriculture, ecosystem services, carbon sequestration	11
iii.	Irrigation water management policies	17
iv.	Mechanization and crop diversification	8
v.	Climate change impacts and adaptation	32
vi.	Sustainability and regional crop planning	10
vii.	Big data and machine learning in agriculture	11
viii.	Extension, advisory services and FPOs	11
ix.	Traditional knowledge systems	6
	Total	180

Overall, the area of Technology and Sustainable Agriculture has seen many publications, as evidenced by the table. Indeed, the volume of output is impressive. In what follows, we focus only on a few key studies from each of the sub-themes and highlight the major focus, activities, and outputs from these, with suggestions for improvement and further research. We also note that although the papers are classified by theme, many are crosscutting in nature. Furthermore, while the emphasis is on the period from 2018 to 2023, a discussion on important ongoing work has been included.

i. Technology adoption, economic viability and impact assessment

This theme constitutes the mainstay of NIAP's research in the Technology and Sustainable Agriculture area, accounting for nearly 40 percent of the 180 papers published. Under this theme, NIAP research has addressed questions related to the economic viability of (i) new technologies for traditional crops under the threat of climate change, (ii) various emerging technologies, and (iii) relatively under-researched non-crop agricultural activities.

The NIAP research underscores the pervasive risk of drought in Indian agriculture, necessitating resilient farming systems. In an interesting study involving multilevel analysis, the results reveal that drought risk variation stems equally from household-level differences and broader geographical factors, particularly states and villages. This highlights the crucial role of state policies and local institutions in the targeted drought-resilience strategies. At the village

level, strengthening community-based institutions can bridge household and higher-level interventions to ensure effective support distribution.

In the first category, in terms of crop varieties, NIAP research suggests that the adoption of short-duration paddy varieties (PR 126, PR 131) can extend post-harvest windows for better straw management with potential economic and agronomic advantages. Similarly, climate-resilient wheat varieties (PBW 826 and PBW 766) have good potential to yield substantial economic benefits. In oilseeds, where India's dependence on imports continues to be high, NIAP research highlights the role of rapeseed mustard, as it is highly adaptable to diverse agro-climatic conditions. Among the various improved varieties, Giriraj is the most popular, covering nearly 15 percent of the mustard area. This research highlights the need to strengthen the seed supply chain and continue investing in research and development, especially for developing disease- and pest-resistant varieties and those that can tolerate higher variations in climatic conditions.

Examples of research in the second category include the impact of Direct-Seeded Rice (DSR). NIAP research suggests that DSR technology offers the promise of reduced labor and irrigation costs without compromising yields. Their estimates suggest that the adoption of DSR could generate ₹43,436 crore in economic surplus by 2035. Another example is an analysis of the returns to a mobile app providing information on weather and pests to grape-producing farmers in Maharashtra, reporting a very high (>300 %) internal rate of return. The third example is a study on solar dryers intended to extend the shelf life of apricots, developed by CAZRI. The analysis suggests that ₹1 lakh capital investment is needed for the solar dryer and ₹1.2 lakhs annually to process 1 metric ton of fruit, which is unaffordable for small farmers, limiting its adoption.

In the third category, NIAP has also expanded its research portfolio by including the analysis of fisheries, dairy, poultry, and livestock farming. For example, improved breeds (Vanaraja poultry and Frieswal cattle) can significantly boost the productivity. Similarly, vaccines for small ruminants show extremely high benefit-cost ratios of 19:1 and can help prevent substantial losses, ranging from ₹4,235–9,375 crores. There are more than 13 papers dealing with various aspects of fisheries in various parts of India, including the northeast and south. NIAP analyzed the economics of lumpy skin disease in cattle following the outbreak in 2022, and their research demonstrated that investing in the prophylactic vaccination of animals prevented economic losses several times higher in magnitude than the cost of the vaccine.

Each of these papers has concrete suggestions for policy, some of which are also included in the policy briefs prepared by NIAP.

Suggestions for further research: NIAP has contributed significantly to bridging research gaps in novel technologies, fisheries, dairy, poultry, and livestock. The main methodology employed in many of the studies in this theme is the estimation of economic surplus, with a focus on quantifying social and private benefits/costs, benefit-cost ratios, internal rates of return, and related metrics. This approach highlights the high profitability of these technologies and makes the case for increased investment in research and development. However, while economic surplus calculations are useful to start with, there is a need to go beyond this model. The economic surplus approach may not adequately capture all the value-added that occurs during the entire value chain. Explicit accounting for impact pathways, especially the use of green accounting methods where appropriate, in addition to the recognition of any negative externalities caused by new technologies, could be documented. Causal methods may be used as they help enhance the rigor of the studies conducted. The QRT notes that several research papers have started using these techniques (as exemplified by their study on cage farming), but these could be developed further and given a stronger methodological footing.

However, it is necessary to address other questions. While NIAP's work is recognized by most institutions, the adoption of various technologies has not been widespread among farmers, despite highly favorable economic outcomes. In the case of DSR, NIAP and other agronomy-based research have pointed to the constraints posed by weed management as a major reason for the difficulty in upscaling DSR technology. NIAP may augment its impact assessment work by focusing on understanding the binding constraints to the adoption of various technologies. Although several constraints are noted, it would be useful to analyze which constraints are more binding than others and whether there are synergies such that some constraints need to be jointly addressed for a meaningful impact.

There are no state- or national-level estimates of the uptake of various technologies. NIAP can contribute to the measurement agenda by providing methodologies and estimates of adoption at the state or national level of DSR rice, mobile apps, or other novel technologies being developed and disseminated by the government.

NIAP is commended for initiating several studies on fisheries. A suggestion to build on this work further is, for example, the tradeoff between encouraging

capture fisheries in common pool resources and aquaculture with ascribed property rights, which may be an area to explore further. There are questions related to the tragedy of the commons that could be addressed. It would also be useful to bring these analyses to a broader audience in agricultural economics, rather than in specialized outlets that are specific to fisheries.

In addition, as many technologies are scaled out by the government, NIAP may go beyond studies based on selected states and regions and consider large-scale and long-term impacts. This will require careful attention to the nationally representative sampling strategies. NIAP may focus on selected technologies and engage in partnerships using its network to evaluate the impact on scale.

ii. Conservation agriculture, ecosystem services and carbon sequestration

The overall research objectives of this theme are to quantify the extent to which various conservation agricultural practices can help sequester carbon. At least two meta-analyses have been conducted to this end. One meta-analysis based on 295 experimental studies covering various sustainable agricultural practices found that most, though not all, of these practices had a positive impact on soil organic carbon. Among these, the application of biochar and integrated nutrient management had higher carbon sequestration rates than other practices. For example, biochar application had an average sequestration rate of 3.27 tons of carbon/ha/year, suggesting its potential to generate additional revenue through the sale of carbon credits. A unique aspect of this study is its focus on the effects across various agro-ecological conditions and time durations. An earlier meta-analysis also found substantial water savings from the adoption of conservation agriculture.

The NIAP has also undertaken a study on the relatively under-researched biochar application. This study (yet unpublished) considers a small sample of farmers and focus group discussions in three states. It finds a relatively modest impact on yields, with differences based on soil types (higher in acidic and sandy soils).

Suggestions for further research: These studies have clear implications for targeting various sustainable and conservation agriculture practices. Given the results on the lack of substantive yield advantage of such practices, payment for ecosystem services may be a useful way to encourage adoption by making these practices economically viable for farmers. The Government of India has recently announced a framework for a voluntary carbon market (VCM), with a specific focus on enabling small and marginal farmers to benefit from

carbon trading, which can enhance the adoption of conservation agriculture practices, especially when yield improvements are not very high. However, given the size of operations of small and marginal farmers, there may be practical challenges in implementing the VCM framework. This is due to the appropriate pricing of carbon credits and challenges in the transparent verification of eligibility. Given the fragmented nature of holdings, some form of aggregation may be necessary to operationalize the functioning of such agricultural markets. NIAP may contribute to developing appropriate tools for the measurement of carbon credits and setting the gold standard by which validating agencies may be expected to operate and ensuring that such payments for ecosystem services do not disproportionately favor large farmers, contributing to an increase in inequality.

As was the case with the previous theme, while the analyses are largely based on social costs and returns, a deeper examination of why, despite high private returns, adoption of these practices has been limited may be useful, and some suggestions are provided on how to internalize the substantial social benefits and translate them into private benefits.

iii. Irrigation and water management policies

Under this theme, various aspects of irrigation were considered. These include conflicts arising from drought, poor quality of canal water delivery, and increased cropping intensity in the Eastern Yamuna Canal region that employs conjunctive use (canal and groundwater) irrigation, and the impact of participatory irrigation management on water that was associated with an improvement in food grain productivity. Another study found substantial water savings and increased productivity (more drops per crop) benefits that can be derived from the adoption of sprinkler irrigation in the drought-prone regions of Bundelkhand. This, in turn, translates into lower diesel consumption. Three of the 17 papers dealt with tank irrigation, which is likely to require greater policy focus as it is a natural recharge structure. One paper based on the Anantapur district in Telangana notes that the actual command area of tanks is a small fraction of the potential and that cement channels (rather than earthen ones) and improved water management techniques can help improve the utilization of tank water. Another point to the substantial benefits of tank rehabilitation is the recommendation to upscale such efforts.

There are also three policy papers on irrigation. An analysis of micro-irrigation schemes (policy paper no. 36) highlights the differential implementation and operational procedures with respect to various micro-irrigation schemes across states, despite having common guidelines. The study estimated that over 70 million hectares could be brought under micro-irrigation, leading

to improvements in water-use efficiency. An analysis based on a primary survey of over 1500 farmers points to the high capital costs of installation and lack of knowledge regarding appropriate agricultural practices, including those related to fertigation, as major constraints to increased adoption. Farmers (adopters) with higher returns were able to increase the area under cultivation and diversify their cultivation. A subsequent study (policy paper no. 46) focuses more specifically on solar irrigation and its bundling with micro-irrigation. While the adoption of solar irrigation is expanding rapidly, its adoption is limited to a few states. It notes that the substantial capital costs associated with the installation of solar energy panels act as a deterrent to widespread adoption despite the substantial subsidy offered by the state and central governments. It was observed that there is potential to save nearly 65 billion cubic meters of groundwater. However, the experience so far suggests that the adoption of micro-irrigation could not prevent the continued decline in groundwater tables (based on estimating an average treatment effect on the treated), although improvement in farmer welfare has been observed. The analysis is augmented by primary data collected from farmers in several states that sheds light on the irrigation practices for each crop and the respective water requirements after accounting for rainfall. Another recent study (policy paper no. 43) examined the consequences of regulating groundwater withdrawals for irrigation. It examines whether Acts (such as the Subsoil Preservation Act) that mandated the delay in sowing and transplantation dates for paddy have been effective in curbing groundwater use. Using synthetic control methodology and data from Punjab and Haryana, this study finds that the regulations had no impact; if anything, the impact was perverse. This study points to several alternative ways to conserve groundwater while protecting farmer welfare, particularly that of small and marginal farmers.

Another study addressing the overexploitation of groundwater in Punjab investigated the optimization of cropping patterns and the introduction of volumetric pricing. It finds that optimized practices can modestly conserve water and raise incomes. Reducing rice cultivation, which is intensive in its use of groundwater, requires pricing that reflects environmental costs. NIAP research shows that differentiated pricing (₹2/m^3 incentive) could reduce the rice area by 23% compared to the relative ineffectiveness of uniform pricing. However, metering infrastructure is a prerequisite for implementation. Furthermore, the proposed Water Allotment Rights (WAR) of 4488 m^3/ha may offer a starting point, but stakeholder input remains vital for equitable implementation. Volumetric pricing must be paired with broader technological, agronomic, and institutional changes to be successful.

Suggestions for further research: There is scope for methodological improvements in some studies. For example, in the analysis of participatory irrigation management, a difference-in-differences approach may have yielded more robust results, avoiding some of the limitations of the before-and-after methodology. Second, while there is a push for micro-irrigation, its uptake is restricted to southern and western states. The NIAP may consider whether there are externalities arising from the adoption of micro-irrigation in these areas, in the form of Jevons' paradox, while simultaneously improving overall farmer welfare. Relatedly, it may be considered why the adoption of micro-irrigation remains a challenge in the northern states. Third, the NIAP research points to the need for a multi-pronged approach to reducing water consumption in states such as Punjab. Future research may focus on the optimal package of interventions that can address groundwater depletion in this state and do so in a feasible and implementable manner.

iv. Mechanization and crop diversification

Two papers on mechanization documented increased reliance on mechanization over time in selected regions/crops, elasticities of substitution, and productivity. They also documented that mechanization is greater on larger farms. This is one of the few studies that consider equity, as custom hiring services (CHS) are one way for small farmers to avail themselves of the benefits of mechanization. This study is also notable for comparing government-supported CHS with those performed by independent providers.

The other six papers dealt with crop diversification, which is increasingly seen as an adaptation mechanism to deal with climate change-induced uncertainty and resource depletion, especially groundwater and soil health. NIAP research demonstrates that crop diversification significantly mitigates productivity losses from rainfall deficits and heat stress, particularly in the case of severe shocks. The benefits of adaptation are more pronounced in the long term, highlighting the role of diversification in building climate-resilient farming systems. In Odisha, their research notes limited diversification despite high cropping intensity and recommend that water saving and short duration varieties can improve resource use efficiency. Another important contribution is the analysis of the trade-off between risk and returns in crop diversification. Poorer farmers see crop diversification as a risk mitigation strategy, but this diversification is towards staple food crops, which are known to have lower-yield risk. This research highlights the need to identify such risk-mitigating crop varieties that have the potential for high returns and are suitable for marginal and small farmers.

Suggestions for further research: On mechanization, NIAP may expand its emphasis and try to understand the nature of the substitution between mechanization and labor against the backdrop of higher surplus labor and high underemployment in rural areas. Furthermore, in terms of equity, the rapid expansion of hire services is thought to improve equity. Is this the case? A gender lens may also be useful here, especially given the current debates over the trends in female labor force participation. Regarding crop diversification, further research on the nature and extent of crop diversification across various size classes of farmers in different parts of India may be useful. Such research may seek to analyze equity consequences in the risk-return tradeoff, as well as the water footprint enabling fostering diversification in favor of high-value crops (with higher returns and crop water demand). This research will gain importance given the increasing land fragmentation over time, with a greater share of small and marginal farmers and holdings.

v. Climate change impacts and adaptation

Several features of NIAP's research in this area are notable. One study, using a fixed effects approach, highlighted significant climate-yield relationships in the Indo-Gangetic plains and demonstrated how increases in rainfall/temperature affect various crops. For example, in Kharif, higher rainfall increases paddy yields but lowers maize, with no effect on pearl millet and cotton. Excess rainfall harms paddy, pearl millet, sugarcane, and chickpea but benefits maize, wheat and mustard. A 1°C rise in the minimum temperature reduced the yields of paddy, maize, and cotton but increased those of pearl millet. In contrast, higher maximum temperatures reduced the yields of paddy, maize, and pearl millet, while slightly increasing that of cotton. During rabi, rainfall helps chickpea but hinders mustard, while wheat is unaffected. In contrast, a 1°C rise in the minimum temperature reduced the wheat and mustard yields but improved those of chickpea. These findings underline the need for crop-specific adaptation—climate-resilient varieties, optimized sowing, and targeted irrigation—to protect food security from climate change. The implications of this study are to accelerate breeding for heat- and drought-tolerant varieties.

A related study examined how rising temperatures under climate change affect Indian agricultural land use by altering the comparative advantages of crops. Findings show yield declines of 1.8–6.6% (medium term, 2041–2060) and 7.2–23.6% (long term, 2061–2080) under RCP 4.5, with modest land-use shifts (area shares drop by 0.1–0.4 pp medium term, 0.4–1.3 pp long term). The limited land-use adaptation potential underscores the need for alternative strategies, such as stress-tolerant crop varieties, climate-smart practices, efficient resource use, and formal insurance to mitigate risks.

Another study of six districts in three states noted that the impacts of climate change differ between men and women. Using IPCC vulnerability metrics, NIAP research shows that women are consistently more vulnerable to climate change than men because of higher exposure and lower adaptive capacity. Their findings highlight the need for gender-responsive policies to bridge adaptation gaps in drought-, cyclone-, and landslide-prone regions.

Other studies on this theme have examined various adaptation strategies. For example, irrigation, input adjustments, and crop-livestock diversification reduce negative growth effects. Irrigation and diversification are the most effective strategies against droughts and heat waves, but their efficacy decreases with an increased frequency of hazards. Adaptation benefits are more pronounced in the long term, highlighting the role of diversification in building climate-resilient farming systems. Livestock and fertilizer management offer moderate benefits, especially under frequent climatic stress. Furthermore, while both irrigation and insurance reduce income risk, irrigation is more effective, except in high-rainfall areas. Another adaptation strategy is institutional credit, which enhances productivity and reduces downside risks. NIAP research demonstrates this but also notes that smallholders face exclusion due to lending bias. Reforms should prioritize climate finance, blended credit products, and innovative collateral mechanisms to improve access for marginalized farmers to these resources. Similarly, insurance is another way to mitigate the downside risk of climate change.

***Suggestions for further research**:* NIAP has already built a strong foundation in this area; however, it is suggested that further research be more forward-looking. Given the impacts of climate change depending on crops and regions, NIAP may propose a network project that suggests a set of interventions, including payment/valuation for ecosystem services across various agro-climatic zones (for which pricing may need to be adjusted) and examine how effective these are in helping farmers cope with climate change. In addition, regions and crops that have not yet been studied, especially fragile mountain and hill agro-ecologies, may be considered for research. It is noted that a comprehensive agricultural development policy framework for the mountain areas with their unique agro-ecologies with sharp variation in micro-ecologies does not yet exist; therefore, NIAP may take the lead in addressing this immediate concern.

vi. Sustainability and regional crop planning

Much research in this area has revolved around developing indices that can capture various dimensions of sustainable agriculture. For example, a

Composite Index of Agricultural Sustainability (CIAS) was developed using 51 indicators spanning ecological, soil/water health, and socio-economic dimensions. Benchmarks were set using scientific logic, expert input, and government targets to assess absolute sustainability. This study highlighted the role of mono cropping (rice/wheat), excessive agrochemical use, and limited forest cover in contributing to reduced sustainability. Similarly, an Agro-ecosystem Diversity Index (ADI) was developed using 20 sustainability-relevant indicators to assess diversity at the landscape, species, and genetic levels. This index evaluates agro-biodiversity threats and societal responses, providing insights into conservation strategies. Another example is the multi-objective crop and livestock allocation model (MOCLAM) that was developed for Bundelkhand, a drought-prone region in Central India. The objective was to provide guidance on how to enhance input efficiency, boost income, and reduce water use and environmental impacts by optimizing crop-livestock allocation through a quasi-dynamic framework. Their results show that micro-irrigation and better sowing techniques can double water savings without reducing profits, especially if farmers are incentivized to grow water-efficient crops such as sesame. The study also calls for incentives to promote agroforestry for its environmental and economic benefits.

