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R2017-0180/1

July 17, 2017

**Closing Date: Thursday, August 3, 2017
at 6:00 p.m.**

FROM: Vice President and Corporate Secretary

India - National Agricultural Higher Education Project

Project Appraisal Document

Attached is the Project Appraisal Document regarding a proposed loan to India for a National Agricultural Higher Education Project (R2017-0180), which is being processed on an absence-of-objection basis.

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Report No: **PAD1672**

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF
USD 82.5 MILLION

TO THE

REPUBLIC OF INDIA

FOR A

NATIONAL AGRICULTURAL HIGHER EDUCATION PROJECT

July 11, 2017

Agriculture Global Practice
SOUTH ASIA REGION

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CURRENCY EQUIVALENTS
(Exchange Rate Effective June 1, 2017)

Currency Unit = Indian Rupee (INR)
USD 1 = INR 64.47

FISCAL YEAR
April 1 – March 31

ABBREVIATIONS AND ACRONYMS

AEDIS	Agricultural Education Digital Information System
AU	Agricultural University
BCR	Benefit-Cost Ratio
CAAST	Center of Advanced Agricultural Science and Technology
EAM	Equity Action Measure
EAP	Equity Action Plan
EMF	Environmental Management Framework
FM	Financial Management
GDP	Gross Domestic Product
GOI	Government of India
GRS	Grievance Redress System
IASRI	Indian Agricultural Statistics Research Institute
IBRD	International Bank for Reconstruction and Development
ICAR	Indian Council of Agricultural Research
IDP	Institutional Development Plan
IRR	Internal Rate of Return
IUFR	Interim Unaudited Financial Report
M & E	Monitoring and Evaluation
MIS	Management Information System
NAHEP	National Agricultural Higher Education Project
NAIP	National Agriculture Innovation Project
NATP	National Agriculture Technology Project
NISAGENET	National Information System on Agricultural Education Network
PG	Postgraduate
PIU	Project Implementation Unit
PME	Project Monitoring and Evaluation
SC/ST	Scheduled Class/ Scheduled Tribe
TFP	Total Factor Productivity
UG	Undergraduate
USAID	United States Agency for International Development

Regional Vice President:	Annette Dixon
Country Director:	Junaid Ahmad
Senior Global Practice Director:	Juergen Voegelé
Practice Manager:	Martien Van Nieuwkoop
Task Team Leader:	Edward W. Bresnyan

INDIA
National Agricultural Higher Education Project

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PAD DATA SHEET*India**National Agricultural Higher Education Project (P151072)***PROJECT APPRAISAL DOCUMENT***SOUTH ASIA**0000009246*

Report No.: PAD1672

Basic Information			
Project ID P151072	EA Category B - Partial Assessment	Team Leader Edward William Bresnyan	
Financing Instrument Investment Project Financing	Fragile and/or Capacity Constraints []		
	Financial Intermediaries []		
	Series of Projects []		
Project Implementation Start Date 05-Jun-2017	Project Implementation End Date 31-May-2022		
Expected Effectiveness Date 04-Sep-2017	Expected Closing Date 30-Nov-2022		
Joint IFC No			
Practice Manager Martien Van Nieuwkoop	Senior Global Practice Director Juergen Voegele	Country Director Junaid Kamal Ahmad	Regional Vice President Annette Dixon
Borrower: Republic of India			
Responsible Agency: Indian Council of Agricultural Research			
Contact: Telephone No.:	Trilochan Mohapatra 91-11-2338-2629	Title: Email:	Director General, ICAR dg.icar@nic.in
Project Financing Data(in USD Million)			
[X] Loan	[] IDA Grant	[] Guarantee	
[] Credit	[] Grant	[] Other	
Total Project Cost:	165.00	Total Bank Financing:	82.50
Financing Gap:	0.00		

Financing Source		Amount				
Borrower		82.50				
International Bank for Reconstruction and Development		82.50				
Total		165.00				
Expected Disbursements (in USD Million)						
Fiscal Year	2018	2019	2020	2021	2022	2023
Annual	17.00	21.50	24.00	13.00	5.50	1.50
Cumulative	17.00	38.50	62.50	75.50	81.00	82.50
Institutional Data						
Practice Area (Lead)						
Agriculture						
Contributing Practice Areas						
Education						
Proposed Development Objective						
The objective of the Project is to support Participating Agricultural Universities and ICAR in providing more relevant and higher quality education to Agricultural University students.						
Components						
Component Name		Cost (USD Millions)				
Support to Agricultural Universities		146.40				
Investments in Indian Council of Agricultural Research Leadership in Agricultural Higher Education		10.40				
Project Management and Learning		8.00				
Systematic Operations Risk- Rating Tool (SORT)						
Risk Category		Rating				
1. Political and Governance		Moderate				
2. Macroeconomic		Moderate				
3. Sector Strategies and Policies		Moderate				
4. Technical Design of Project or Program		Moderate				
5. Institutional Capacity for Implementation and Sustainability		Substantial				
6. Fiduciary		Substantial				
7. Environment and Social		Moderate				
8. Stakeholders		Substantial				
9. Other						
OVERALL		Substantial				

Compliance			
Policy			
Does the project depart from the CAS in content or in other significant respects?		Yes []	No [X]
Does the project require any waivers of Bank policies?		Yes []	No [X]
Have these been approved by Bank management?		Yes []	No [X]
Is approval for any policy waiver sought from the Board?		Yes []	No [X]
Does the project meet the Regional criteria for readiness for implementation?		Yes [X]	No []
Safeguard Policies Triggered by the Project		Yes	No
Environmental Assessment OP/BP 4.01		X	
Natural Habitats OP/BP 4.04			X
Forests OP/BP 4.36			X
Pest Management OP 4.09		X	
Physical Cultural Resources OP/BP 4.11			X
Indigenous Peoples OP/BP 4.10		X	
Involuntary Resettlement OP/BP 4.12			X
Safety of Dams OP/BP 4.37			X
Projects on International Waterways OP/BP 7.50			X
Projects in Disputed Areas OP/BP 7.60			X
Legal Covenants			
Name	Recurrent	Due Date	Frequency
Steering Committee	X	90 days after Effectiveness	CONTINUOUS
Description of Covenant			
ICAR to establish a Steering Committee to provide strategic guidance to the Technical Committee and Project Implementation Unit, approve plans and proposals and award the respective grants, and monitor and evaluate Project implementation.			
Name	Recurrent	Due Date	Frequency
Project Implementation Unit	X	N/A	CONTINUOUS
Description of Covenant			
ICAR to maintain the Project Implementation Unit (PIU) responsible for: (i) carrying out of the day-to-day implementation of the Project; (ii) assisting, monitoring and evaluating participating Agricultural Universities in their preparation of development plans, innovation proposals, etc., and their execution of the respective grants; (iii) preparing Project budgets and annual plans; (iv) monitoring project implementation and preparing project reports; (v) preparing the Project's financial statements; and (vi) ensuring compliance with/adherence to the safeguard documents/requirements.			

Name	Recurrent	Due Date	Frequency
Technical Committee	X	6 months after Effectiveness	CONTINUOUS
Description of Covenant			
ICAR to establish (prior to selecting any proposals and awarding any grants) and thereafter maintain a Technical Committee responsible for: (i) the screening, evaluation and selection of participating Agricultural Universities and their respective proposals as per the PIP, and recommending them to the Steering Committee for approval; and (ii) appraising the Steering Committee on the overall performance of the participating Agricultural Universities in the implementation thereof.			
Name	Recurrent	Due Date	Frequency
Monitoring and Evaluation Cell	X	90 days after Effectiveness	CONTINUOUS
Description of Covenant			
ICAR to establish a Monitoring and Evaluation Cell (“M&E Cell”) responsible for developing a monitoring and tracking system to supervise Project activities and oversee their progress; identifying implementation bottlenecks and propose corrective actions, and (iii) coordinate the Project's overall impact assessment.			
Name	Recurrent	Due Date	Frequency
Monitoring and Evaluation Consultants	X	90 days after Effectiveness	CONTINUOUS
Description of Covenant			
ICAR to select and hire: (i) a monitoring and evaluation expert or consulting firm in order to assist the M&E Cell in performing its monitoring and evaluation functions; and (ii) a monitoring and evaluation consulting firm in order to carry out: (A) an independent baseline survey of Project indicators; and (B) an outcome-focused impact evaluation of Project activities at mid-term of Project implementation and at Project completion.			
Name	Recurrent	Due Date	Frequency
Internal Auditor	X	9 months after Effectiveness	CONTINUOUS
Description of Covenant			
ICAR to hire and maintain a firm of chartered accountants to serve as internal auditors and carry out periodic internal audits of ICAR's and the participating Agricultural Universities' Project/sub-project accounts, as per the Financial Management Manual.			
Name	Recurrent	Due Date	Frequency
Project Documents	X	N/A	CONTINUOUS
Description of Covenant			
ICAR to implement the Project, and ensure that the participating Agricultural Universities implement their respective subproject plans/proposals all in accordance with the Project's Financial Management Manual, Procurement Manual, Project Implementation Plan and Safeguard Documents.			