Suggestions for further research: While going through the work conducted, one question that arises is how to translate the implications of this research into action. One policy brief attempts to address this by asking what policy interventions are needed to incentivize farmers to adopt environmentally friendly practices. The authors propose repurposing agricultural subsidies towards payment for ecosystem services. This is a welcome proposal and has the advantage that it may be easier to sell to farmers. However, more research is necessary on the specific ways in which such repurposing can be undertaken, especially regarding the green credit program. Given the regional and crop specificity of sustainable practices highlighted by NIAP's research, it would be useful to develop a set of principles that can be applied to tailor context-specific recommendations. There are some natural synergies with the research recommendations provided in the previous theme.

vii. Big data and machine learning in agriculture

Most papers in this area are in the domain of agronomy and focus on predicting the risk of various diseases and stages of plant growth in wheat and soybean. Another study used geo-climatic features along with expert opinion to determine the suitability of cultivation of various crops in Haryana. These results suggest that millet and sorghum can be promoted in this state based on their suitability, whereas rice is not suited for cultivation in most

of Haryana. Once again, this analysis relies on agro-ecological suitability, and not on economic incentives and farmer decision-making.

Suggestions for further research: There are increasing applications of machine learning techniques in areas related to economic evaluation, marketing, price formation, and so on. A good review of these areas is in the chapter on Machine Learning Applications in Agriculture by Baylis, Heckelie, and Storm that appeared in the Handbook of Agricultural Economics. NIAP may focus less on agronomy applications and instead address more policy-related questions. There is also a need for machine learning techniques used in conjunction with geospatial data to analyze several research questions in the areas of water use, the role of infrastructure, and overall productivity. Many of these are in the public domain and are open-source. NIAP may also play a major role in ML benchmarking exercises in agriculture, an area in which expertise is somewhat lacking. If necessary, it is recommended that the NIAP hire research staff with expertise in machine learning and/or geospatial data.

viii. Extension advisory services and Farmer Producer Organizations

Two overall issues have been taken up for study: the first has to do with farmer producer organizations and their effectiveness in special cases, including turmeric and poultry. One study suggested that price differentials, value addition, and marketing are key determinants of the success of FPOs, while delayed payment schedules (relative to those obtained from local traders) and other collective action issues are the main constraints. The second sub-theme deals with the effectiveness of information and skill development programs in improving output. One study points to the fact that over 90 percent of cotton farmers in two districts of Maharashtra reported the need for information on pest and disease management. Television and village-level extension workers were the primary sources of information for these farmers, suggesting a wide gap between the needs of farmers and the way to meet them. Access to formal information was associated with a modest increase in the output.

Suggestions for further research*:* The sampling strategies employed in many of these studies may need strengthening. Further, while impact analyses of technologies are commonly undertaken, there are few if any analyses of impact of alternative sources of extension or quality information provided to farmers are done/ or taken up. NIAP may expand its research in this domain so that scalable policies of extension and collective action may be formulated.

ix. Information networks and indigenous Traditional Knowledge (ITK) systems

The Agricultural Information & Knowledge System (AIKS) plays a pivotal role in integrating farmers, researchers, agricultural educationists, and extension workers to enhance the dissemination of information and application of agricultural technologies. Between 2018 and 2022, six research papers were published, focusing on various aspects of agricultural knowledge exchange and traditional practices. Much of this research has focused on the structure and diversity of social networks. In the context of smallholder dairies, NIAP research has shown that in Kerala, stronger and more interconnected networks facilitate information flow. Another paper on Kerala shows that the Network of Akathethara emerged as a model to emulate due to its robust horizontal and vertical linkages, community governance, and peer-to-peer learning. Despite formal institutional dominance, grassroots actors were active information hubs, and the integration of formal and informal networks enhanced sustainability and innovation. This calls for strengthening both formal and informal network.

As far as ITKs are concerned, one study documented locally used ITKs for managing crop pests and livestock ailments in Uttar Pradesh. These include neem-based pest control and herbal livestock treatments that are eco-friendly, effective, and passed through oral traditions. Another study stressed the urgency of preserving knowledge regarding the association of Biotic Factors with Indigenous Knowledge of Rainfall Prediction. Another study compiled and evaluated traditional practices for fodder management and animal healthcare. The key takeaway from this research is that many ITKs are ecologically sound and could be integrated into modern practices after due validation.

***Suggestions for further research**:* NIAP may build on this work by documenting ITKs across agro-ecological zones and suggesting promising ITKs for their validation. It would be useful if sampling frameworks were based on older farmers as they are more likely to be repositories of this traditional knowledge, and that there be adequate representation of older women in these surveys as they are similarly likely to know more about food preservation that maintains nutrient content. The NIAP may explore the role of public-private partnerships in agricultural knowledge dissemination. This research may focus on gender-inclusive and community-led governance models and develop policy frameworks that recognize ITK systems as a legitimate pillar of sustainable agriculture.

Overall recommendations

i. The QRT suggests that NIAP focuses on increasing the quality of its research output by publishing in either Scopus-ranked or higher-ranked NAAS journals. Across all research areas, more than half of the research was published in journals with a NAAS ranking of less than 6. There may be a quality versus quantity trade-off here, and the QRT urges NIAP researchers to target more impactful journals and publications.

ii. Relatedly, the QRT recommends that all its peer-reviewed research outputs be made available on its website, with doi links. ICAR may also facilitate access to NIAP's research by ensuring free access to articles that may otherwise have a pay wall.

iii. The impact assessment research, integral to NIAP's mandate, could be strengthened by placing less emphasis on the economic surplus approach and more on newer approaches, including but not limited to causal inference. This will include analyses of constraints to adoption at scale and assessment of the impacts of scale. NIAP can lead to a transformation of the approach of looking at impact only ex-post, as has been the case so far, to making a case for integrating impact assessment into all deployments of scalable technologies and practices.

iv. Continue to strengthen work on payment for ecosystem services, with policy suggestions for how these may be operationalized, given the small scale of much of Indian agriculture. A network project may be a suitable forum for this type of research.

v. Consider exploiting process indicators using MIS platforms already extensively used by the GoI to assess questions of impact. A step in this direction has already been taken, as evidenced by the paper on the Farmer First Program (FFP). As increasingly granular information becomes available digitally (on government portals) on beneficiaries under various schemes (including solar energy, micro irrigation etc.) The NIAP may want to develop expertise in exploiting this rich data (involving lakhs of records) to see where there may be bottlenecks to adoption.

vi. NIAP is also uniquely positioned to define policy priorities for what is being termed the increasing digitalization of agriculture. The potential for making plot-specific recommendations for improved productivity is promising, and NIAP research can play an important role in prioritizing digital tools that require policy emphasis and intervention.

vii. Another area where NIAP may strengthen its research is equity. Many papers from NIAP highlight the disproportionate share of large farmers in the adoption of improved agricultural outcomes, but more explicit

attention to any potentially adverse distributional consequences of technology and the way it may be mitigated is warranted.

viii. Similarly, NIAP's research on gender in agriculture could be strengthened. There are two aspects: one from the side of labor markets, given the increased participation rates of women that have been reported recently, and second from the fact that welfare effects from several technologies may not be gender neutral. Nothing exemplifies this better than the tradeoff between irrigation and domestic water use in rural areas. It would be helpful if NIAP can mainstream gender in much of its research, in addition to undertaking gender-specific research.

3.1.2 Agricultural Markets, Trade and Institutions

This section highlights the achievements of NIAP in terms of research publications related to the theme of 'Markets, Trade, and Institutions' and identifies possible improvements in methodology and other aspects.

Achievements and Assessment

A summary of publications under different sub-themes is provided in Table 3.2.

Table 3.2 Research publications: Markets, Trade and Institutions (2018-2023)

S. No.	Theme/ Sub-theme	Research publications	Policy Papers/ Reports *etc.*	Total
i.	Agricultural markets, prices and value chain	40	-	40
ii.	Agricultural Trade	10	2	12
iii.	Institutions and Policy	-	4	4
	Total	50	6	56

As can be seen, there were 56 publications during the period from 2018 to 2023, of which 50 were research publications appearing in journals and other academic fora. This is quite impressive and encouraging for future research. A detailed sub-theme-wise list of publications has been provided by the NIAP. About 31 of these articles, for which functional links to soft copies were available, were carefully reviewed. A summary of the review is presented in Table 3.3.

Table 3.3 Summary of research studies under Markets, Trade and Institutions

S. No.	Broad Group	Components	Methodology	Major findings
1	Food processing sector	Productivity and technical efficiency in bakery and cotton textile sectors	Stochastic frontier function	TFP is driven by technological progress
2	Dairying	Supply response in Indian dairying		Non-price factors more important than price factor
3	Vegetables	Price volatility	Time series econometric methods	Market power of intermediaries
4	Cereals	Macro market outlook of wheat		Wheat surplus during 2020-30
5	Fruits	Micro study of two Rajasthan districts for two kinnow and aonla	Growth rates and tabular analysis	Cartelisation among traders
6	Dairy	Value chain analysis	Multinomial treatment effect model	Food safety compliance is positively associated with profit
7	Fisheries	Micro study of Ratnagiri District of Maharashtra	Rank-based quotient (RBQ) analysis	Transportation cost and infrastructure main constraints
8	Sugar	Macro study on technical efficiency	Stochastic Production Frontier (SFA) approach	Decreasing returns to scale in sugar mills Best practices in technology, policy and institutions needed.
10	Demonetization policy	Micro study in 3 villages of Haryana	Stakeholder consultations	Better awareness about digital payments system is needed
11	Policy	Market access and price policy on crop choices	Econometric methods	Greater market access promotes specialization in less risky crops, away from pulses and oilseeds towards cereals and vegetables
12	Crop choices	Transportation and communication networks	Econometric methods	Farmers' access to transportation itself is not sufficient but is more effective when combined with provision of market information

S. No.	Broad Group	Components	Methodology	Major findings
13	Indian food processing industry (FPI)	Macro study using industry-level data.	Capital intensity, financial performance and employment potential	Employment growth is not appreciable as compared with the output growth
14	Marketing	Transaction time, price discovery, market competition of e-tendering in Karnataka	logit model	Largely successful but in some cases traders' resistance stalled the progress
15	Black pepper market	Price volatility	Volatility measures: Heckman endogeneity adjustment model	Contractual arrangements were alone were not sufficient to protect from volatility
16	Onion market	Market linkages,	Vector auto regressions (VAR)	Lasalgaon, Pimpalgaon, Bangalore and Solapur are the major markets transmitting price signals to major consuming and producing markets.
17	Onion market	Price triggers and responses	Impulse response functions (IRF)	Diversification of production and stabilization through stocks
18	Turmeric	Value chain analysis in North-east India	Factor share and, cost and returns analysis	Better processing and marketing facilities needed
19	Organic chilli	North-east India	value addition analysis	Technological interventions would add value to the local cultivars
20	Large Cardamom in Arunachal Pradesh:	Producer surplus	Value chain analysis	opening market yards, establishment of storage with training to youth
21	Input markets	seeds, pesticides and fertilisers.	Policy analysis	Lack of quality seeds and technology policy deficit; low innovation and R&D in pesticide sector, and subsidy issues in fertilizer sector.

S. No.	Broad Group	Components	Methodology	Major findings
22	Sugar	Supply, demand and prices	Simultaneous equation model (3SLS) using time-series data from 1970–1971 to 2013–2014	price of sugar affected sugar supply positively and demand negatively.
23	Sugar	Effect of price and non-price controls on prices and technological change	Autoregressive distributed lag models (ARDL)	In the long run, sugar price is significantly influenced by the recovery rate, beginning stock, jaggery price and per capita income.
24	Edible oil imports	Ex-ante effect of protective tariffs	Three-sector open-economy Computable General Equilibrium (CGE) model calibrated to 2017-18 SAM	Tariff protection improves production of oilseeds and edible oil but needs to be complemented with technology
25	Food security	Food security implications of Ukraine war for India	Tabular analysis	
26	Coffee	Performance of coffee exports in post-WTO era	Growth rates and trends; Transition Probability Matrix; Markov chains	International price, exchange rate and lagged production are major determinants of coffee exports
27	Fisheries	Exports to China	Simpson Index of Diversity (SID); unit value realization (UVR) and revealed comparative advantage (RCA)	India has a strong comparative advantage in frozen fillet meat mince, crustaceans and frozen fish
28	Horticulture	Export advantages	Revealed Symmetric Comparative Advantage (RSCA) and Trade Balance Index (TBI); modified QS-test (QS), Friedman-test (FT) and seasonal dummies	Cucumbers/gherkins, onions, preserved vegetables, fresh grapes, shelled cashew nuts, guavas, mangoes, and spices are the most favourable horticultural products

S. No.	Broad Group	Components	Methodology	Major findings
29	Rice	Virtual water trade and comparative advantages in rice exports.		Shifting rice cultivation based on demand–supply gap, groundwater exploitation, productivity growth and untapped productivity potential
30	Policy analysis	Impact of the export promotion policy	Social accounting matrix (SAM) multiplier model	Exports of unprocessed foods would be more useful based on SAM 2007–08 and processed foods-based policies will be more useful in 2012–13 (SAM).
31	India-EU trade in agriculture	Composition of trade, growth and instability	Compound Annual Growth Rate (CAGR) and Cuddy-Della Valle Index (CDVI) for instability	Trade between India and the EU has increased consistently

Note: Names of the studies are listed in Appendix VIII (A)

The studies spanned several sectors of agriculture, such as crops, dairying, horticulture, fisheries, and food processing. The analysis in these studies focused on various aspects, including but not limited to, productivity and technical efficiency; supply response; price volatility; value chain analysis; determinants of crop choice; capital intensity; financial performance; input markets; trade and tariffs; war and policy. The scope of the studies was broad, from the macro-level issues of market outlook, technical efficiency, market access, and transportation and communication to the micro-aspects of profitability, supply response, and price volatility at the individual crop level. The studies used varied methodological tools, including simple tabular analysis, stochastic frontier functions, time series econometric methods (VAR, VECM, IRF, ARIMA, ARDL, etc.), multinomial treatment effect model, RBQ, SEM (3SLS), CGE models, and some trade tools like RCA, RSCA, SID, and TBA. From this diverse body of work, NIAP has drawn some important conclusions and implications that can be useful for policymaking.

The above research on markets, institutions, and trade is quite comprehensive and generally of good quality. The results of these studies should be useful for policy formulation and its implementation. However, there are a few directions, particularly related to research focus and methodological aspects, in which improvements can be made. Based on the foregoing review, a few

important recommendations for improvement are provided below. These are followed by specific suggestions for a few studies in Appendix VIII (B).

Overall recommendations

The research publications of the NIAP on this theme are generally of good quality. However, there are a few areas where improvements can be made.

i. Almost all research has focused on the supply side aspects of agriculture. There is very little research on the demand-side aspects, such as farmers' income, food economy, stocks, and inter-sectoral linkages of agriculture for rural development. Since NIAP is focused on policy research, it may be necessary to pursue research in all these directions because agriculture is at the core of and is closely linked to all these themes.

ii. Most of the research is *ex post* analysis. It would help policy formulation if a few *ex-ante* studies were conducted, particularly related to the requirements of farmers and other stakeholders. In addition, *ex-post* policy impact assessment studies need to be undertaken.

iii. Methodologically, most research on this theme uses time-series econometric methods. Only a couple of studies have used structural estimation methods such as SEM. In addition, experimental methods, quasi-experiments, etc., are missing from the tool kit.

iv. Although time series techniques are useful for forecasting, structural methods can provide good insights into policy formulation. Structural methods can be useful for informing macro policy, and experimental methods can help in the impact assessment of the policies pursued.

v. Even within time-series econometric methods, the techniques used are mostly univariate in nature. Very few studies have used multivariate and multi-equation techniques such as the VECM and M-GARCH.

vi. There is very little research on institutions related to agriculture, food, and the rural economy.

vii. For a more diversified and well-rounded research portfolio and to improve methodological rigor, one approach is to pursue more collaborative research with institutions such as IGIDR, IEG, Delhi School of Economics, ISEC, CDS, and MSE.

3.1.3 Agricultural Growth and Development

Achievements and Assessment

During the reporting period of 2018-2023, 31 studies were published on the broad theme of 'Agricultural Growth and Development.' This includes 27 papers published in various peer-reviewed national and international journals,

2 books, and 2 Policy Papers. They can be grouped under six sub-themes, as shown in Table3.4 below:

Table 3.4 Research publications: Agricultural Growth and Development (2018-2023)

S. No.	Theme/ Sub-theme	Number of publications
i.	Agriculture – growth and sectoral issues	11
ii.	Agricultural infrastructure	3
iii.	Livestock sector	2
iv.	Labour market and employment	9
v.	Food and nutritional security	2
vi.	Rural development	4
	Total	31

Most of these studies address empirical and policy issues of interest to a wide audience. To the extent that the focus has been on empirical/policy issues, the papers are easy to read and hence are accessible to both academic and non-academic readers. A flip side to this is that the journals wherein these studies have been published are not high ranked in general. These studies used a variety of datasets drawn from diverse sources. These include,

- Official datasets such as the National Accounts Statistics, various Rounds of National Sample Surveys, Cost of Cultivation surveys, and data from various ministries (Agriculture, Labour, Transport, Power, etc.).
- Proprietary data from other agencies, such as the Center for Monitoring Indian Economy (CMIE), and datasets developed/maintained by universities.
- A few primary surveys were conducted by the authors of these studies.

In the context of the theme "Agricultural Growth and Development" reliance on secondary datasets is quite natural and cannot be considered a shortcoming of these studies. An unintended consequence of using secondary datasets is that their limitations are often the constraining factor that determines the questions that can be researched. This critique applies not only to the studies conducted by NIAP but also to all studies relying on secondary datasets published by researchers in any institution.

In terms of the methodologies used in these studies, most of them use simple econometric models, mostly linear regressions, fixed-effects models, probit/ logit models, etc. A few of them use time-series methods and machine

learning models, while others are descriptive in nature. There are also one-off applications of various other methods, such as spatial correlations, decomposition analysis, and scoring methods, in some of these studies. While there is a rich variety of methods used, the level of application of these methods is simple and quite rudimentary, without taking the analysis to more sophisticated levels or complexity. Consequently, the findings of these studies are more associative in nature than causal inferences. While they serve the stated objectives of these studies, they also act as barriers to publishing in higher-ranked journals.