Name	Recurrent	Due Date	Frequency
IDP, CAAST and Innovation Subprojects	X	N/A	CONTINUOUS
Description of Covenant			
ICAR to: (i) publicly invite all Agricultural Universities to submit institutional development plans, proposals for centers for advance agricultural science and technology and/or innovation plans in accordance with the Project Implementation Plan; (ii) screen, through the Technical Committee, the applicant Agricultural Universities as well as their proposals/plans in accordance with readiness and selection criteria set forth in the Project Implementation Plan, and determine those subproject proposals to be recommended to the Steering Committee for approval; and (iii) through the Steering Committee, approve the final list of subprojects and award the respective grants.			
Name	Recurrent	Due Date	Frequency
Grant Agreements	X	N/A	CONTINUOUS
Description of Covenant			
Upon selection and approval of subproject proposals/plans, ICAR to enter into performance-based written Grant Agreements with the respective participating Agricultural Universities providing for: (i) the release of the respective grant in tranches upon the Agricultural University having achieved pre-agreed indicators and/or milestones; (ii) ICAR's rights to exercise remedies upon a breach of the terms and conditions by the Agricultural University; and (iii) the obligations of the participating Agricultural University of, among others: (A) carrying out the respective subproject with due diligence and efficiency and as per the project documents, Procurement/Consultants' Guidelines and Anti-Corruption Guidelines; (B) providing promptly as needed the counterpart resources required; (C) adhering to/subscribing to and following the procurement complaint mechanisms established/prescribed by ICAR; (D) establishing within 90 days as of the signing of the Grant Agreement a monitoring and evaluation cell; (E) maintaining financial and management systems and preparing financial statements; (F) providing quarterly utilization certificates on the use of grant funds; (G) carrying out annual audits of the subproject financial statements; and (H) keeping records and authorizing inspection thereof and/or of subproject sites by ICAR and the Bank.			
Name	Recurrent	Due Date	Frequency
Safeguards Documents	X	N/A	CONTINUOUS
Description of Covenant			
ICAR to implement Project activities, and ensure that the participating Agricultural Universities implement their respective subprojects in accordance with the Environmental Assessment (EA) and Environmental Action Framework (EAF) and the Equity Action Plan (EAP), as well as the environmental and social plans and the equity actions measures prepared or to be prepared for the Project/subprojects pursuant to the EA&EAF and the EAP as the case may be.			
Name	Recurrent	Due Date	Frequency
Safeguard Screening	X	N/A	CONTINUOUS
Description of Covenant			
The Borrower to ensure that, prior to ICAR selecting any subproject or ICAR and the participating Agricultural Universities' tendering any bids for civil works or requesting any expression of interest for any technical services under the Project/subprojects, ICAR and/or the respective participating Agriculture University, as the case may be, has: (i) carried out an environmental and social screening /assessment of the proposed civil works or technical services in accordance with the EA&EMF and EAP; and (ii) whenever required pursuant to such screening, prepared and adopted an Environmental Sustainability			

Plan and/or an Equity Action Measure, and publicly disclosed the documents in local language(s) at the relevant Project sites.

Name	Recurrent	Due Date	Frequency
Excluded Activities	X	N/A	CONTINUOUS

Description of Covenant

ICAR to ensure that no activity under the Project shall (i) require the involuntary acquisition of land or give rise to displaced persons; and/or (ii) have, in the opinion of the Bank, significant adverse environmental impact of sensitive, diverse and/or unprecedented nature.

Name	Recurrent	Due Date	Frequency
Permits and Clearances	X	N/A	CONTINUOUS

Description of Covenant

ICAR to ensure that, prior to ICAR's or the participating Agricultural Universities commencing any activities under the Project and/or the respective subprojects: (a) all necessary permits and clearances for such activities have been obtained; and (b) all pre-construction conditions imposed by the government authority/ies under such permit(s) or clearance(s) have been complied with/fulfilled.