A summary of the studies conducted so far on each of the subthemes is provided below. Some suggestions are also provided for future studies on related issues. Specific comments on individual studies are not provided here, as they have already been published in journals.

i. Agriculture – growth and sectoral issues

Out of the 11 studies published under the first sub-theme two studies trace the trajectory and sources of agricultural growth and while the rest of them look at various sectoral issues in agriculture especially from a policy perspective[1]. One of the two studies on agricultural growth is a multi-country study on Southeast Asia, while the other is for Madhya Pradesh. A study on Southeast Asia covering Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, Indonesia, Malaysia, and the Philippines found that the pace of agricultural growth and transformation varies substantially across them. The sector is dominated by small holdings, with rice as the main crop in all these countries, except Malaysia. It supports a large proportion of the workforce, even as its share in GDP has declined. This picture is similar to that in India. Agricultural growth has been robust in these countries, especially in low-income countries, where area expansion, technological change, and diversification in favor of high-value crops are the main drivers. In contrast, in high-income countries that specialize in export-oriented commercial crops, agricultural growth has been driven by increases in producer prices and area expansion. The study argues that given land availability constraints and price volatility, these countries should focus on investing in research and extension and diversifying into high-value crops to sustain agricultural growth. Given the similarity with Indian agriculture, these suggestions could also be valid for India.

In the last two decades, Madhya Pradesh has witnessed strong agricultural growth, and the state was the fastest growing in the country for several years

1 There is one study which uses machine learning algorithms to forecast quarterly GDP. This study is included under this sub-theme even though its scope is beyond agriculture per se, and hence for this reasons it is not discussed here.

at the beginning of this century. The study finds three distinct periods in the state's growth trajectory: first, a period of deceleration from 1990-91 to 2002-03, second a period of accelerated growth from 2002-03 to 2009-10, and finally, a period of high growth from 2009-10 to 2014-15. Examining the drivers of growth, the study finds that growth was driven by appropriate developmental policies relating to irrigation, credit coverage, fertilizer usage, and crop diversification. Looking at the district-level performance, the study finds that growth has been unequal across districts, and disturbingly, there is no evidence of growth convergence; rather, the districts are diverging during the past decade. This study argues in favor of focusing on disadvantaged districts.

With India achieving food security in cereals, the country is now focused on improving farmers' incomes and lives. In this context, one study looks at the key challenges, takes stock of those segments of farmers who are particularly disadvantaged and where they are located, and the way forward to improve their economic situation. The study identifies land constraints, small-size farms, growing stress on water resources, increasing frequency of extreme climate events, energy scarcity, pressures on the R&D system, financing small farmers, imperfections in domestic markets, and excessive dependence on agriculture for employment as key challenges. It also identifies small and marginal farmers all over the country, especially those located in the eastern parts of India (Bihar, Jharkhand, Odisha, West Bengal, and eastern Uttar Pradesh) as those who have not benefited from the Green Revolution and various other agricultural missions aimed at improving agricultural output and productivity. They are the ones whose economic conditions have to be improved dramatically. The broad strategy advocated by the study includes greater investment in the eastern region, improving efficiency and diversification to high-value crops to improve farmers' income from agriculture, and diversification to non-farm sources of income. Some specific measures have been suggested, such as improving irrigation reliability and water use efficiency through appropriate technologies, access to seeds of short-duration high-yielding crop varieties, diversification to horticulture and animal husbandry, increasing on-farm renewable energy generation through bio-gas and solar systems, improving domestic market functioning through comprehensive reforms including revisiting the role and method of fixing minimum support prices (MSP), provision of subsidies for fertilizers, water, and electricity, which has resulted in environmental degradation, laying greater stress on technology, and increasing rural non-farm employment opportunities including through greater integration of agriculture with agro-processing industries in rural areas.

Other sectoral studies have focused on some of these aspects in greater detail. For example, one study reviewed the aborted attempt by the government to reform domestic agricultural markets through new farm acts in 2020. Another study examined the socioeconomic impact of retail supermarkets on vegetable farmers in peri-urban areas. Another study examined the issues that affect the impact of research and extension on agricultural performance. Various studies in the Agricultural Development Reports (ADR) also focus on a variety of sectoral issues such as food inflation, achieving self-sufficiency in edible oils, long-term facilitation of agricultural exports, sustainability in Indian agriculture, and improving the effectiveness of farmer producer organizations.

Suggestions for future studies: It is evident from the studies presented in this sub-theme that one can obtain a comprehensive picture of various aspects of Indian agriculture, the challenges, and plausible solutions. By their nature, many of these issues must be frequently revisited to obtain an updated picture of developments in the sector. Here, the ADRs are very useful, and the Institute should strive to publish this report annually. Each ADR may have some chapters that are more in the nature of an annual stock-taking exercise on the developments in the sector, while other chapters can examine specific issues. Here, one may also consider the ADR focusing on a specific theme, with some chapters covering different aspects of that theme. NIAP can also consider inviting external experts to address specific aspects of the theme on which it does not have internal expertise. The theme can vary from one ADR issue to another. Finally, the NIAP should give wide publicity to the ADR through special events, email outreach, and social media to audiences in other universities and research institutions beyond ICAR institutions and agricultural universities.

Some research questions that the Institute can consider pursuing are as follows: More state-level assessments of agricultural growth, its sources, constraints, and potential. State-level assessment of the upstream and downstream inter-sectoral linkages between agriculture and other sectors, especially the agro-processing sector. Spatial spillovers across states in various dimensions, such as price formation, marketing, access to inputs, access to research and extension services, and technologies.

ii. Agricultural infrastructure

In the context of agriculture and rural development, two types of infrastructure can be identified: (a) general or sector-agnostic infrastructure, such as roads, electricity, and communications, and (b) agriculture/livestock sector-specific infrastructure, such as irrigation, storage, and agricultural service centers, such as agricultural extension and animal health services, among

others. Both types of infrastructure are critical for agricultural growth and rural development. Assessing the availability and adequacy of both types of infrastructure is important for identifying the factors that constrain agricultural growth in specific regions. During the reporting period, three studies have been conducted on infrastructure, of which one measures infrastructure adequacy across states, while another looks at the Bundelkhand region. These two studies provide scores for specific infrastructure, such as roads and irrigation, and arrive at a composite infrastructure suitability score. These scores provide a useful snapshot of the situation across states and districts, which helps identify lagging states and districts. The third study examines the impact of infrastructure on livestock sector performance in Uttar Pradesh using regression methods. This analysis shows that extension services, value chain development, and investments in research have a beneficial impact on livestock sector growth and its potential to improve farmers' income.

Suggestions for future studies: Studies on infrastructure adequacy/suitability are very useful. Periodic updates to the infrastructure scores will help track progress in reducing disparities across states and districts within states. Similarly, a study on the impact of infrastructure on the livestock sector would also be useful. Such analyses for other states can help identify gaps in specific infrastructure at the regional level. This, combined with infrastructure scores, can be immensely useful for policymakers. Several questions related to infrastructure can be explored. Apart from measuring the adequacy of infrastructure, it would be worthwhile to know the cost of infrastructure development. Does the cost of developing a specific infrastructure (say cold storage) vary across states, and if it does, what explains the differences? What about the pricing/cost-recovery of infrastructure projects? What is an appropriate cost-recovery mechanism that ensures the viability of the infrastructure project and yet makes its access cheap for resource-poor farmers? Should it be subsidized? What is an appropriate financing mechanism that ensures inclusive access to location-specific infrastructure that can be privately owned, such as cold storage, primary on-farm processing facilities for paddy/cotton, maintenance facilities for agricultural machines, and so on? These are only a sample of possible questions that can be researched and not an exhaustive list.

iii. Livestock sector

Livestock is known to play a crucial role in income generation, poverty reduction, and nutrition security. In this context, the two studies under this sub-theme examine the trajectory of the livestock sector in India and its role in enhancing farmers' income in Eastern India. These studies highlight the various roles played by livestock and the need to understand their

diversity, as well as the objectives of various stakeholders in the livestock sector. They clearly show the need to improve the productivity of the sector and the role of crossbreeds and various other scientific tools in this regard. Furthermore, trained manpower is critical to enhance the quality and safety of various livestock products that have a large export market. In addition, efficient extension services, increasing feed and fodder availability, animal health services, addressing supply chain deficiencies, and using technology to address livestock-induced environmental and climate change concerns are critical for transitioning from subsistence livestock farming to livestock entrepreneurship. These are all the more critical in Eastern India, where 31 percent of the livestock population exists, so that the full potential of the sector to enhance farmers' income is realized.

Suggestions for future studies: Several aspects of the growth and development of the livestock sector remain unexplored. What is the trade potential of various livestock products What are the export markets? What are the specific issues and constraints that Indian livestock exports encounter? In addition, what is the consumption pattern of livestock products across states, which are the supply and deficit states in these products, and what is the potential for inter-state trade in them? What is the market structure for various livestock products, and do the markets exhibit pricing efficiency and convergence? What are the sanitary and phytosanitary issues affecting the sector's growth? What are the regulatory issues affecting the sector's growth in the domestic market?

iv. Labour market and employment

Agriculture continues to be the single largest source of employment in the country. Developments in the labor market have an immense impact on the sector in terms of productivity, cost, and livelihoods. What happens outside the sector often exerts a greater influence. During the reporting period, nine studies have been conducted on this sub-theme, covering trends in agricultural labor markets and rural non-farm employment, wages, and the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).

Studies on the trends in agricultural labor markets and rural non-farm employment clearly highlight the growing importance of the latter in rural areas over a long period. This structural change in the labor market is natural when a country is witnessing rapid economic development. Regarding the factors driving labor into non-farm activities, the study on Tamil Nadu suggests a strong spatial clustering effect along with rising education levels as major pull factors, whereas land ownership is a major factor dampening labor transition. A study on Eastern India finds that non-farm employment is generally welfare-

improving, as it results in higher monthly per capita expenditure. However, those involved in non-farm casual labor do not benefit much.

A study on labor market trends finds that changes in the employment profile in rural areas affect labor costs in agriculture. While one may expect labor costs to decline with a fall in labor use in agriculture, the opposite is seen, suggesting that real wages could be rising. This is confirmed by a study on trends and determinants of agricultural wages in India, though not continuously year after year. This study finds that real farm wages rose faster after the introduction of the MGNREGS. The study finds that nonfarm wages, MGNREGS, net-irrigation proportion to net-sown area, and rural literacy rate have a positive impact on agricultural wages. The study on wage determinants in the casual labor market, however, shows that the return to literacy in terms of wage rate is much higher in non-agricultural sectors and almost nil in agriculture. The study on trends and determinants in agricultural wages finds that, at the national level, the male-female wage differential has remained stable at around 23%-24% over two decades, though there are significant differences across states. Wage inequality has been explored in greater detail in another study. Using the Gini coefficient to measure wage inequality and through a series of regression models, this study finds that wage inequality is less across agricultural operations but more spatially across states. This is especially true for gender in agriculture compared to non-agriculture. In general, women are worse off in agriculture, whereas the opposite is true in non-agriculture. A reverse pattern was observed for males.

While the long-run structural change involving the movement of labor out of agriculture to non-agriculture plays out in the labor market, an important related question is the resilience of non-farm employment to shocks. A recent study examined this question for two policy-induced economic shocks, *viz.*, demonetization and introduction of the Goods and Services Tax (GST), and one exogenous shock, namely, the COVID-19 pandemic. This study concludes that all three shocks manifested as both demand and supply constraints that ultimately resulted in unemployment. Furthermore, the impact was much larger on rural employment than on urban employment, highlighting the need for social protection and employment guarantee programs, such as the MGNREGS. This calls into question the MGNREGP's performance in terms of its stated objectives, especially regarding women's empowerment. This was examined in the Jodhpur district of Rajasthan using a primary survey. This study shows that in the focus district, the programme has been women-friendly and has, by and large, brought benefits to women both tangibly and intangibly. It has provided gainful employment to women, which has, in turn, helped

improve their capacity to invest in better food baskets, children's education, and increased their bargaining power in household decisions. While these findings could be location-specific, they nevertheless suggest that such social protection measures can be beneficial to laborers, especially women.

***Suggestions for future studies**:* At the outset, it should be noted that the methodology used in these studies is largely descriptive and/or with some simple regression models. The robustness of these findings is unclear, and hence they need to be taken with caution, even though they are interesting. From a methodological standpoint, these findings are largely associative; hence, causal interpretations are not warranted. The methodological rigor of these studies needs to be improved. This will also help target higher-ranked journals. However, there are several issues in this sub-theme that may be taken up for further research.

There is plenty of anecdotal evidence of workers in the city heading back to their villages during important phases of the agricultural season, such as sowing and harvesting. The role of such off-seasonal migration to cities and other states remains to be studied. Are there spatial patterns to this phenomenon? What are the characteristics of such labor in terms of gender, socio-economic categories, literacy level, and the nature and sector of employment in the city?? To what extent does such seasonally returning family labor offset the labor shortage felt by farmers? How does this phenomenon affect agricultural productivity and wage levels?

Another important line of research is the linkages between agriculture and other non-farm sectors where rural labor increasingly finds employment. Are there strong inter-sectoral input-output linkages? Are these linkages centered around specific agricultural commodities produced in a region? Can this provide a basis for rural-based agro-processing industries under the one-district one-product scheme?

The impact of the MGNREGS on farm and non-farm wages needs to be studied. Has this program reduced short- and long-term rural-urban migration? These are some of the questions that arise. There could be many more open issues regarding labor markets and employment.

v. Food and nutrition security

Two publications were published during the reporting period for this subtheme. One of them takes stock of the changes in nutrition status over nearly 40 years since the early 1970s and its determinants. It focuses on trends in the intake of calories, proteins, and fats and develops linear regression models to explain the observed trends in these three macronutrients. The findings are

consistent with those of other studies on this topic. The other paper attempts to summarize the literature on measurement issues related to food and nutrition security. In a sense, both these studies take a beaten path and offer little by way of innovation or findings.

Suggestions for future studies: Issues that will be researched under this sub-theme need to be identified and spelled out clearly. However, this is not evident. NIAP studies on this important sub-theme should be cutting-edge and path-breaking in nature. Accordingly, future research should focus on issues that have not been studied extensively. One possible area where NIAP can contribute is in the field of micronutrients. A possible research question could be the following: Is the current output of various food items that are sources of a specific micronutrient (say zinc) adequate to address the full extent of deficiency in the country in that micronutrient, considering consumer preferences? A series of such studies for various micro-nutrients can help identify which micro-nutrient deficiencies can be addressed through the current patterns of agricultural production. This, in turn, can help reformulate agricultural policies to prioritize the production of specific food items required to address micronutrient deficiencies in the country.

vi. Rural development

Under this sub-theme, there are two publications, one on gender issues specifically on gendered and caste-based social norms, and the other on using satellite data and machine learning methods to predict rural poverty. Both papers are interesting and would appeal to researchers in this subtheme. While they may not fit directly into the research mandate of the Institute, they nevertheless bring a different perspective on the problems faced by rural communities. For instance, a study on social norms highlights the role of sociological factors, perceptions of gendered roles, and gendered norms in influencing the effectiveness of agricultural research and development and technology absorption, especially by women farmers. Agricultural economics has traditionally not focused on the role of such factors, except perhaps in passing. Such research in the Indian context is limited, and more studies are needed. Similarly, a study estimating poverty through satellite data and machine learning techniques also brings a new perspective on this issue.

Suggestions for future studies: The role of social norms in various aspects of gendered farmers' decision-making needs to be studied. For instance, how do social norms influence the commercial farming decisions of farmers by gender, their choice of marketing channels, dependence on governmental schemes, access to credit, access to extension services, and their propensity

for some form of collective/cooperative behavior, such as forming farmer producer organizations?

Overall recommendations

As mentioned earlier, the publications thus far have used appropriate but simple methodologies, resulting in largely associative results. While none of the studies claimed the results to be causal in nature, there is a risk of readers, especially non-technical readers, misinterpreting them as causal inferences. Moreover, the empirical nature of the studies and the methodologies used constrain the journals in which the studies are published. Typically, higher-ranked journals require greater methodological rigor. In addition, some of the topics suggested above for future research require the use of other methodologies not used by NIAP researchers in their publications. These include spatial econometrics, input-output/social accounting matrix (SAM) analysis, and computable general equilibrium (CGE) models. As a prerequisite for pursuing studies using these methods, the Institute may undertake an internal exercise to identify skill gaps among its researchers and seek external expertise to train them.

Another area where NIAP needs to work is publicizing its research. First, the publications must be easily accessible on the Institute's website. For this, the Institute's website should always be accessible, which was often not the case. It proved useful for individual researchers to upload their publications on other portals, such as ResearchGate. However, ideally, publications should be easily accessible from the Institute's website. Second, the Institute should systematically publicize its research output through email and social media. Currently, many researchers in universities and research institutions outside the ICAR institutions and agricultural universities are unaware of NIAP's publications. Lack of awareness of NIAP's publications results in reduced citations and impact, which reduces the visibility of the Institute. The Institute can invest in developing and periodically updating a database of researchers and libraries outside the ICAR institutions and agricultural universities and reach out to them for every new publication.

3.2 Capacity Building (HRD): Activities, Achievement and Assessment

Building capacity (human and institutional) for agricultural economics research and policy analysis within NIAP, in particular, and NARS, in general, is one of the three erstwhile mandates of NIAP. Although the presently evolved mandate focuses on three subject matter themes, the critical necessity of capacity building/development of agricultural economists in NARS is still a

widely felt need. Keeping this in view, the NIAP is emphasizing/focusing on strengthening the skills, competencies, and abilities of agricultural economists, social scientists, and research managers to pursue economic analysis of technology investments and policies, research prioritization, and monitoring and evaluation of technologies and other related innovations/programs, thereby strengthening/empowering ICAR in sharpening its technological edge and its greater participation in policy discussions and decision making. Training programs with international institutions of excellence to align ongoing research efforts with national policy requirements may also be a priority.

Achievements and Assessment

During the period 2018-23, NIAP tried to strengthen and update the capacity of NIAP scientists, especially 23 junior and middle-level scientists in 35 national and international training sessions. During 2018-19 to 2022-23 it also deputed three technical and three support staff for three training courses relevant to their theme of work. Furthermore, it has undertaken 155 capacity-building programs, such as teaching activities/student guidance, and supported 64 staff in capacity-building activities, such as attending workshops, lectures, and brainstorming sessions.

As a part of the SCSP (Scheduled Caste Sub-Program), it has organized six training programs involving 149 participants; six nutritional security through Backyard Vegetable Cultivation programs involving 1111 participants in the selected villages of Haryana, Rajasthan, and UP states; and one each on training-cum-goat distribution at KVK, Chomu, Jaipur; a workshop-cum-training for skill development of field investigators under the Project on Database Development for Agricultural Households at ICAR-NIAP and on Innovative Farming at Panipat, Haryana. Under the Policy Lecture Series on Contemporary Issues in Indian Agriculture, NIAP delivered six lectures; under Amrit Mahotsav lectures, eight lectures were delivered; and four lectures on important topics were delivered by eminent speakers of national and international repute at NIAP, New Delhi. All these efforts to build the capacity of staff are important and should continue in greater numbers and relevant topics in the future.

It is also important that NIAP deliver lectures/train scientists/teachers in other ICAR Institutions and SAUs in skills of analysis using the latest and most advanced analytical tools, raising their levels of understanding and interpretation of policy implications of outputs of analysis, and improving access to information and data needed for policy analysis through data mining and other techniques. Presentations by NIAP scientists at conferences, workshops, or symposia, and interaction with participants at conferences will

further contribute to the capacity building of scientists in NARS. In addition, NAIP needs to play a key role in curriculum development and build capacity to deliver the revised curricula for graduate and post-graduate teaching/ training in agricultural economics, climate change adaptation strategies, and risk management. It is also important that technical staff of the Institute may be nominated/deputed to reputed Institutes in India to update them with modern analytical tools and techniques of data analysis and preparing scientific reports. Furthermore, they may also be deputed for good HRD training.

It is satisfying to note that NIAP is collaborating with 20 SAUs/ICAR institutions in areas such as research impact assessment of proven technologies once a quarter for faculties and students, capacity building for PME, assessment of agricultural risk and insurance products, visioning on hill agriculture, and conservation agriculture.

In addition, NIAP is collaborating on the evaluation of the marketing efficiency of horticultural products under network mode and on tracking changes in rural poverty in collaboration with ICRISAT. It is also satisfying to note that during the QRT period, it has developed linkages with CGIAR Institutes like IFPRI, South Asia, New Delhi; IRRI; CIFOR-ICRAF, South Asia, New Delhi; The Biodiversity International, International Food Policy Research Institute (IFPRI), USA, and Cornell University, USA.

Constraints

Adequate human and financial resources remain a constraint. Of the sanctioned scientist posts, three posts of senior scientists and two posts of scientists are vacant. Furthermore, there is no position for managing training programs or a separate Cell in NIAP for planning and execution of training/ CB activities, which was strongly and rightly recommended by the 3rd QRT (2006-2010). Further, the NIAP has no exclusive guest house or trainees hostel. There is no AICRP in agricultural economics subject in ICAR, unlike other SMDs, to strengthen agricultural economics and policy research, including capacity development in NARS. Although ICAR has mandated that agricultural economics and policy research should be operated in network mode, special support for capacity development is missing/inadequate. The capacity development activities in NIAP are also constrained by the lack of adequate infrastructure facilities, such as separate training halls, hardware, and software facilities. As seen earlier (Table 2.7), the budget for CB activities is paltry. Owing to these constraints, CB activities do not receive enough support and remain inadequate or weak.

Suggestions for future capacity-building programmes: The demand for NIAP's capacity-building/mentoring activities to build the capacity of

agricultural economists with a focus on quantitative skills and the scientific rigor required for working in NARS organizations is increasing exponentially. Other social scientists, agro-biological scientists, and research managers also need continuous support in PME techniques, analysis and setting research agenda, policy analysis, visioning and foresight, and strategizing technology commercialization/business activities. All these could be possible if NIAP prepares a five-year strategic plan of capacity building involving regular training programs that are region-specific, focusing on emerging fields like data analytics, impact assessment methodologies with new evaluation methods such as AI-driven, and advanced policy communication techniques at suitable intervals or as when sought. Training programs also need to be regional, which requires resources, scientists' time, and infrastructure. Organizing impact assessment training regularly once a quarter for the faculties and students of NARS may be pursued. A standard tool kit for the impact assessment of technologies and policies by the government may have to be developed. Similarly, short- and medium-term training on agricultural policy, especially for entrepreneurs, start-ups, and CBOs involved in the agriculture sector, may be pursued. Training programs in collaboration with global institutions with whom they can have symbiotic relationships to perform more and more multi-institution studies as well as exchange programs to enable cross-functional and cross-cultural engagements, with an aim to align the research efforts to national policy requirements, may have to be pursued. For this, ICAR needs to adequately strengthen NIAP with financial and human resources to ensure system-wide benefits. A special CB Cell with a 5-year strategic plan should be created with adequate positions of scientists, technical and administrative staff, and sufficient financial resources by ICAR to be provided to NIAP to meet the full cost of training, including the travel cost of participants, training hostel facilities at NIAP, and dedicated guest house facilities. Starting Degree programs on public policy in collaboration with IARI and foreign universities may be explored. NIAP may identify and mentor talented young scientists in NARS by involving them in joint research. The publication of textbooks in agricultural economics and policy should be encouraged. NIAP may regularly organize sessions in guiding publication of articles for agricultural economists throughout the country and, also in developing countries/SAARC countries. Ensure/support NIAP scientists to travel to other institutions in NARS, interact with and develop multi-disciplinary/multi-institutional projects in agriculture and related subjects. As actively engaging policymakers through evidence-based recommendations and advisory roles will enhance policy influence, it should be given more emphasis. Similarly, special attention may be given to offering advanced training workshops, annual "sand pit" workshops, and

fellowships for agricultural and allied Ph.D. scholars to build capacity among researchers and attract talented young researchers. In addition, the participation of young agricultural economists in International Conferences and Seminars should be encouraged and facilitated. Thus, NIAP should become a second home/preferred destination for all those interested in agricultural economics and policy research, from Ph.D. students to retired and active researchers/ policy makers who are really interested in research and policy analysis work and want to contribute significantly. Funding PDF and sabbatical openings for agricultural economists under NARS may also have to be explored through special budget approval from ICAR.

3.3 Outreach/Dissemination/Linkage/Partnership

Achievements and Assessment

Outreach, dissemination of research outputs, policy interactions, linkage, and partnership are interdependent activities and not mutually exclusive. The dissemination of research outputs is done by NIAP through technologies (products/methodologies) certified by ICAR, products/processes developed (policy papers, policy briefs), research publications, contributing popular articles in different journals and newspapers, radio talks, appearances in visual media, and participation and presentation in conferences, seminars, or symposia, besides participation in policy interactions and dialogues. It is highly gratifying to record that during the QR period, five technologies (methodologies) have been developed, namely, an index for measuring heat stress, sustainability mapping for rice cultivation, an agroecosystem diversity index, a composite index of agricultural sustainability, and a composite effectiveness index for extension and advisory services of FPOs, which have been certified by ICAR. It has also published two books, 11 policy papers, and 14 policy briefs addressing important policy issues. Its research paper publication record is highly impressive, publishing 272 papers in referred journals during the QR period, 41 with an Impact Factor of more than 8, 79 with an Impact Factor between 6-8; and 152 with an Impact Factor of less than 6. It has published 151 other publications (E-Books-5; Chapters 60; Popular articles-54; News Paper articles-20; Discussion papers-12). For these and other notable achievements, the NIAP scientists have been bestowed with 16 prestigious awards. The QRT found that these publications are of very high quality and are widely quoted and used by policy makers and academia.

NIAP strongly believes in forging synergy through national and international collaboration, linkages, and networking to attain excellence and emerge globally as a branded policy research and advocacy institution. It has developed

effective and meaningful partnerships with most centers under the CGIAR, FAO, World Bank, ODI, other advanced research institutions, Government Departments, private organizations, and NGOs. The NIAP acts as a think tank for the ICAR and enables it to enhance its active participation in policy debates and discussions. The NIAP has been representing ICAR in various national and international forums and entering into joint publications, participation in global forums, policy debate, and discussions. NIAP is collaborating with SAUs, Central Agricultural Universities, General Universities, Development Institutes, central and state ministries and departments, Semi and NGOs, Private sector, and international institutions in many network projects (completed-3; ongoing-4) /human resource development works, externally aided projects (Completed-7; Ongoing-4), consultancy and contract research projects (Completed-14; Ongoing-3).

Thus, NIAP is doing exceedingly well in establishing linkages and collaborations to excel in its output and impact. NAIP should further expand its outreach activities by setting up an Outreach and Policy Dissemination Cell tasked with actively engaging stakeholders, such as state governments, farmer organizations, and the private sector. This Cell should ensure that NIAP's research and policy recommendations reach relevant policymakers and practitioners in real time. One key suggestion is the creation of a rapid-response team that can produce and share policy briefs on emerging issues within 48 years. This would enable the NIAP to provide timely, evidence-based input to ongoing policy debates. Furthermore, stakeholder feedback suggests much more under this head in the future in the following respects:

Suggestions for future outreach/dissemination/linkage/partnership activities: Linkage/strategic partnership with SAUs to undertake field-based research and capacitate them to take part in state-level policy making; with Agri-Business Schools in SAUs and State Governments; further exploring training collaboration/academic collaboration with IARI, IASRI, and NAARM; more MOUs with AUs to mentor students; linkage with AERCs to undertake/ promote field-based multi-disciplinary research and capacity building in the states in policy making, forecasting production, price, etc.; and stronger industry linkage to ensure research relevance and practical impact; Policy interactions and engagements at central and state level; organizing trainings for policy makers; engagement with private sector, farmers, CSOs, FPOs, and other stakeholders to gather bottom-up feedback on agricultural policies and technologies; greater interactions with farmers about policies and programs, and their feedback for bottom-up research; eliciting policy needs, policy prescription, implementation difficulties and solutions, etc. There is

a general feeling among stakeholders that whenever some hot debate on agricultural policy erupts, a professional brief/write-up/note of 1-2 pages should be immediately prepared by convening a brainstorming meeting and a well-edited output should be prepared and shared with the press with the caveat that it is purely a professional, impartial view on the basis of existing information, understanding, and the collective wisdom of concerned professionals. To strengthen international collaborations, NAIP should pursue strategic partnerships with SAUs, international agricultural economics and policy research think tanks, and private players. These collaborations can be further leveraged for joint research initiatives, policy dialogues, and technology transfer programs, which would enhance the depth and reach of the NIAP's work.

Dissemination of research outputs and policy communications is to be further strengthened by NIAP through high-impact research publications; flagship publications to be attempted (sector outlook, agri-business index, etc.); an annual or biannual publication on the State of Farmers or Farm Income or Changing Rural Economy; contributing popular articles in different journals and newspapers; radio talks; appearances in visual media; writing opinion pieces in mass media to reach a wider mass; collaborating with renowned global researchers and think tank institutions to co-author papers, thereby increasing the reach and credibility of NIAPs's research; utilizing social media platforms like Twitter, LinkedIn, and YouTube to share research findings, policy insights, and expert opinions; and engaging content such as infographics, short videos, compendium of success stories, and interactive webinars to attract a global audience, participation, and presentation in conferences, seminars, or symposia; besides participation in policy interactions and dialogues. In the erstwhile mandate of the NIAP, capacity building and policy dissemination were the other mandates. Similar to capacity building, policy dissemination mandate is now not an explicit mandate but considered as functions and activities to be discharged for carrying out three theme-based revised mandate. However, to acknowledge the critical importance of policy advocacy/dissemination for a policy research and advocacy institution like NIAP, it is important to establish a special Outreach and Policy Dissemination Cell with the required competent staff and resources. It was observed that the records and reporting of research outputs, outcomes, and likely impact in some of the research projects were less than satisfactory, and adequate documentation and systematic reporting/ recording of input, output, outcome, and impact should be compulsory for each scientist. As stated earlier, NIAP's research productivity is highly impressive, and the coverage of theme areas of research publications is up-to-date, highly policy-focused, and driven in line with the changing priorities of agricultural economics and policy research over time. The other recommended modes of

communication/dissemination may include exploring the WhatsApp channel of NIAP, WhatsApp group of Agri-Economists, inclusion of more universities and other social science institutions in the NIAP network/mailing list, study and adaptation of extension/dissemination strategies adopted by international organizations like IFPRI, IWMI, etc., hiring a communication specialist, and uploading NIAP publications in Ag Econ Search.

3.4 Organization and Management

Achievements and Assessment

The Institute's administrative structure has evolved carefully in a decentralized manner, with an activity-based approach. The Institute's research programs are guided by a high-powered Research Advisory Committee (RAC) comprising eminent professionals from outside and inside the ICAR system. Research thrusts and strategies, initiatives in human resource development, and approaches to improve policy dialogues and evaluations are guided by the RAC. The Institute is guided and supervised by the Institute Management Committee (IMC), and its activities are directed and coordinated by the Director. In addition, several internal committees and cells, including those mandated by the ICAR, are operating for the efficient and decentralized management of the Institute. The Joint Staff Council (JSC) promotes healthy interactions and a congenial work environment at the Institute. The Director conducts regular meetings with the staff, mostly every month, to discuss problems and difficulties, if any, faced by the staff and to make suggestions for the cordial functioning of the Institute. Chapter 2 provides a detailed/candid account of O&M with respect to genesis and evolution; vision, mandate, and mission/focus; organizational structure; human resources; physical infrastructure; and finance.

NIAP believes in a decentralized, participatory, activity, not hierarchy, based approach involving every scientist or staff in one or more committees/ responsibilities to give them a sense of belonging to the Institute's management and contribute to institutional building. It strongly believes in doing formalities informally, hence the difference.

Notwithstanding appreciable performance by NIAP, some concerns like, position of some scientists and staff remaining vacant for a long time and the number of technical, administrative and support staff positions is considerably lower than the requirements as per the ICAR norms. NIAP has a state-of-the-art office but is missing an exclusive Capacity Building Cell and training laboratory, and does not have residential quarters for the Director, scientists, and staff, which has been one of the reasons for the high rate of attrition of scientists/staff. The other concerns relate to the availability of the latest computer hardware and software on statistical/econometric packages for conducting advanced research on policy analysis. The non-availability of credible long-term databases has also been a major hurdle in recent years for advanced analysis.

The review of organizational features and management system, work culture, and output of NIAP are highly impressive and worthy of emulation by other ICAR/NARS institutions. The pool of scientists available at NIAP is the best in the profession in the country in terms of trained/motivated/driven mindset. The QRT strongly feels that the Institute can contribute many times more to enhancing the credibility and role of ICAR in policy discussions if the following constraints faced by the Institute are addressed.

Suggestions for future organization and management strategies

i. As several papers published by NIAP involve the use of primary data collection through surveys, it is recommended that the survey instrument and consent form be scrutinized by an Ethics Review Board (ERB) of the Institute, including the presence of an external member to oversee primary surveys and any secondary data that may contain confidential information.

ii. As already stated, /argued earlier, NIAP needs to be placed directly under the administrative jurisdiction of the Secretary DARE and DG, ICAR. This has become particularly important because of the abolition of the ADG (ESM) post at the ICAR(HQ). Furthermore, there is a need to upgrade the present unit of Agricultural Growth and Development at NIAP to an independent Division of Growth and Modelling with the required staff and funding support from ICAR (NIAP Vision 2050, page 13).

iii. NIAP's lead role is not being fully utilized due to the required number of scientists not being in position or the very high attrition rate at different levels, as they are in demand elsewhere, either for higher positions/RMP posts, etc. This affects the quality, quantity, and timeliness of the output. The scientific and technical manpower ratio is also adverse, resulting in low and untimely output. It is desirable that all vacant positions be expeditiously filled, addressing gaps in critical areas such as impact assessment and data analysis, and the technical/administrative/support staff ratio, as per ICAR norms, be maintained in the Institute. The cadre strength of scientists in NIAP may be raised to 50, and the number of technical and administrative staff positions should be expanded as per ICAR norms.

iv. Establish a digital workflow system for faster project approvals and monitoring to significantly improve internal efficiencies, reduce delays, and allow the Institute to better respond to external demands

v. To overcome staff vacancies, outsourcing task-specific consultants may have to be permitted by the Director.

vi. There is a broader issue of sustainability in agricultural economics research strength in NARS. It is advisable to upscale the skills of PG students and scientists selected in ARS in agricultural economics. For this, the newly

recruited/inducted ARS agricultural economics scientists are to be placed in NIAP for 3 months of hands-on training at NIAP by ICAR and NAARM.

vii. The practice of annual IRC meetings, as conducted at IARI and some other ICAR institutions, is good and very useful. Inviting to 1-2 experts to this meeting to comment and make suggestions may further help improve the research output. Further, the NIAP should create a Research Impact Assessment Committee that specifically reviews the real-world outcomes of research projects. Moreover, it is essential that the NIAP institutionalizes an Annual Research Impact Report that assesses the real-world influence of its work on agricultural policies, technologies, and practices.

viii. The lack of staff quarters, guest houses, and training hostels is a big constraint in attracting/retaining talent in NIAP and organizing frequent events, including long-term training. Adequate budget provision should be made for constructing the Director's residence, scientists, and staff quarters, and land for the purpose in the nearby location should be made available expeditiously.

ix. To improve resource mobilization, NIAP may engage in identifying collaborative international projects, consultancies and contract research. Empowering the Director with greater financial autonomy for approving projects will enhance the Institute's ability to execute more research

x. There is a need for the constitution of an Internal Complaints Committee (ICC) to address all sexual harassment-related cases in accordance with the POSH Act of BNS and to conduct gender awareness/sensitization workshops.

3.5 Overall Assessment

The team assessed the overall performance of the NIAP, both in terms of achieving the mandates and in institutional management. On all counts, despite several constraints, NIAP has done excellent work during the review period and has largely fulfilled the expectations of the ICAR and all other stakeholders. The work includes high-quality research-based policy outputs, policy advocacy, and capacity strengthening. It has also introduced some management innovations worthy of emulation by other institutions in the NARS. To further enhance the role and contribution of NIAP towards the goals of ICAR, the QRT has made several analysis-based detailed suggestions or recommendations in the preceding chapters of this report.

4

Way Forward

After stating an overall assessment of the Institution during the QRT period, this section briefly outlines forward-looking suggestions for ICAR-NIAP across its core priority areas based on a review of recent achievements, concerns, and emerging needs. The recommendations focus on changing the administrative jurisdiction of NIAP directly under DG, ICAR, upgradation of a unit in NIAP into a full-fledged division with adequate staff and funding support from ICAR, strengthening systematic impact assessment of new technologies, scaling up evidence-based policy research, expanding human resource development activities, deepening and widening outreach and partnerships, and further enhancing organizational efficiency. Special emphasis is to be placed on institutionalizing ex-ante and ex-post impact evaluations of agricultural innovations, building advanced analytical capacities, engaging dynamically with policymakers and stakeholders nationally, regionally, and globally, and streamlining governance mechanisms to maintain ICAR-NIAP's professional leadership in agricultural policy research.

NIAP has a good publication profile but should continue to improve and extend its outreach. Notably, several papers have begun appearing in international publications that are Scopus indexed and ranked by ABDC (commonly used in the Agricultural Economics profession internationally). This trend needs to be strengthened. A critical component of outreach is web presence. Apart from the policy papers on the website, links to all the other papers should also be made available. ICAR may be advised to ensure that all these papers are available for download on the website and that waivers from paywalls are implemented as necessary. Acquiring expertise in GIS and satellite image processing to leverage its expertise in field-level observations and policy knowledge by combining it with analyses based on satellite imagery and providing value addition is necessary.