Name	Recurrent	Due Date	Frequency
Contractors' Safeguards Obligations	X	N/A	CONTINUOUS

Description of Covenant

ICAR to ensure that each contract for civil works under the Project, or under the participating Agricultural Universities' subprojects, includes the obligation of the relevant contractor to comply with the safeguard documents applicable to such civil works commissioned/awarded under said contract.

Name	Recurrent	Due Date	Frequency
Grievance Redress Mechanism	X	6 months after Effectiveness	CONTINUOUS

Description of Covenant

ICAR to establish, and thereafter maintain and operate, a grievance redress mechanism/protocol for the handling of any stakeholders' complaints/grievances arising out of the implementation of the Projects (including the Agricultural Universities' subprojects).

Name	Recurrent	Due Date	Frequency
Land Acquisition	X	N/A	CONTINUOUS

Description of Covenant

ICAR to ensure that any land required for the Project/subprojects shall be procured on a willing-buyer/willing-seller basis or obtained as a voluntary donation/bequest, and any expenditures associated with such acquisition be financed exclusively out of ICAR's or the participating Agricultural University's own resources.

Name	Recurrent	Due Date	Frequency
Safeguards Monitoring and Reporting	X	N/A	Semi-Annual

Description of Covenant

ICAR to maintain and/or cause the participating Agricultural Universities to maintain monitoring and evaluation protocols and record keeping procedures adequate to supervise and assess the implementation of/compliance with the safeguard documents and submit to the Bank, as part of the Project Reports, an assessment of the general compliance with the safeguard documents, the social and environmental impact of the project activities and the results of the mitigation or benefit enhancing measures applied thereto.

Team Composition				
Bank Staff				
Name	Role	Title	Specialization	Unit
Edward William Bresnyan	Team Leader (ADM Responsible)	Senior Agriculture Economist	Agricultural Economics	GFA12
Priti Jain	Procurement Specialist (ADM Responsible)	Senior Procurement Specialist	Procurement	GGO06
Papia Bhattacharji	Financial Management Specialist	Sr Financial Management Specialist	Financial Management	GGO24
Andreas Blom	Peer Reviewer	Lead Economist	Edn. Economics	GED13
Bela Varma	Team Member	Senior Program Assistant	Program Assistance	SACIN
Eija Pehu	Peer Reviewer	Consultant	Ag. Research	GFA13
Erick C.M. Fernandes	Team Member	Lead Agriculture Specialist	Ag. Research/ Climate Change	GFA04
Gizella Diaz Munoz	Team Member	Program Assistant	Program Assistance	GFA12
Jacqueline Julian	Team Member	Operations Analyst	Project Costs	GFA06
Jorge Luis Alva-Luperdi	Team Member	Senior Counsel	Legal	LEGES
Martin M. Serrano	Counsel	Senior Counsel	Legal	LEGES
Paul Singh Sidhu	Team Member	Consultant	Soil Science	GWA06
Sambuddha Goswami	Team Member	Consultant	Ag. Economics	GFA12
Saumya Srivastava	Team Member	Consultant	Institutional Arrangements	GFADR
Shagun Ahuja	Team Member	Team Assistant	Program Assistance	SACIN
Surbhi Dhingra	Safeguards Specialist	Consultant	Social Science	GSU06
Tara Beteille	Team Member	Senior Economist	Edn. Economics	GED06
Tobias Linden	Team Member	Lead Education Specialist	Edn. Economics	GED01

Vanitha Kommu	Safeguards Specialist	Consultant	Env. Science	GEN06	
Venkatakrishnan Ramachandran	Team Member	Program Assistant	Program Assistance	GFA12	
Victor Manuel Ordonez Conde	Team Member	Senior Finance Officer	Disbursement	WFALA	
Wilhelmus Gerardus Janssen	Peer Reviewer	Lead Agriculture Economist	Ag. Economics	GFA13	
Extended Team					
Name	Title	Office Phone	Location		
Helen Leitch	Livestock Specialist		FAO/Rome		
Locations					
Country	First Administrative Division	Location	Planned	Actual	Comments
India	States with Participating AUs	To be determined	N/A	N/A	
Consultants (Will be disclosed in the Monthly Operational Summary)					
Consultants Required?	Consulting services to be determined				