Strengthening research on digital agriculture and the use of AI as farmer-level decision support systems needs attention. SMS-based or video-based advice or chatbots that can respond to queries in real time, AI-based predictors of soil moisture availability, price information, and so on, should be given more attention. The NIAP may assess these technologies and help guide public sector investments in these areas. The recruitment of scientific staff with core competencies in these areas should be pursued.

4.1 Research Programs

Technology and Sustainable Agriculture

In the realm of technology and sustainability, the NIAP must develop standardized impact assessment frameworks for evaluating the effects of new technologies, such as climate-resilient farming techniques, AI-enabled precision agriculture, and water-efficient practices. This will allow for a more systematic analysis of how these technologies influence farm productivity, environmental sustainability, and farmers' long-term income stability. A focus on AI and Machine Learning (ML) tools to predict adoption rates, measure impacts, and forecast long-term outcomes is recommended. This will also enable the NIAP to understand the scalability of these innovations and refine strategies for their wider adoption across diverse farming systems.

Markets, Trade, and Institutions

Regarding markets and trade, NIAP's research should focus on real-time assessments of how market reforms, price stabilization policies, and trade liberalization efforts directly impact farm income and food security. By using cutting-edge tools such as market forecasting and big data analytics, NIAP can develop insights into market behavior, price transmission, and supply chain efficiencies. Furthermore, exploring innovative market models, particularly those that integrate e-commerce, Farmer Producer Organizations (FPOs), and digital platforms, requires rigorous evaluation to assess their real-world impact on market access and rural poverty reduction. Research focused on the impact evaluations of various initiatives by public and private players in India and abroad will allow for data-driven recommendations to improve market policies at both the national and local levels.

Agricultural Growth and Development

For continued progress in agricultural growth, the ICAR-NIAP should enhance its focus on ex-ante and ex-post impact assessments of agricultural technologies and policy interventions. By using structured evaluations, it can better understand the effectiveness of technological innovations and policy reforms in improving farm incomes, rural livelihoods, and addressing regional disparities. Furthermore, prioritizing research on returns to R&D investments, Total Factor Productivity (TFP) growth, and the socioeconomic impact of technology adoption will better align the Institute's research with national growth objectives. Close collaboration with State Agricultural Universities (SAUs) for field-based data collection and grassroots-level policy feedback will ensure that research outputs are contextually relevant and actionable at the state and local levels.

4.2 Human Resource Development

To address the growing demand for agricultural policy expertise, ICAR-NIAP should establish a dedicated Capacity Building Cell with an eye on the future,

which would oversee a Five-Year Strategic HRD Plan. This cell should organize regular training programs that are region-specific, focusing on emerging fields such as data analytics, impact assessment methodologies, and advanced policy communication techniques. Given the increasing integration of technology in agricultural research, it is imperative that the NIAP strengthens training on new evaluation methods, such as AI-driven impact assessments and empirical research methodologies.

ICAR-NIAP should also get involved in identifying global institutions with whom they can have symbiotic relationships to perform more multi-institution studies as well as exchange programs to enable cross functional and cross-cultural engagements. Mentorship for young agricultural economists and researchers should be a core activity, with a focus on quantitative skills and scientific rigor required to evaluate the impacts of agricultural innovations. By incorporating structured programs to develop competencies in policy analysis and technology assessment, the Institute will enhance the capacity of agricultural economists and social scientists to conduct high-quality evidence-based research that informs national policy decisions. Participation by young scientists in International Conferences and Seminars should also be encouraged and facilitated.

4.3 Outreach Activities and Linkage

ICAR-NIAP should expand its outreach efforts by setting up an Outreach and Policy Dissemination Cell tasked with actively engaging stakeholders such as state governments, farmer organizations, and the private sector. This cell should ensure that NIAP's research and policy recommendations reach relevant policymakers and practitioners in real time. One key suggestion is the creation of a rapid response team that can produce and circulate policy briefs on emerging issues within 48 hours. This would enable the NIAP to provide timely, evidence-based input to ongoing policy debates.

Moreover, the NIAP must actively engage with farmers to gather bottom-up feedback on agricultural policies and technologies. Stakeholder consultations, farmer workshops, and field-based evaluations of new technologies should be prioritized. Establishing mechanisms for real-time policy interaction, including digital tools such as webinars, social media outreach, and virtual roundtables, will significantly broaden the Institute's influence and visibility.

To strengthen international and national collaborations, the NIAP should pursue strategic partnerships with SAUs, international agricultural think tanks, and private sector players. These collaborations can be further leveraged for joint research initiatives, policy dialogues, and technology transfer programs, which would enhance the depth and reach of the NIAP's work.

4.4 Organization and Management

In view of significant research-based policy inputs from NIAP to ICAR and DARE and abolishing the post of ADG (ESM) in ICAR (HQ), ICAR should either create a new SMD (Policy and Planning) or link the Institution directly to the Director General. As recommended by an earlier QRT, the status of the Director of NIAP should be raised to the level of DDG.

In view of India aspiring to transform into Viksit Bharat by 2047 and the raising demand for policy inputs, the unit of Agricultural Growth and Development in NAIP should be upgraded to an independent Division with the required staff and funding support from ICAR. Organizational efficiency and governance at ICAR-NIAP should be bolstered by filling vacant scientific positions and addressing staffing gaps in critical areas such as impact assessment and data analysis. Furthermore, the establishment of a digital workflow system for faster project approval and monitoring will significantly improve internal efficiencies, reduce delays, and allow the Institute to respond better to external demands.

The Institute Research Council (IRC) should continue its strong oversight with the participation of one or two external experts, but with increased resources dedicated to impact evaluation and policy communication. This could involve the creation of a Research Impact Committee that specifically reviews the real-world outcomes of research projects. Moreover, it is essential that the NIAP institutionalizes an Annual Research Impact Report that assesses the real-world influence of its work on agricultural policies, technologies, and practices. NAIP's role in policy research, education, and capacity building in upgrading the analytical skills of agricultural economists in ICAR/NARS will always remain extremely important and hence be given priority.

Finally, to improve resource mobilization, the ICAR-NIAP must engage in identifying collaborative international projects, consultancies, and contract research. Empowering the Director with greater financial autonomy to approve projects will enhance the Institute's ability to execute more research initiatives without delay. These recommendations focus on scaling up ICAR-NIAP's role as a key player in the impact assessment of technologies and evidence-based policy formulation and communication, market intelligence collection, analysis and dissemination, and visioning to contribute to ushering in Viksit Bharat by 2047, ensuring its continued relevance under ICAR/DARE in the evolving agricultural research for development landscape.

5 Key Recommendations

5.1 Structure and Governance

i. Through its credible research, ICAR-NIAP has progressively established itself as a key organization in agricultural economics and policy research, not only within the NARS but also by extending its influence on organizations such as NITI Aayog and various central and state government ministries for policy analysis and suggestions. Given the Institute's mandated role in providing evidence-based suggestions to policymakers and research administrators, the QRT strongly recommends that ICAR either establish a new Subject Matter Division (SMD) of Policy and Planning or place the Institute directly under the administrative control of the Director General, ICAR, to facilitate the timely and efficient flow of feedback and information. The post of Director should be upgraded to the status of Directors of ICAR Deemed Universities, considering ICAR-NIAP as a unique institution in the ICAR System.

ii. By 2047, India is projected to join the ranks of developed nations, with agriculture playing a pivotal role. However, the sector will confront several challenges, especially in aligning policies with the vision of a developed country. ICAR-NIAP is poised to contribute significantly by offering credible policy inputs. Currently, the Institute comprises two divisions: Technology and Sustainable Agriculture and Markets and Trade. It is recommended that a new Division of Growth and Modelling, as recommended by the earlier QRT, be established to address emerging policy needs. Furthermore, the QRT recommends that to meet the rising stakeholders' expectations, the Institute's scientific cadre strength should be increased to 50, and the number of technical and administrative staff positions should be increased proportionately, in accordance with the prescribed ICAR norms. This may be possible by redeploying vacant technical cadre posts from the IASRI. Furthermore, to overcome staff vacancies, outsourcing task-specific competent consultants/post-doctoral fellows may be permitted to the Director. The ICAR needs to increase the budget for the Institute, and the Director's authority should be expanded to enable resource generation through consultancy or policy advice, similar to the Directors of ICAR Deemed Universities.

iii. High-quality, up-to-date data and contemporary, state-of-the-art software are essential for conducting rigorous research and effectively communicating its outcomes to the Council and other stakeholders in a timely manner. Adequate financial support from the Council to strengthen the AKMU in the NIAP through technical assistance and management, establishing a centralized Wi-Fi facility throughout the NIAP building, ensuring data security, exploring the provision of online cloud storage services to individual researchers, regular civil repairs and maintenance of the server room, and IT manager augmentation are imperative to achieve this. Furthermore, regulations concerning subscription to secondary databases should be relaxed, permitting the Director of ICAR-NIAP to subscribe to the necessary secondary databases. Additionally, the QRT recommends permitting the Director, NIAP, to hire consultants/post-doctoral fellows as required, as well as to outsource necessary primary surveys to reputable/authorized agencies to minimize administrative delays and ensure the timely execution of activities and collection and processing of data. NIAP may also explore establishing a National Agricultural Data Repository/National Agricultural Economics Data Hub at NIAP, encompassing secondary and farm-level data.

iv. The significance of ethics in publications has increased globally. The QRT recommends that ICAR-NIAP establish an Internal Ethics Review Committee to ensure the ethical integrity and quality of research databases in accordance with international best practices. This Committee would responsible for maintaining the quality and integrity of primary surveys and secondary data, including confidential information, scrutinizing survey instruments and consent forms, and implementing safeguards for data privacy and anonymization. This can enhance the credibility and reliability of research outputs, thereby bolstering the Institute's reputation as a responsible and trustworthy research entity.

v. The ICAR-NIAP does not have residential accommodation for its staff, its own guest house, or a training hostel for conducting capacity-building programs. To provide space for the increased cadre and staff strength, office building expansion becomes crucial. This limitation hinders the Institute's ability to attract and retain talented and competent staff to fulfill its mandate of undertaking advanced agricultural economics and policy research and enhancing the skills of agricultural economists and others through capacity-building programs. The QRT strongly recommends that these facilities be created or at least provided on priority to the ICAR-NIAP from the available facilities at the IARI and IASRI. By ensuring on-campus accommodation, guest houses, training facilities, and office

building expansion, ICAR-NIAP would also be better equipped to effectively discharge its responsibilities.

5.2 Research

i. The QRT after professionally/critically reviewing published peer-reviewed research and ongoing research programs that the volume of output is impressive, encouraging, and commendable. However, more than half of the research was published in journals with a NAAS ranking of less than 6. To publish in high-impact journals, QRT recommends: a) enhancing the design, theoretical framework, robustness checks, and employing advanced analytical approaches or causal methods of analysis, such as structural estimation, experimental methods, multivariate and multi-equation techniques, spatial econometrics, input/output/social accounting matrix, and CGE models; additionally, adopting better sampling strategies will strengthen the methodological rigor of studies, leading to more robust interpretations and context-specific recommendations that enhance the private and social benefits of publications; b) ensuring all peer-reviewed research outputs are accessible on NIAP's website with DOI links, uploaded to ResearchGate, and mentioned in Google Scholar. Systematically publicizing research outputs through emails and social media and developing and periodically updating a research database for researchers and libraries outside ICAR institutions/SAUs will enhance the visibility of NIAP.

ii. In light of the shifting dynamics in both domestic and global agri-food markets, it is highly recommended that the ICAR establish a Market Intelligence Unit at the ICAR-NIAP, equipped with trained personnel and financial support. This unit would be tasked with gathering, analyzing, and disseminating crucial information on market trends, consumer preferences, international trade patterns, regulatory requirements, and commodity forecasts. Additionally, the market intelligence unit could play a crucial role in boosting the competitiveness of Indian agriculture globally.

iii. The NIAP should engage in a visioning exercise within the framework of Vision 2050 and develop a roadmap that outlines strategic priorities along with actionable recommendations.

iv. The structural transformation within agriculture has led to a significant shift in agricultural production portfolios, moving away from traditional cereal crops towards horticulture, dairy, and animal products. This change necessitated the re-evaluation of research priorities and policy needs. ICAR-NIAP has played a leading role in identifying and addressing these evolving policy requirements. However, there remains a gap in the

research on productivity constraints and market prospects for horticultural crops, pisciculture, poultry, and related sectors. The QRT suggests that more research should be conducted on agricultural diversification and the non-farm sector, their determinants, and their outcomes.

v. The QRT recommends comprehensive studies on the food economy, technological advancements, nutrition, climate change and risk assessment, adaptation pathways, credit and input markets, consumption patterns, demographic changes, farmers' income, inter-sectoral linkages, and domestic and global market dynamics. By examining these elements, the Institute can develop a forward-looking perspective that will inform and guide agricultural research, education, marketing priorities, and the formulation of agricultural policies at both the national and state levels.

vi. ICAR should establish a monitoring, evaluation, learning, and impact assessment (MELIA) unit at NIAP to institutionalize PME system/culture in the ICAR. For this, adequate and systematic reporting/recording of output/outcome and likely impact should be made compulsory for each scientist in respect of his/her projects/studies, and this should be monitored by the relevant committees of NIAP for compliance.

vii. Although agriculture is a state subject in India, the central government provides considerable financial assistance to the states. However, there is a disconnect between the central and state governments in policy formulation and implementation, leading to the misallocation of resources, conflicting priorities, and ultimately, suboptimal outcomes. The QRT suggests that the ICAR-NIAP should examine the extent of divergence in agricultural policies, identify the root causes of these gaps, assess their impact, and suggest measures for effective coordination and synergy between the state and central governments.

viii. QRT advocates enhancing research on the application of machine learning, exploiting process indicators using MIS platforms to assess questions of impact, using granular information becoming digitally available on beneficiaries under various schemes, big data analytics, and other digital tools in agricultural economics and policy research at ICAR-NIAP. This is crucial for generating feedback for future research programs and policies. The NIAP must define policy priorities to increase the digitization of Indian agriculture. Such advancements would aid in predicting crop yields, analyzing market dynamics, and assessing the impact of policy interventions on agricultural systems. Collaboration with institutions such as the Indian Agricultural Statistics Research Institute (IASRI), IITs, or private sector entities can further enhance the effectiveness of these research efforts.

ix. The QRT recommends regular studies on spatial aspects of agriculture, including state-level drivers, constraints, and potential of agricultural growth, infrastructure disparities (physical/digital), cost differentials in infrastructure development across states, inter-sectoral linkages at the state level, migration patterns and state-level labor markets, interstate spillovers in price formation, marketing, access to inputs, and access to research/technology and extension services.

x. NIAP's specialized knowledge in areas such as water footprint analysis, carbon emissions assessment, payment for ecosystem services, and agricultural sustainability ideally positions it to evaluate these emerging issues. Potential research areas further include examining the economics of fodder cultivation and its relationship with the use of grain as animal feed, as well as developing strategies to reduce transmission of zoonotic diseases. These could provide valuable insights for policymakers and stakeholders to address the challenges and opportunities associated with ongoing structural transformations. Some policy-oriented projects/studies should be conducted regularly, and a strategic plan must be made by the NIAP for such studies.

5.3 Capacity Building

i. NIAP disseminates its output through in-house publications of policy papers and policy briefs. Nonetheless, to further enhance the quality of output and its reach on a wider scale, the QRT strongly suggests establishing a dedicated Outreach and Policy Communication unit with the required specialized personnel and adequate funding. This unit should organize annual workshops to foster dialogue involving all stakeholders, including state governments, the private sector, and farmers, to ensure the relevance and uptake of policy research and obtain feedback. Such workshops will highlight the gap between the alignment of policymaking and implementation between the states and the center and its impact on agricultural performance, as well as measures to minimize the gap and improve performance. This will also enable the NIAP to mobilize greater external funding and resource generation. Another related recommendation is the creation of a Rapid Policy Response Team that can produce timely evidence-based, professional input/policy briefs (not more than two pages) on current policy debates. Additionally, the NIAP should consider publishing a monthly or quarterly newsletter highlighting its research findings, policy updates, and impacts.

ii. The QRT recommends that the ICAR-NIAP strengthen state-level policy formulation and advice. A pilot study involving to 2-3 states could be initiated to examine issues related to the agricultural and allied sectors of

states and organize dissemination workshops. This approach can then be gradually implemented across all states.

iii. Capacity building of the NIAP faculty in advanced impact assessment tools and policy analysis is crucial for continuously enhancing and upgrading its expertise and effectiveness. This can be achieved through exchange programs with renowned institutions in India and internationally. In addition, the QRT strongly feels that the next stage of NIAP in leadership ascendence is to undertake objective articulation of demand-driven research agenda for institutions in ICAR/NARS through its ex-ante/ex-post, visioning/foresight studies to help them remain continuously relevant and competitive.

iv. The lack of professional competence in Agri-business Schools in NARS, compared to esteemed Business Schools, poses a challenge to their sustainability. These institutions are not sufficiently equipped to offer systematic and contemporary research, teaching, and policy insights essential for students. ICAR-NIAP could conduct a study to identify challenges and potential solutions to enhance their viability and performance.

v. There is a broader issue regarding the quality of agricultural economics and policy research in NARS. It is recommended to upscale the skills of PG students and scientists selected in ARS in agricultural economics. For this, the newly recruited/inducted ARS agricultural economics scientists are to be placed by ICAR at NIAP for three months of hands-on training.

ANNEXURES

Annexure I

भारतीय कृषि अनुसंधान परिषद
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
कृषि अनुसंधान भवन – II, पूसा, नई दिल्ली – 110012
Krishi Anusandhan Bhawan-II, Pusa, New Delhi 110012
Agricultural Education Division
E-mail: nirmals.icar@nic.in; Telefax: +91-11-25848033

File No: Agril.Edn.04(01)/2024-A&P (e-297244) Dated February 07, 2024

To,

The Director,
NIAP, Library Avenue,
Pusa, New Delhi–110012

Sub: Constitution of Quinquennial Review Team (QRT) for the period (2018-23) of ICAR-NIAP-reg.