I. STRATEGIC CONTEXT

A. Country Context

1. India is a lower middle-income country with per-capita GDP of USD 1,593 (2015). GDP growth reached 7.9% in 2015, compared to a global average of 3.1%. High rates of investment and savings contributed to this growth, as did strong exports. Yet today some 263 million people in India (80% of whom live in rural areas) subsist on less than USD 1.90/day. India faces challenges in reducing extreme poverty, curbing high malnutrition and achieving shared prosperity. The Government of India (GoI) has emphasized increased climate resilient agricultural productivity as fundamental to India's poverty reduction and growth strategy. Building the relevant skill sets has been a persistent challenge across the economy. Educational institutions, particularly at the tertiary level, are critical to accelerate India's emergence in global markets, yet teaching is poorly linked with labor market demand, research and development, thereby producing graduates with limited problem-solving skills.

B. Sectoral and Institutional Context

2. Agriculture in India employs 52% of the labor force and is the main source of livelihood for 80% of the rural poor, but contributes only 14% to GDP and 10% to total exports. Women constitute about 60% of the economically active population in agriculture and livestock. The Green Revolution in the late 1960s and 1970s, with investment in new seeds, production technologies, cultivation methods and irrigation practices, improved agricultural productivity and made India food-secure. Haryana and Punjab – where the Green Revolution flourished – are today among the higher income states in the country. However, agricultural productivity growth declined in the 1990s, rebounded in the 2000s, and today remains low. Moreover, this growth has been largely price driven and heavily reliant on inputs rather than efficiency gains.

3. At current total factor productivity (TFP) growth, India's domestic agricultural output will meet 59% of the country's 2030 projected food demand (GAP Report 2014). The rising middle class demand for a more diverse diet, along with persistent malnutrition, increased water scarcity and climate change point to the urgency of achieving greater agricultural productivity, value addition and resilience. Agricultural higher education can be the engine for increasing agricultural productivity through better skilled technicians, innovative research and market-based extension linked to technologies and practices, all of which were common under the Land Grant model that India followed in establishing its Agricultural Universities (AUs). A 2014 Bank agricultural sector study¹ argues that, while India doubled investment in agricultural research and extension (0.4% of Agriculture GDP in 1981 to 0.96% in 2011), the quality of innovation has suffered along with institutional capacity to adapt and remain relevant. Reawakening the "research-education-extension nexus" intrinsic to the Land Grant model can propel India's agricultural innovation, farmers' technology adoption and agriculture's overall transformation. In Brazil, for example, the Coordination for the Improvement of Higher Education Personnel (CAPES) and the National Council for Scientific and Technological Development (CNPq) have worked together to build and maintain high-quality faculty in universities nationwide.

¹ India: Accelerating Agricultural Productivity Growth (<https://openknowledge.worldbank.org/handle/10986/18736>)

4. The Indian Council of Agricultural Research (ICAR) carries the mandate for the coordination and quality assurance of agricultural higher education at AUs in India. The ICAR-AU System comprises 63 State-level AUs, five Research Institutes (known as Deemed Universities), four Central-level universities with agricultural faculty and three Central-level AUs. The first State-level AU – G. B. Pant University of Agriculture and Technology, Pantnagar – was established in 1960 based on the United States Land Grant model, which emphasizes the integration of research, education and extension. Under the Indian Constitution, the State Governments exercise statutory control of agricultural higher education for State-level AUs, while the Union Government coordinates and sets educational standards across the entire ICAR-AU System, including the State-level AUs. ICAR maintains statutory control for Central-level AUs and Deemed Universities. In 1996, ICAR began voluntary AU accreditation to establish norms and quality standards across the ICAR-AU System. To date, ICAR has accredited 58 AUs.

5. The once-impressive AUs established during India's Green Revolution have become less effective and less relevant in stimulating the needed transformative change in Indian agriculture. The research-education-extension synergy – strong in earlier years – has waned substantially. Academic inbreeding has stunted curricula content, eroded faculty quality and weakened research and extension outcomes -- which have direct links to the currently low agricultural TFP across India, as well as the declining academic quality at AUs. As a result, the ICAR-AU System does not attract the high-quality students needed to form the talent base for India's agricultural growth, principally in the private sector.