Sir,

I am directed to refer to institute Note Dir./251/01/24-NIAP-19 dated 15.01.2024 on the subject cited above and to say that the competent authority in the Council has been pleased to constitute Quinquennial Review Team (QRT) of ICAR-NIAP for a period of five years (2018-2022) as per the following details:

Sl. No.	Clauses as per Rules and Bye-laws of ICAR Society (Rule 71A)	Nominated Members	Nominated as
1.	An eminent scientist having specialized knowledge of the subjects and areas of research covered by the concerned institute/ unit, and should possess wider knowledge and experience of such critical reviews in the ICAR or other research organizations	Dr. Mruthyunjaya, Former National Director, NAIP.	Chairman
2.	4 or 5 eminent scientists having expertise in the subject relevant to the institute with wider experience of research, education, extension, socioeconomic impact analysis and management	1. Dr. J. V. Meenakshi, Professor of Economics, IIIT, Delhi 2. Dr. A. Ganesh Kumar, Professor, IGIDR, Mumbai 3. Dr. M. H. Wani, Former Registrar, SKUAST-K, Shalimar 4. Dr. C.S.C. Shekhar, Professor, Institute of Economic Growth, Delhi 5. Mr. Deepak Pareek, CSO, Suumaya Corporation Limited, Lotus Corporate Park, Goregaon East, Mumbai	Members
3	Director of the Institute	Director ICAR-NIAP, New Delhi	Member
4		Dr. Khem Chand, Principal Scientist, ICAR-NIAP	Member Secretary

The Chairman and the Members of the Committee would be informed by Director, ICAR-NIAP accordingly. TA/DA to non-officials will be regulated as per rules of GoI/ICAR.

Yours faithfully,

(Nirmal Sarkar)
Deputy Secretary (Agril. Edn.)

Annexure II

ICAR-National Institute of Agricultural Economics and Policy Research
Pusa, New Delhi-12

Dated: 21.07.2024

Proceedings of the first meeting of Vth QRT

First meeting of present QRT was held on June 27-28, 2024 and following members were present:

S. No.	Name & Designation
1.	Dr. Mruthyunjaya, Chairman Former National Director, NAIP, New Delhi
2.	Dr. J. V. Meenakshi, Member Professor of Economics, Indraprastha Institute of Information Technology, Delhi
3.	Dr. A. Ganesh Kumar, Member Professor, Indira Gandhi Institute of Development Research, Mumbai
4.	Dr. M. H. Wani, Member Former Chair Professor Rajiv Gandhi Chair and Registrar, SKUAST-K, Shalimar, Jammu & Kashmir
5.	Professor C.S.C. Sekhar, Member Institute of Economic Growth, Delhi University, Delhi
6.	Mr. Deepak Pareek, Member, Founder Managing Director, HnyB Tech-Incubation Pvt. Ltd.
7.	Dr. Pratap Singh Birthal Director, ICAR-NIAP, New Delhi
8.	Dr. Khem Chand, Member Secretary ICAR-NIAP, New Delhi

On the first day of the QRT program on June 27, 2024, the team held a meeting with DDG (Education) and ADG (EQA&R) at 10 A.M. DDG (Education) appreciated the NIAP research work and explained the future expectations of work from this Institute. He suggested more work on agricultural commodities exports. A network of agricultural economists in 113 Institutes/ Universities with NIAP in leadership roles was also recommended. QRT chairman assured DDG (Education) about a fair review of NIAP work and report submission in a given time period.

Dr. P. S. Birthal, Director of the Institute, welcomed QRT members and presented an overview of ICAR-NIAP achievements in research, capacity building, and policy interactions with stakeholders.

Dr. Khem Chand, Member Secretary, QRT, presented the detailed action taken report on recommendations of IV QRT. Dr. Mruthyunjaya, the Chairman, and other QRT members shared their views on the Institute accomplishments and appreciated for nicely compiling all research achievements in the QRT document. The house discussed the extent of addressing recommendations of previous QRT and the difficulties faced in addressing them. QRT members appreciated the Institute's overall progress and urged the scientists to augment their efforts further to achieve the challenging demands.

Scientists in different thematic areas presented the research achievements of the Institute during the 2018-2023 period. Their details, along with the comments by QRT members, are summarised below:

Theme area	Comments/ Suggestions/ Recommendations
Structural transformation, governance, and farmers' income (Dr. Balaji S.J., Scientist)	• The state of hilly regions in terms of income convergence and returns to investment shall be explored. • Global CGE models shall be explored to understand tariff effects focusing on specific commodities
R & D investment, innovations, and impact of agricultural research (Dr. Ankita Kandpal, Scientist)	• The findings of research on investment may be well documented and communicated to officials/ academicians who can implement it
Sustainability assessment, regional crop, and resource use planning (Dr. Prem Chand, Senior Scientist)	• Recommendations of Tree Outside Forests (TOFs) species requiring intensive use of water shall be made after considering the sustainability of water resources.
Sustainability and management issues in water management & farm mechanization (Dr. S.K. Srivastava, Senior Scientist)	• Macro-level impacts of technologies like micro-irrigation and solar energy on water and environment need to be effectively disseminated to the stakeholders.
Carbon markets and valuation of ecosystem services (Dr. Kiran Kumar, Scientist)	• Valuation of ecosystem services of different agricultural production systems like agri-horticulture, agri-livestock, agro-forestry systems may be taken up in a multi-disciplinary/ multi institutional mode. • Macro level implications due to legume based cropping systems on nitrogen saving and fertilizer subsidy may be studied • In assessing economic feasibility of carbon sequestration, the cost of issuing carbon credits need to be accounted

Theme area	Comments/ Suggestions/ Recommendations
Climate, trade, and sustainability linkages (Dr. Raka Saxena, Head, Division of Technological and Sustainable Agriculture)	• Linkages between MSP and exportable surplus of rice and wheat shall be explored. • Possible implications of import and export restrictions on trade shall be explored
General	• Strengthening communication and dissemination strategies so that NIAP work reaches to maximum stakeholders • WhatsApp channel of NIAP may be explored as officials uses it more frequently for communication than emails • WhatsApp group of agri-economists may be created to facilitate exchange of ideas • Inclusion of universities and other social science institutions in NIAP network/ mailing list for better dissemination of work • Extension strategies adopted by international organizations like IFPRI/ IWMI may be analyzed for better communication • Need of communication specialist for appropriate policy communication to different stakeholders. Further setting up dedicated communication unit for better rapport with policy makers and stakeholders may be explored • Uploading NIAP publications in AgEcon Search, as it is used by more people to explore related work • Expanding research work in allied sectors, poverty estimation, and hunger index • Exploring funding sources due to increasing research demand and decreasing funds • Difficulties in meeting revenue generation targets considering the time delay in getting concurrence of consultancy/ contract research projects from ICAR. Discussion may be held with ICAR about delayed clearance of projects and giving more powers to directors for approval • Explore improving academic collaboration with IARI/ Agri-Universities and more MOUs with Agricultural Universities to mentor students and explore funding source for Post Doc program • Awards from Indian Chambers of Commerce and Industry may be explored • Increasing expectations from the Institute and inadequate staff strength, including expertise of contractual manpower is a big issue. ICAR authorities may be approached for enhancing scientific/ other manpower

Meeting on 28.06.2024

A meeting of all QRT members was held, and the following action points emerged during the discussion.

Conducting an opinion survey among other ICAR Institutes/ senior leaders/ bureaucrats/ former directors and DGs of ICAR seeking feedback

The Institute has to get feedback from stakeholders about its work by distributing a proforma to all concerned and pursue to get their reply. The feedback proforma may be sent to maximum organizations/ people like CGIAR Institutes, previous secretaries, MoA&FW, DAHD, chairman of RAC/ IMC, Dr. R. S. Paroda, Dr. Ashok Dalwai, Traditional universities, past presidents of AERA, ISAE, ISAM etc. Interaction with RA/SRF worked at NIAP and students may also be held for feedback. The feedback has to be analysed for improvement.

QRT interaction with stakeholders during second meeting in last week of September (2 days)

- Meeting with chairman and member secretary of RAC, IMC etc.
- Meeting with DG, DDGs
- Meeting with private sector representatives like seed, fertilizer companies etc.
- Meeting with farmer representatives, representatives from allied sectors
- Meeting with Network Partner Institutes
- Analysis of the opinion survey

Third meeting: November 1st week

- Discussion on draft report

Fourth meeting: December

- Final report

Responsibilities assigned for last report

Area	Name of Member
Technological and Sustainable Agriculture	Dr. J. V. Meenakshi and Dr. M. H. Wani
Agricultural Market and Trade	Dr. C.S.C. Sekhar
Agricultural growth and development	Dr. A. Ganesh Kumar
Governance, partnership, policy communication and advocacy	Dr. Mruthyunjaya and Mr. Deepak Pareek
Information support	Dr. Khem Chand, Heads of Divisions

Materials to be provided by NIAP

- QRT initial reports
- Copy of Presentations
- Core publications segregated into thematic areas
- Vision 2050 documents
- Recommendations of previous RAC committees

Annexure III

ICAR-National Institute of Agricultural Economics and Policy Research
Pusa, New Delhi-12

Dated: 28.10.2024

Proceedings of second meeting of Vth QRT

Second meeting of present QRT was held on October 24-25, 2024 and following members were present:

S. No.	Name & Designation
1.	Dr. Mruthyunjaya, Chairman Former National Director, NAIP, New Delhi
2.	Dr. J. V. Meenakshi, Member Professor of Economics, Indraprastha Institute of Information Technology, Delhi
3.	Dr. A. Ganesh Kumar, Member Professor, Indira Gandhi Institute of Development Research, Mumbai
4.	Dr. M. H. Wani, Member Former Chair Professor Rajiv Gandhi Chair and Registrar, SKUAST-K, Shalimar, Jammu & Kashmir
5.	Professor C.S.C. Sekhar, Member Institute of Economic Growth, Delhi University, Delhi
6.	Mr. Deepak Pareek, Member, Founder Managing Director, HnyB Tech-Incubation Pvt. Ltd.
7.	Dr. Pratap Singh Birthal Director, ICAR-NIAP, New Delhi
8.	Dr. Khem Chand, Member Secretary ICAR-NIAP, New Delhi

The second meeting of Vth QRT of ICAR-NIAP was conducted on October 24-25, 2024 at the Institute. The main purpose of this meeting was to seek feedback from different stakeholders regarding ICAR-NIAP's progress, future agendas related to research, capacity building, collaboration, policy analysis and advocacy. Prior to the meeting, an opinion survey was also conducted among different stakeholders using google form. Around 52 stakeholders participated in the online survey, shared their feedback and 27 stakeholders had attended the meeting on October 24, 2024. Further QRT also held separate meeting with all NIAP scientists and Chairman of various committees on 25th October. Detailed list of stakeholders participated in the feedback exercise are given in Annexure I. The suggestions given by the stakeholders through

online survey and through the meeting conducted on October 24, 2024 are summarized below

Research Priorities

Agricultural Growth, Development, Technology and Sustainable Agriculture

- Assessment of changing land scape of Indian Agriculture with reference to technologies, markets, and spatial & temporal changes in agriculture growth & required policy reform
- An integrated assessment of agriculture along with non-agriculture sector over short and medium term and extension of research work on SE Asia
- Economic assessment and policies for extension of natural farming and conversion of waste to wealth
- Emphasis on farmers' income, welfare, and focus on agri-food system policies
- Economic upliftment of tribal villages and reforms in MNREGS program
- Macro and Micro level analysis of food and fertilizer subsidies and promotion of nano fertilizers
- Assessment of energy requirement in villages
- Agriculture energy policies (agricultural use of energy/ contribution of agriculture to alternative sources of energy) and energy efficient farming (E2 farming)
- Impact analysis of improved technologies in crops, horticulture, livestock and fisheries sector including FLD's in crop/ livestock technologies in different regions of India
- Guiding Impact of Land mark research institutions under ICAR in different Divisions like SBI, Coimbatore, IIHR Bangalore, CAZRI, Jodhpur, etc. for their contributions and future agenda
- Market assurance and value chain improvement in oilseed sector
- Promotion of oilseed crops in non-traditional areas with the involvement of FPOs
- Identify the coping mechanisms and adaptation strategies against climate change for different crops
- Economic valuation of ecological services through pulse cultivation and MSP for field pea in Northern India
- Policy directives for biofuel (ethanol blending) production vs. food &

fodder security

- Economic and environmental impacts of grasslands and inputs for grazing/fodder policy
- Pastoral production system: Census, economic contribution, breed recognition; employment & marketing issues of pastoral communities, policies for revival of pastoral system
- Economic impact assessment of important livestock diseases and vaccines developed by veterinary science Institutes
- GHG emission studies in Indian cattle and carbon financing for livestock sector
- Economic impact assessment of *diggi system* (water harvesting system) in Rajasthan & Gujarat states
- Landscape and Bio- Regional modelling & financing
- High vulnerability of rainfed ecosystem: Investment priorities and policy instruments
- Assessment of ecosystem benefits of different cropping systems e.g. Ecosystem services through honeybees (apiculture) in cross pollinated crops
- Food system transformation by focusing on nutrition/hectare
- Documentation of success stories / case studies of the grass root innovations in agricultural sector
- Analyse the operational environment of the FPO/FPC/ CSO/ Innovative grass root institutions towards providing policy direction/s to the Govt. of India
- Risk management strategies for small farmers
- Economic dimensions of Post-harvest losses, management and food safety implications in all agro-commodities including fisheries sector
- Carbon credit in fisheries and aquaculture and *Viksit Bharat* roadmap for fisheries sector

Markets and Trade

- Market intelligence and crop outlook
- Trade policy analysis through CGE modelling and Carbon credit
- Identification of high export potential commodities
- Real-time monitoring of production, prices, and trade for timely interventions
- Post-harvest losses and how to minimize them by commodities/regions and capacity building issues

Research strategies for NIAP

- Formation of Agricultural Development and Governance Division
- Centre of Excellence in Agriculture policy analysis
- Align research agendas closely with current policy debates and bring out actionable policy recommendations
- Evidence generation on impact of NIAP's research on policy and practice
- Establish commodity-specific policy groups and decentralized, region-specific policy-making units.
- Aligning the research programmes into mega programmes and network projects. Mega programmes may include the following:
  - Spatial and temporal changes in agriculture growth and required policy reforms
  - Ecosystem services, climate action and risk mitigation strategies
  - Innovative institutions and inclusiveness
  - Agriculture energy policies (Agricultural use of energy/ Contribution of agriculture to alternative sources of energy)
  - Agriculture trade CGE Modelling
  - Agriculture and health (including food safety issues)
  - Waste to wealth (case studies)
- Network projects may include the following:
  - Research priority setting
  - Impact assessment of frontier technologies including protected cultivation, vertical cultivation, digital agriculture etc.
  - Agriculture markets and agri-business involving agri-business Departments/Schools in AUs

Capacity Building

- Degree programme on public policy in collaboration with IARI and other foreign universities
- Capacity building of scientists on artificial intelligence and machine learning
- Theme specific capacity building of all NIAP scientists
- Training programmes in collaboration with global institutions
- Becoming capacity building partner of NAARM in the Foundation Course for ARS Probationers.
- Funding PDF and sabbatical openings for economists under ICAR/ SAUs

- Annual "sand pit" workshops for agricultural and allied Ph.D. scholars
- Building a Research Network of all the economists in the ICAR System and assigning smaller group of economists to each SMD
- Organize impact assessment training once in quarter for faculties and students
- Data bank on major indicators at NIAP
- Conduct short term/medium term trainings on agricultural policy especially to entrepreneurs / start-ups involved in the agricultural sector
- Capacity building to community based organizations

Linkages and Collaborations

- Partnership/ MoU with state government (Research and Capacity building)
- NIAP to collaborate with AERC/State departments/ SAU/Agri-Business / Departments Schools in AUs in providing state wise policy instruments for important agricultural commodities
- NIAP to partner with SAU/ Private institutions in the aspect of forecasting (production/price/DSS etc.)
- Collaborative studies with Grassroots organisation, Socio-Economic Institutes and NGOs, and Development of feedback mechanism
- Form strategic partnerships with global institutions like FAO, World Bank, IFPRI, and CGIAR
- Multi-Disciplinary Research promotion for better quality policy recommendations
- Stronger Industry Linkages: Enhance connections with the industry to ensure research relevance and practical impact

Dissemination of Research Findings

- Flagship publication (sector-wise outlook, agri-business index)
- Establishing a unit for policy communication and networking
- Release of research publications in seminars in the presence of outside experts
- Writing opinion pieces in mass media to reach wider mass
- Utilize digital platforms for dissemination and public engagement while developing a clear brand identity
- Publish research in high-impact international journals in collaboration with renowned researchers and institutions

- Utilize social media platforms like Twitter, LinkedIn, and YouTube to share research findings, policy insights, and expert opinions. Engaging content such as infographics, short videos, and interactive webinars to attract a global audience
- Compendium of success stories: Collaboration with CSOs
- MoU with private agency for better communication and to get more visibility

Other miscellaneous issues

- Need of Trainees hostel/Guest house/Quarters facility
- Recruitment of technical staff, hiring interns/ young professionals and other higher grade consultants
- Delay in approval of consultancy/ contract research project at ICAR H.Q.
- Database subscription issues (ICAR condition for 100% bank guarantee)
- Price reasonability certification issues associated with purchase decisions through GEM
- Vehicle replacement: Permission may be granted at SMD level
- Primary data collection through some professional agencies

The second meeting of the QRT was concluded on October 25, 2024. Next meeting of the QRT has been tentatively planned in December 2024/January 2025. It is decided that the final report of the V QRT may be drafted within 60-70 pages which may include about 10 feasible recommendations for the Institute.

Annexure IV

ICAR-National Institute of Agricultural Economics and Policy Research
Pusa, New Delhi-12

Dated: 21.04.25

Proceedings of the third meeting of Vth QRT

Third meeting of Vth QRT of ICAR-NIAP was held on April 21, 2025 in hybrid mode. The following members were present in the meeting:

S. No.	Name & Designation
1.	Dr. Mruthyunjaya, Chairman Former National Director, NAIP, New Delhi (Online)
2.	Dr. J. V. Meenakshi, Member Professor of Economics, Indraprastha Institute of Information Technology, Delhi (Online)
3.	Dr. M. H. Wani, Member Former Chair Professor, Rajiv Gandhi Chair & Registrar, SKUAST-K, Shalimar, Jammu & Kashmir (Online)
4.	Professor C.S.C. Sekhar, Member Institute of Economic Growth, Delhi University, Delhi (Online)
5.	Mr. Deepak Pareek, Member, Founder Managing Director, HnyB Tech-Incubation Pvt. Ltd.
6.	Dr. Pratap Singh Birthal Director, ICAR-NIAP, New Delhi
7.	Dr. Khem Chand, Member Secretary ICAR-NIAP, New Delhi

Meeting was started at 10.30 a.m. Main purpose of the meeting was to discuss regarding the progress of draft QRT report and the additional inputs required for the same. Progress of work done under each chapter assigned to different members were reviewed by the chairman and suggestions regarding the key recommendation were expressed by the members. Some of the suggestions/ recommendations emerged in the meeting are as follows:

- Clarification regarding the analytical software requirement of the Institute
- Need of constitution of Internal Complaints Committee and conducting gender sensitization workshops
- Inclusion of recommendations regarding future roadmap for ICAR-NIAP to strengthen its capacity in Artificial Intelligence and Machine Learning

- Collecting feedback from key stakeholders who did not participate in previous feedback session (Prof. Ramesh Chand, Dr. R. S. Paroda, Dr. Ashok Gulati, Secretaries of Department of Agriculture, Animal Husbandry, Irrigation, Commerce, Consumer affairs under various Ministries, Government of India, Director General and Deputy Director Generals of ICAR)
- Suggestion to conduct separate workshop to prioritise agricultural economics research as a part of upcoming AERA conference
- Including the requirement of Training Hostel at ICAR-NIAP in the recommendations
- Recommendations may be restricted to maximum 15 which should be achievable in 5 year time

At the end of the meeting, it was decided that next meeting of the QRT may be conducted offline tentatively during May 15-17, 2025. Meetings with the key stakeholders may also be conducted during the same time period. It has been agreed that, Chapter 1 and Chapter 2 of the QRT report will be drafted by ICAR-NIAP and will be shared with the QRT members towards the end of April 2025. Additions inputs needed such as software requirements of Institute, details regarding the research publications, proceedings of the previous meetings and the outline of the QRT report will be shared with the QRT members as soon as possible. The meeting was ended at11.45 a.m.

Annexure V

ICAR-National Institute of Agricultural Economics and Policy Research
Pusa, New Delhi-12

Dated: 28.06.2025

Proceedings of the fourth meeting of Vth QRT

Fourth meeting of present QRT was held on June 27-28, 2025 and following members were present:

S. No.	Name & Designation
1.	Dr. Mruthyunjaya, Chairman Former National Director, NAIP, New Delhi
2.	Dr. J. V. Meenakshi, Member Professor of Economics, Indraprastha Institute of Information Technology, Delhi
3.	Dr. A. Ganesh Kumar, Member Professor, Indira Gandhi Institute of Development Research, Mumbai
4.	Dr. M. H. Wani, Member Former Chair Professor Rajiv Gandhi Chair and Registrar, SKUAST-K, Shalimar, Jammu & Kashmir
5.	Professor C.S.C. Sekhar, Member Institute of Economic Growth, Delhi University, Delhi
6.	Mr. Deepak Pareek, Member, Founder Managing Director, HnyB Tech-Incubation Pvt. Ltd.
7.	Dr. Pratap Singh Birthal Director, ICAR-NIAP, New Delhi
8.	Dr. Khem Chand, Member Secretary ICAR-NIAP, New Delhi

On the first day of the QRT program on June 27, 20the 24, the team held a meeting with DDG (Education) and ADG (EQA&R) at 10 A.M. DDG (Education) appreciated the NIAP research work and explained the future expectations of work from this Institute. He suggested more work on agricultural commodities exports. A network of agricultural economists in 113 Institutes/ Universities with NIAP in leadership roles was also recommended. QRT chairman assured DDG (Education) about a fair review of NIAP work and report submission in a given time period.

Dr. P. S. Birthal, Director of the Institute, welcomed QRT members and presented an overview of ICAR-NIAP achievements in research, capacity building, and policy interactions with stakeholders.

Dr. Khem Chand, Member Secretary, QRT, presented the detailed action taken report on recommendations of IV QRT. Dr. Mruthyunjaya, the Chairman, and other QRT members shared their views on the Institute accomplishments and appreciated for nicely compiling all research achievements in the QRT document. The house discussed the extent of addressing recommendations of previous QRT and the difficulties faced in addressing them. QRT members appreciated the Institute's overall progress and urged the scientists to augment their efforts further to achieve the challenging demands.

Scientists in different thematic areas presented the research achievements of the Institute during the 2018-2023 period.

Annexure VI

ICAR-National Institute of Agricultural Economics and Policy Research
Pusa, New Delhi-12

Dated: 20.08.2025

Proceedings of the fifth meeting of Vth QRT

Fifth meeting of present QRT was held on August 19-20, 2025 and following members were present:

S. No	Name & Designation
1.	Dr. Mruthyunjaya, Chairman Former National Director, NAIP, New Delhi
2.	Dr. J. V. Meenakshi, Member Professor of Economics, Indraprastha Institute of Information Technology, Delhi
3.	Dr. A. Ganesh Kumar, Member Professor, Indira Gandhi Institute of Development Research, Mumbai
4.	Dr. M. H. Wani, Member Former Chair Professor Rajiv Gandhi Chair and Registrar, SKUAST-K, Shalimar, Jammu & Kashmir
5.	Professor C.S.C. Sekhar, Member Institute of Economic Growth, Delhi University, Delhi
6.	Mr. Deepak Pareek, Member, Founder Managing Director, HnyB Tech-Incubation Pvt. Ltd.
7.	Dr. Pratap Singh Birthal Director, ICAR-NIAP, New Delhi
8.	Dr. Khem Chand, Member Secretary ICAR-NIAP, New Delhi

On the first day of the QRT program on August 19, 2025, forenoon the team held a meeting with scientific faculty and other staff of the NIAP and shared the key recommendations proposed in draft QRT report. QRT members appreciated the Institute's overall progress and urged the scientists to augment their efforts further to achieve the challenging demands. The recommendations presented were in three categories viz. Structure and Governance, research and capacity building. The NIAP staff discussed the recommendations with QRT team and suggested some modifications. Further QRT team held discussions on draft report during afternoon session and finalized it in its final meeting on August 20, 2025.

ATR on QRT (2011-17) recommendations

S. No.	Recommendations	Council comments	ATR
A	**Agriculture policy and advocacy**		
1.	In keeping with increasing advisory role to ICAR, the Team recommends to strengthen the advocacy role so as to trickle down the policy effects on various interventions at field level. The Team observed latency in transmission of research findings to the policy in some areas and suggested that Institute must strive to reduce this by being the link and ICAR-NIAP can enhance the role of increasing policy communication and advocacy.	Agreed	The Institute scientists regularly interact with stakeholders, efforts will be made to enhance participation in policy interaction meetings organized by state governments and relevant central ministries. Institute policy recommendations are regularly communicated to stakeholders through policy papers, policy briefs, discussion papers, print and electronic media etc. The Institute has also started the Policy Lecture series for strengthening the policy linkages.
2.	The Institute should strengthen interaction with state governments for their policy matters, besides SAUs, as states play vital role in development of agriculture. Phased development of strong policy connections is the need of the hour. This should be facilitated by ICAR and government departments.	Very important. Such interactions to be taken up on regular basis.	The Institute scientists regularly participate in interaction meetings conveyed by the various state governments. The research findings and policies recommended are shared with the state governments. Sponsored studies are also undertaken for different states. The Institute regularly participates in Regional Committee meetings convened by ICAR, and provide inputs on policy related matters. The Institute also completed the Uttarakhand Livelihood Diversification Project with Uttarakhand government.

S. No.	Recommendations	Council comments	ATR
3.	The Team after considering the ranking framework practiced in other sectors to gauge the key indicators of development and also to enhance competitive federalism, recommended to develop a ranking of states in agriculture. The Institute can prepare India Agricultural Report (IAR) to incorporate the rankings once in 3 years or 5 years.	Agreed	Institute is regularly publishing ADR (Agricultural Development Report)thatincludesvariousfacets of agricultural economy. The Report provides the information and data on key performance indicators for all India and states. The Institute has developed an agricultural sustainability index for all states in the country. More studies will be taken for overall ranking of states in the context of agricultural development.
4.	Interaction with various Institutes and stakeholders assumes a prime importance for policy formulation. Essentially seminars and conferences gather them all under one roof to discuss the host of issues circumventing various policies, and hence the team suggested to increase the frequency of these interaction over next five years.	Agreed	Institute scientists participate in conferences/ seminars/ workshops both at National and International level organized by professional societies and Government organizations and provides policy inputs for development of agricultural sector. Efforts will be made to further increase scientists' participation in interactions across the country. The Institute also organizes webinars/ seminars/workshops regularly. Besides, the Institute operates a Network Project involving several ICAR Institutes and SAUs.
5.	The committee noted that the role and expertise of policy institutions are less utilized in exclusively policy formulation and as the ICAR-NIAP is the only institution for agricultural policies, hence, the team strongly	Very important and these interactions/ consulta-tions to be strength-ened.	Institute scientists are called for consultations at concerned ministries/ departments. Besides, scientists also participate in policy debates in different states. The Institute is a knowledge partner of NITI Aayog, and MoAFW. It also serves on

S. No.	Recommendations	Council comments	ATR
	recommended that any consultation on agricultural policy at the ministry or policy level should involve ICAR-NIAP.		the Committees of Ministry of Statistics and Programme Implementation, and the Ministry of Forests, Environment and Climate Change. The Institute is also consulted by different inter-ministerial committee meetings for issues related to agricultural policy.
6.	Some of the team members highlighted the importance of working on the germplasm exchange, policy research on exploitation of resources, policy for bio-regulators, role of private and public agencies, etc. The Institute may also foster collaboration with private sector on important issues.	Projects with Public-Private partnership may be taken up as per the mandate of the Institute.	Presently, NIAP conducts research projects sponsored by private sector as per ICAR guidelines. The Government of India recognizes the role of private sector in development of agribusiness in India. NIAP has started projects on solar water pumps and impact of digitalization in agriculture with private partners. The Institute will further tap this opportunity for larger policy research collaboration on important issues with private organizations. This shall be done by policy consultations and sponsored studies.
7.	Taking note of the crunch of manpower in the Institute and limited application of empirical models based on ground realities in the NARS, it is recommended to start a learning platform for Ph.D. and Post-Doctoral students, where, the individual scholars may be leveraged to develop a policy papers based on their dissertations.	Agreed. The faculty needs to develop expertise in newer emerging areas.	NIAP scientists are involved in guiding research scholars for their Ph.D. programmes enrolled in IARI, NDRI and State Agricultural Universities. Recently a MOU was signed between NIAP and Assam Agricultural University, Jorhat for working jointly on research projects and guiding students. The Institute will further boost this activity by involving more students for Ph.D. and Post-Doctoral studies on policy research

S. No.	Recommendations	Council comments	ATR
8.	The team members were also of the view that ICAR-NIAP should revisit the Agriculture Policies, as planning and direction to various intervention need a fresh revision on the backdrop of COVID 19 and other futuristic risks.	Agreed	Institute scientists have worked on Impact of COVID 19 on agriculture sector and suggested changes in agriculture sector policies for sustainable development of farmers. The Institute has recently provided inputs on agricultural outlook and foresight exercises and planning to take up more such exercises.
9.	Further the members also suggested ICAR- NIAP to work in the areas, technology systems, resource allocations, drought resource management and policy, extension effectiveness, capacity building of NARS scientists in data interpretations etc. The Team also opined that ICAR-NIAP and other policy oriented institutions should collaborate for better targeting of policies.	Agreed	The Institute is already working on above mentioned issues through Institute and network projects. NIAP is also conducting capacity building programs for NARS scientists on methodological issues. NIAP shall further increase its collaboration with policy institutions, specifically from different regions in India, so that a concrete policy input may be given to policy making bodies considering all regional dimensions.
B	**Research**		
10.	Apart from future research plans suggested in earlier chapter, QRT members suggested research on farmers' behaviours, crop insurance and local research, behavioural programs on nutrition, big data, macro policies and climate shocks etc., role of information in variety, seed, role of extension etc.	Expertise to work on newer research areas like big data and AI may be developed.	The Institute has conducted significant research on climate change impacts, adaptation and mitigation in agriculture. It has concluded studies on crop insurance in collaboration with MoA&FW. It also completed a study on impact of information on dairy productivity. Studies on big data analysis and AI, digital agriculture are being planned. A project on Agriculture-Nutrition Nexus is in operation in collaboration with Shaffield University, UK.

S. No.	Recommendations	Council comments	ATR
11.	Research collaboration should be pursued with other institutions like IIMs, ICSSR Institutes etc. This can foster periodic village survey, educate policy makers on how to increase producers' share in consumer price, how to lower the cost of production, agricultural credit and brand marketing, packaging, cooperative and contract farming and farmers' distress amongst others.	Collaborations with international organizations also to be explored.	The Institute is working with International institutions along with some other Government departments on policy issues. It will further develop programs wherein active linkages will be developed with the national institutions, and a network project with more than 10 organizations is already operationalized since 2021. The Institute is also developing a panel database of vulnerable households in selected geographies.
12.	The team noted that there exists a dire need to develop a matrix of research programs and link its research programmes into 3 flagship programmes, 1-2 flagship publications and 1-2 flagship training programmes. The matrix may involve ranking states based on agricultural performance.	Agreed	Institute has already initiated actions in this direction and developed one network program with three sub components and conducting flagship training programmes. The Institute has been continuously organizing the training programmes for the Officers of Indian Economic Services sponsored by the Ministry of Finance.
13.	As agriculture in rural areas has seen continuous transformation in the last decade or so, there is immense need to link the agricultural growth with the employment, labour markets, livelihood generation and rural prosperity so as to draw imperatives from it.	Very important. More such studies need to be taken up on priority.	The Institute through its projects (e.g. DFI project) is taking care of the issues related to changing agriculture and employment at macro and micro levels. A collaborative project on agricultural transformation, income and governance is in progress.

S. No.	Recommendations	Council comments	ATR
14.	The Institute needs to align the research portfolio with SDGs and commence a dedicated research on how agriculture is helping to achieve number of SDGs goals to underline the importance.	Agreed	The Institute research programs, especially on 'Doubling Farmer Income', 'Resilience of Agriculture to Climate Change', Database Development on Vulnerable Communities' Ecosystem Services, and Farmers' First, are directly or indirectly aligned with some of the SDGs. The Institute is handling various issues pertaining to the institutional and economic dimensions pertaining to water resources. In future also, Institute will develop a few more research program to achieve SDGs.
15.	The Institute has done good work in trade etc., and ICAR may facilitate institutionalizing such studies in future as well.	Dissemination of the findings and results are very much required and needs to be taken up.	Institute scientists has worked on outlook models for different commodities viz. rice, wheat, oilseeds and pulses. The findings are being shared with relevant organizations. The Institute has recently examined the export prospects, growth linkages and the virtual water exports from the country. The Institute is undertaking research works on impact of Free Trade Agreement between nation/Union/ trade blocks and India in Agriculture sector.
16.	The Institute may act as a lynchpin in promoting the diversification in agriculture. By taking cognizance of the status, potential and trade-offs from diversification, Institute can foster their commercial cultivation.	Agreed	The Institute has contributed significantly towards understanding the nature, extent and drivers of agricultural diversification towards high-value crops and livestock. It has also studied some aspects of commercial cultivation of

S. No.	Recommendations	Council comments	ATR
	For instance, commercial cultivation of medicinal and aromatic plants to feed domestic industries and to toe the line of Atmanirbhar Bharat.		medicinal and aromatic plants, such as ginger. It will continue this work with focus on niche commodities.
17.	On trade front the research needs to be done on tracking the trade movement/ commodity movement to the key markets in the hinterland and the stakeholders involved and cost associated in it. This larger insight is required to tackle the menace of undue profiteering and increase the share of producers in consumer rupee.	Agreed	The Institute has conducted studies on prospects of improving export competiveness and reducing imports through policy and non-policy measures. These have also assessed the likely benefits of trade to farming communities, and made suggestions to improve producers share in consumer rupee for different commodities based on various field studies conducted in network project. A group of scientists are working on agricultural trade and market outlook.
C	**Training and Capacity Strengthening**		
18.	Team also suggested ICAR-NIAP to start a Ph.D. programme in development policy, post- doctoral programme and hire YPs and consultants on the lines of NITI Aayog to augment its research activities, like state ranking index, farmers' condition across states, etc.	The feasibility needs to be worked out.	The Ph.D. programme in Agricultural Economics is already offered in IARI. ICAR-NIAP will explore possibilities of offering Post-Doctoral programme.
19	On peer review of the research progress, policy advocacy and capacity building in last several years, the Committee has given the	Explore capacity building programs to be taken up. Also	ICAR-NIAP is regularly conducting capacity building programs for University teachers and ICAR scientists in the discipline of Agricultural Economics. NIAP faculty

S. No.	Recommendations	Council comments	ATR
.	tag of Centre of excellence to ICAR-NIAP in agricultural economics. ICAR-NIAP should also pursue active role in strengthening teaching activities in view of recent advances in discipline.	more involvement in UG-PG teaching activities with IARI.	teaches and guides students at IARI and NDRI. Recently, NIAP has signed an MoU with Assam Agricultural University for strengthening teaching and research at the University.
20.	ICAR-NIAP has to assume new role in developing leadership in NARS through network and collaboration. Also recommended to build capacity of staff at various levels both at project and institution level.	Very much required	A Network project is in progress involving agricultural economists from ICAR Institutes and State Agricultural Universities. The project aims at developing research capacity of NARS scientists. Further NIAP scientists shall also be sent for advance trainings in India and abroad
D	**Structure & Governance**		
21.	The team observed that ICAR-NIAP is governed well with all democratic institutions in place for transparency and effective work culture. The QRT endorses the previous recommendations for establishing the 3 themes into full-fledged divisions for maintaining the uniformity with other institutions and better decentralized governance.	Agreed	ICAR has already established two divisions' viz. Technology and Sustainable Agriculture, and Market and Trade. One more division 'Growth and Development' has been proposed in the EFC is functional as separate section
22.	The team took stock of the system of various committees and opined that their working is fine. It suggested to increase the technology intervention in governance to reduce any administrative delay/ lag in decision making.	Agreed	The Institute is functioning under ICAR system and adopted all online administrative software for better working interacting with concerned ministries and sharing the policy documents for inclusion in their decisions.

S. No.	Recommendations	Council comments	ATR
E	**Enhancement of the number of scientists**		
23.	ICAR-NIAP cannot do everything due to limitations of scientists. Research portfolio should be based on its strength. The Institute cadre strength should be enhanced to 35 and hence ICAR should depute more scientists with policy research expertise at ICAR-NIAP.	Very much required	ICAR-NIAP will pursue with Council for enhancing cadre strengthen from 30 to 35 so that ICAR deputes more scientists trained in agricultural and policy research.
F	**Strengthening communication**		
24.	ICAR-NIAP should be more effective in policy communication not only with the policy makers but also communicate with all stakeholders and also bring monthly bulletin for effective communication.	Monthly/ Quarterly Newsletters can be published.	The Institute is publishing Policy Papers, Policy Briefs based on research work. The scientists are regularly participating in policy related dialogues in agricultural sector organized by the ministries, academic organizations and mass media platforms like Doordarshan and Radio. Policy discussions are also organized for dissemination of policy research findings. Recently a monthly policy lecture series has been started. In addition, NIAP faculty regular interacts with farming communities on the issues they confront in the villages identified for database development. Institute also makes regular interaction with private sector on various issues of agriculture development and technology extension.

S. No.	Recommendations	Council comments	ATR
25.	To foster communication at ground level and to timely build their capacity ICAR-NIAP should think of establishing constant linkage with key ICAR Institutes and other social science organizations. This would help in real- time assessment and yearly evaluation of social benefits, ecosystem services and capacity building of whole social scientist	More initiatives to be taken up.	The Institute is collaborating with various ICAR Institutes and State Agricultural Universities through various network research programmes. It has also initiated a new network research program with three sub components and jointly working with social scientists posted in different Institutes/ universities in the country. A project on valuation of ecosystem services has been started.
26.	Digital technology should be strengthened for effective communication, hence the ICAR- NIAP can play critical role in enhancing the same.	Agreed	The Institute is using modern communication tools like ZOOM etc. for organisation of online capacity building programs/webinars for social scientists in the NARS. It shall further enhance the use of modern digital technologies for better communication. All the publications in soft form are shared with all the social scientists working in ICAR-SAU system and at its web site for wider publicity and use by concerned ministries. Social media platforms are extensively being utilized for disseminating the research achievement and strengthening academia-industry linkages.

LIST OF RESEARCH STUDIES ANALYZED IN TABLE 3.2

Agricultural markets, prices and value chain

1. Kumar, S., Abdulla and Singh, C. (2020). Productivity growth in India's bakery manufacturing industry. Journal of Agribusiness in Developing and Emerging Economies, 1-10. DOI 10.1108/ JADEE-12-2019-0204 https://www.emerald. com/insight/2044-0839.htm

2. Abdulla and Kumar, Shiv (2021). Technical efficiency and its determinants in the Indian textile garments industry. *Research Journal of Textile and Apparel*, 25(4): 346-360. https://doi.org/10.1108/RJTA-09-2020-0110

3. Birthal, P. S., Pandey, G., Jumrani, J., Jaweriah, N. (2019). Supply response in Indian dairying. Indian Journal of Animal Sciences, 89(4): 459-465. https://doi.org/10.56093/ijans.v89i4.89150

4. Birthal, P., Negi, A., and Joshi, P. (2019). Understanding causes of volatility in onion prices in India. Journal of Agribusiness in Developing and Emerging Economies, 9(3):255–275. https://doi.org/10.1108/JADEE-06-2018-0068

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SPECIFIC SUGGESTIONS FOR A FEW ARTICLES

(on the theme of "Agricultural Markets, Trade and Institutions")

Detailed suggestions are given below for a few specific articles. These suggestions can be adopted and adapted for other similar research. The following articles are very good in terms of methodology and general approach. Therefore, these suggestions should be taken in the spirit of further improvements. The suggestions are divided into those related to methodology and general suggestions

1. **Balaji, S. J.,** Umanath, M., and Arun, G. 2021. "Welfare Gains of Inward-Looking: An Ex-Ante Assessment of General Equilibrium Impacts of Protectionist Tariffs on India's Edible Oil Imports." *Agricultural Economics Research Review* 34 (Conference Number): 1-20. https://doi.org/10.5958/0974-0279.2021.00011.2

Objective: To quantify the likely benefits of protectionist tariff hikes in enhancing domestic production and improving producer prices.

Abstract

The present study is an attempt to quantify the likely benefits of protectionist tariff hikes in enhancing domestic production and improving producer prices. It takes the case of the edible oil imports of India and estimates the price gains the oilseed producers (farmers) and the processing industries may receive; likely increase in domestic oilseeds and edible oil production, and the role the technology in attaining oilseeds/edible oil self-sufficiency.

A three-sector open-economy Computable General Equilibrium (CGE) model is calibrated to a 2017-18 SAM developed for this purpose. Tariff hikes are assumed in different protectionist scenarios and their impacts on production and prices are simulated. Total Factor Productivity (TFP) estimates are derived for the oilseeds (2005-18) and the edible oil (2014-18) sectors to understand the technological penetration there. The price gains vary between 2.4% and 6% for the oilseeds producers and between 1.2% and 2.9% for the edible oil industries. The oilseeds production may enhance by 1.8% at maximum, and the edible oil production by 2.9%. The existing TFP growth is inadequate to move towards oilseeds/ edible oil self-sufficiency. This demands a shift in production technology.

Suggestions for alternative methodology

This is a good attempt. However, DSGE (with forward looking agents) and spatial GE, which is more suited to agricultural trade, can be the directions for future work.

1. Dynamic Stochastic General Equilibrium (DSGE) Model

A DSGE model provides a dynamic framework by incorporating forward-looking agents, allowing for the assessment of long-term macroeconomic effects of tariff policies on consumption, savings, and investment. Unlike CGE models, it accounts for market rigidities, monetary policy, and gradual trade adjustments.

Implementation:

- Calibrate a DSGE model with trade frictions using macro and sectoral trade data.
- Introduce tariff policy shocks and assess effects on domestic production and prices.
- Employ Bayesian estimation to refine parameters.

Strengths: Captures dynamic behavioural responses and expectations.

Limitations: Requires complex modelling and is highly sensitive to parameter calibration.

Reference: https://arxiv.org/pdf/2503.10715

2. Spatial Equilibrium Model (SEM) for Evaluating Tariff Policy Impact

SEM models regional market adjustments, analysing how tariff-induced price changes influence production, trade flows, and market equilibrium. It is particularly relevant for agricultural trade due to its regional nature.

Implementation:

- Construct a spatial price equilibrium framework for domestic and international markets.
- Incorporate tariff shocks and calibrate with empirical trade data (e.g., FAO, WTO).
- Solve the model using nonlinear programming techniques.

Strengths: Captures price and trade flow adjustments; policy-relevant.
Limitations: Mostly static; does not account for macroeconomic interactions.

Reference: https://onlinelibrary.wiley.com/doi/epdf/10.1002/jaa2.12

General suggestions

Methodological Rigor – While the paper employs a CGE model, robustness checks and a thorough justification of key assumptions, including trade elasticities and household and firm responses to tariff adjustments are needed. Strengthening these aspects would improve the model's credibility and reliability.

Engagement with Literature – Although the study references relevant works, a more in-depth discussion on trade protectionism, market distortions, and comparative analyses with similar studies would enhance its theoretical and empirical contributions.

Policy Implications – The conclusions effectively summarize the price and production impacts; however, a more comprehensive discussion on broader economic consequences, alternative policy instruments, and potential unintended effects would provide greater policy relevance and depth.

2. **Saxena, Raka**, Devesh Kumar Pant, Purushottam Sharma, Ranjit Kumar Paul, and Rohit Kumar. 2023. "Sustaining Long-Term Agricultural Exports from India." *Current Science* 125(10): 1109-1115. https://doi.org/10.18520/cs/v125/i10/1109-1115

Objectives:

- To examine the trend and composition of agricultural exports,
- Assess the dynamics of comparative advantage,
- To explore the reasons for Indian agri-exports rejection,
- Ascertain the impact of the COVID-19 pandemic on Indian agricultural exports.

Design/methodology/approach

The study delineated horticultural commodities in terms of comparative advantage, examined temporal shifts in export advantages (mapping) and estimated seasonality.

(1) Product mapping was carried out using the Revealed Symmetric Comparative Advantage (RSCA) and Trade Balance Index (TBI).

(2) Seasonal advantages were examined through a graphical approach along with the objective tests, namely, modified QS-test (QS), Friedman-test (FT) and using a seasonal dummy

Suggestions for alternative methodology

1. Markov Chain Transition Probability Matrix

Tracks the probability of commodities shifting between comparative advantage levels, assessing stability and mobility.

Implementation: Classifies RSCA states, constructs transition matrices, and estimates long-run equilibrium distributions.

Strengths: Captures mobility dynamics. Predicts future comparative advantages.

Limitations: Requires long time series data. Assumes the Markov property.

2. Survival Analysis

Measures how long a commodity retains comparative advantage and factors influencing its persistence.

Implementation: Estimates survival functions (Kaplan-Meier) and Cox models to assess duration dependence.

Strengths: Quantifies persistence over time. Identifies key determinants of survival.

Limitations: Requires detailed longitudinal data. Cox model assumptions may not hold.

Reference: https://onlinelibrary.wiley.com/doi/epdf/10.1155/2022/2566259

3. Gravity Model

The Gravity Model, widely used in international trade analysis, effectively assesses COVID-19's impact on agricultural exports by incorporating pandemic-related variables, facilitating causal inference on trade disruptions.

Implementation: Estimated using Poisson Pseudo Maximum Likelihood (PPML) to address heteroskedasticity and zero trade flows, the model controls for economic size, distance, trade agreements, and COVID-19-induced disruptions. Panel fixed effects mitigate unobserved heterogeneity across trading partners.

Strengths: It quantifies trade barriers' causal effects, addresses endogeneity using instrumental variables, and provides policy-relevant insights on market access and trade costs.

Comparison with ANN-SARIMA: Unlike Hybrid ANN–SARIMA, which excels in short-term forecasting but lacks interpretability, the Gravity Model explains

trade determinants, remains robust to structural shifts, and does not require extensive training data.

Reference: https://doi.org/10.1016/j.jjie.2021.101135

General suggestions

Theoretical Framework – Integrate trade theories like Ricardian or Heckscher-Ohlin models to strengthen the conceptual foundation.

Robustness Checks – Enhance empirical rigor using Markov transition matrices or panel regressions to analyse stability and determinants of comparative advantage. Consider a gravity model for deeper trade insights.

3. **Saxena, Raka**, M. S. Raman, Shivendra K. Srivastava, Md Arshad Khan, and Rohit Kumar. 2023. "Does India Need a Different Rice Ecosystem to Harness the Export Advantages and Manage the Virtual Water Exports?" *Current Science* 124(4): 407-413. https://doi.org/10.18520/cs/v124/i4/407-413

Objective: Assessed the virtual water trade and comparative advantages in rice exports

Suggestions for alternative methodology

1. Spatial econometric model

Spatial econometrics, including GWR and Spatial Durbin models, uncovers spatial heterogeneity in phenomena like water usage and trade advantages, accounting for spatial dependencies.

Implementation

GWR and Spatial Durbin models capture spatial variations and spillover effects using spatial weight matrices.

Strengths: These models improve model accuracy, reveal regional heterogeneity, and inform localized policy.

Limitations: Requires high-quality spatial data and is computationally intensive. Interpretation can be challenging due to spatial spillovers.

Reference: https://www.tandfonline.com/doi/epdf/10.1080/08853908.2014.1001536?needAccess=true

General suggestions

- Use natural experiments (e.g., policy changes, droughts) and instrumental variable techniques to strengthen causal claims regarding trade and water sustainability linkages.
- Incorporate micro-level farm data to enhance understanding of farmer behavior and regional productivity variations.
- Develop predictive models to simulate the effects of policy incentives on rice acreage and sustainable transitions.

4. **Saxena**, **Raka,** Anjani Kumar, Ritambhara Singh, Ranjit Kumar Paul, M.S. Raman, Rohit Kumar, Mohd Arshad Khan, and Priyanka Agarwal. 2024. "Examining Export Advantages in Indian Horticulture: An Approach Based on Product Mapping and Seasonality." *Journal of Agribusiness in Developing and Emerging Economies* 14(2): 161-192. https://doi.org/10.1108/JADEE-12-2021-0310

Objectives

- Maps various commodities and analyses the competitiveness of horticultural commodities in terms of comparative advantage and disadvantage in exports,
- Examines temporal shifts in product movements (mapping),
- Analyses seasonality to identify commodities and countries to enhance India's horticultural exports.

Suggestions for alternative methodology

1. Gravity Model

The study employs the Revealed Symmetric Comparative Advantage (RSCA) and Trade Balance Index (TBI) to evaluate export competitiveness. However, these indices do not fully capture dynamic trade shifts, non-tariff barriers, and value chain factors.

Implementation

Incorporating the Gravity Model of Trade can enhance the analysis by accounting for bilateral trade flows, trade barriers, and country-specific factors. This approach provides a more comprehensive and policy-relevant assessment of India's horticultural exports.

Strengths

The Gravity Model integrates macroeconomic variables, trade agreements, and economic size, offering a realistic framework for analysing trade dynamics.

Limitations

The effectiveness of the Gravity Model depends on high-quality bilateral trade data, which may be limited for certain horticultural commodities.

Reference: https://doi.org/10.1016/j.jjie.2021.101135

General suggestions

- Establish a clearer connection between the findings and established trade theories, such as the Ricardian model or the Gravity Model, to contextualize the study's contributions relative to existing literature.
- Employ panel econometric techniques to account for temporal and cross-sectional variations, conduct robustness checks using alternative measures of competitiveness, and control for unobserved heterogeneity to strengthen the validity of the results.
- Derive actionable policy recommendations related to export promotion, infrastructure investment, and regulatory reforms, while situating India's performance within a comparative framework of other emerging economies.

5. Sharma, P., Meena, D. C., & Anwer, M. E. (2025). Asymmetric price transmission in perishable crops value chain: A NARDL approach. *Agribusiness, 41*, 588–611. https://doi.org/10.1002/agr.21904

Objective: To understand the asymmetries in price transmission, both in magnitude and speed, along the farm–wholesale and wholesale–retail supply chains of Potato, Tomato, and Onion marketing in India.

Abstract

Policymakers and economists envisage effective price transmission across markets or stakeholders in supply chains as a vital contributor to market efficiency. The paper explores the vertical price transmission in the perishables supply chain in India using weekly data on farm, wholesale and retail prices collected from main production and consumption markets.

We estimate the asymmetries in price transmission using the **nonlinear autoregressive distributed lags model** and found the asymmetry in both magnitude and speed in the case of wholesale–retail chain of Onion and Potato, asymmetry in magnitude in wholesale–retail chain of Tomato,

and asymmetry in speed in farm–wholesale chain of Potato. The results of asymmetric coefficient, long–run elasticity of price transmission, speed of adjustment and implied half–life of disequilibrium indicated that farm–wholesale chain is more efficient than wholesale–retail chain. Further, market chains of Onion and Tomato are more efficient than Potato chains. The magnitude of the adjustment was found to be larger for the long–run positive shock in wholesale–retail market chain of Onion, Potato and Tomato, and it concluded that retailers enjoy an advantage over wholesalers as well as farmers. We draw interesting policy considerations for the perishables sector.

Suggestions for alternative methodology

In analyses of asymmetric price transmission (APT), the selection of the empirical model plays a pivotal role in shaping the results. The Nonlinear Autoregressive Distributed Lag (NARDL) framework proposed by Shin et al. (2014) offers a robust approach for identifying both short-run and long-run asymmetries. However, neglecting to account for potential structural breaks or to evaluate alternative model specifications may result in misleading inferences.

1. **Structural breaks**: Agricultural price series are frequently influenced by exogenous shocks, including policy interventions and global disruptions such as pandemics (See Figure A1 for price spikes). Failure to account for potential structural breaks in such series can lead to misleading inferences regarding price asymmetries. Ignoring structural breaks can produce spurious asymmetry results. Hassanzoy et al. (2016) explicitly incorporates Bai-Perron tests to detect structural changes in price series. While Meyer and von Cramon-Taubadel (2004) do not implement break tests, they underscore the importance of addressing potential regime shifts when modelling asymmetric price transmission.
2. **Robustness check model alternatives**: While NARDL is flexible, robustness could be tested against Asymmetric Vector Error Correction Models (AVECM) (Hassanzoy et al. (2016)) or multivariate panel vector error correction model (PVECM) (Rezitis and Tsionas, 2019)

General suggestions

- The selection of appropriate market nodes is critical when analysing asymmetric price transmission in TOP (Tomato, Onion, and Potato) crops. For example, in the case of onions, Lasalgaon represents a key production-side (farm-gate) market, while Delhi serves as a major consumption-side (retail) market. Price movements between these two locations often diverge, reflecting potential asymmetries in transmission from wholesale to retail levels. Such spatial considerations are essential

for accurately identifying and interpreting APT patterns across the value chain.

- Ensure that **policy recommendations** are backed by specific findings (Eg. if tomato supply chains are more efficient, what exact intervention does the evidence support?).

6. **Meena, D. C**., Sharma, P., & Anwer, M. E. (2024). Did COVID-19 impact market arrivals and prices of major food commodities in India: Evidence from extended time series analysis. *Agricultural Research, 13*(2), 340–351. https://doi.org/10.1007/s40003-023-00695-2

Objective: To estimate the impact of the nationwide lockdown on market arrivals, price margin, and wholesale and retail prices of major food commodities.

Abstract The COVID-19 pandemic and subsequent lockdown policy significantly impacted all sectors of the economy, including agriculture. It disrupted the market's normal functions in multiple ways; hence, this study was conducted using extended time series data to estimate the impact of the nationwide lockdown on market arrivals, price margin, and wholesale and retail prices of major food commodities. The study employed multiple policy interventions **interrupted time series analysis (ITSA) model** to estimate pre- and post-intervention price trends change following lockdowns in 2020 and 2021. The results indicated that most agricultural commodities witnessed a substantial decrease in market arrivals, and there were heterogeneous effects on price margins across commodities and lockdown periods. ITSA results reveal that wholesale and retail prices for wheat and rice decreased significantly due to record crop harvests in 2019–20 and free distribution through Government welfare programs (PMGKAY). In contrast, the wholesale and retail price of pulses dal and mustard oil increased significantly during the lockdown period of 2020 and 2021. Overall, the Government managed the lockdown in 2021 better than in 2020, enabling access to essential goods and services, transportation and other conveniences. Furthermore, the study suggests policies to enhance the supply chain's responsiveness and resilience to future pandemics and natural disasters, given the lessons learned from the COVID-19 lockdown.

Suggestions for methodology

1. While the study incorporates a broad set of commodities, it treats them as a homogeneous group. To enhance analytical precision, it is recommended that the analysis be disaggregated by commodity category (e.g., staples versus perishables) and regional context (e.g., northern versus southern

India) to capture potential heterogeneity in market responses and policy effectiveness during the pandemic.

2. In addition to ITSA, incorporate complementary diagnostics such as:
   - **a. GARCH models** to capture temporal volatility,
   - **b. Structural break tests** (eg., Additive Outlier models) to formally assess whether regime changes align with policy shocks.

   These additions will provide a more nuanced view of price dynamics and strengthen the causal interpretation of the intervention's impact.

General suggestions

In addition to documenting trends in prices and market arrivals, the integration of commodity-specific policy interventions is recommended to strengthen empirical insights:

1. Relevant Policy Interventions

a. Public Distribution System (PDS) coverage during lockdown periods

b. State-wise agricultural procurement data

c. Mobility relaxations specific to agricultural operations

d. Distribution through e-commerce platforms or Farmer Producer Organizations (FPOs)

2. Suggested Analytical Approach

a. Incorporate descriptive mapping and interaction terms with policy-specific dummies to capture the differential impact of interventions

b. Where feasible, triangulate findings using secondary sources or official government communications

3. Rationale and Contribution

a. Enables clearer attribution of observed market resilience or disruptions to specific policy measures

b. Enhances the manuscript's relevance to ongoing debates on state capacity and governance of food systems under crisis conditions

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