6. There is increased private sector demand for skilled labor in all aspects of agriculture, particularly high-value agro-industry, food processing, and specialized knowledge-intensive areas such as water efficiency, food safety, and trade. Women agricultural producers must also participate in and benefit from agricultural research, education, and extension. A 2014 assessment of human resource requirements shows an annual deficit of 14,000 qualified individuals to satisfy the demand for degree holders in agricultural and allied sciences. A 2010 National Academy of Agriculture Research Management study found a jobs deficit of 50% in agriculture and allied sciences relative to the anticipated demand in 2020. AUs must adapt and respond to the rapidly changing agricultural sector and its increasing knowledge intensity, and prepare the high-quality human resources essential for any technology and innovation system to succeed.

7. ICAR has taken the lead in analyzing the challenges facing agricultural higher education in India. This has led to an ambitious reform agenda for AUs, detailed in the 2013 Bhubaneswar Declaration, emphasizing: (a) transparent governance; (b) financial and academic autonomy; (c) adequate and consistent funding; (d) standards and accreditation; (e) public-private partnerships; (f) revamped teaching curricula and methodologies; and (g) international cooperation. Nonetheless, several challenges confront AUs in achieving these reforms, namely:

- *Poor AU governance*: Overall academic accountability is weak and not linked to either desired student learning outcomes or faculty performance.
- *High AU faculty vacancy rates and pervasive academic inbreeding*: Some 56% of AU faculty positions are currently vacant, with minimal recent recruitment, leading to heavy workloads, poor teaching performance and scarce time available for research or extension. 51% of AU faculty have earned all their degrees from the same university, only 17% of faculty recruits are

new to the respective AU, and 46% of AU faculty have more than 15 years at the same institution. Limited contacts with national or international centers of excellence and weak linkages with industry, farms and the private sector have led to generalized academic stagnation, at a time when competitiveness requires more such interaction. There are few incentives in place to spur faculty productivity in teaching, research or extension.

- *Disconnect between agricultural higher education and future employment:* The private sector generates nearly one-half of agricultural employment opportunities in India, yet AU curricula remain focused on the shrinking opportunities in the public sector. More importantly, AU curricula lack a problem-solving orientation and offer little in terms of experiential learning. AUs must strengthen job-driven programs, including entrepreneurship-focused courses and certificate programs, to build pathways for off-farm work and facilitate technology transfer from lab-to-land.
- *AU capital development and financial management:* Salaries comprise up to 90% of AUs' expenditures, funding is almost entirely sourced from the public sector and AU budgets have not kept pace with increasing student admissions. In contrast, a typical Land Grant university in the United States sources only about 20% of its annual budget from public funds and about 80% from its own revenue (e.g., fees, tuition, royalties) and endowments. AUs must begin to raise their own resources through fee-based/market-oriented programs, sales of proprietary seed/planting material, consultancies and capital development initiatives. Assuring the quality and relevance of the AU academic "product" will be key to unlocking this potential revenue.
- *Meeting globalization:* Greater infusion of AU curricula in the "frontier sciences" (e.g., biotechnology, nanotechnology, precision and climate-resilient agriculture, ICT), good agricultural trade practices, and market intelligence are critical to promote efficiency, awareness, equity, and competitiveness in agriculture as India strives to cement its role as a global player in agriculture.
- *Forging agricultural service market development:* Employment demand among agro-industry, as well as professional private and public agricultural service providers will require business and technical skills to meet the knowledge demanded by farmers, particularly women.

8. The Development Grant – ICAR's annual financial support program to AUs – is perhaps the most significant tool to stimulate and encourage progress in addressing these challenges. Almost all of AU capital expenditure comes from ICAR through its Development Grant. As such, the norms and standards which ICAR establishes in deploying its Development Grant to AUs can play a critical role in enhancing the quality of agricultural higher education across the ICAR-AU System. Yet historically, these standards have been more procedural than substantive: to date, ICAR has essentially served as a pass-through mechanism for disbursing the Development Grant to the AUs. In GoI 2016-17, AU accreditation became a determinant for AU eligibility for the Development Grant. What is now needed is a refinement in how ICAR and the AUs engage with respect to the Development Grant: greater transparency, attention to quality outcomes, links to student and faculty performance, and objective and verifiable metrics need to be incorporated.

9. The proposed National Agriculture Higher Education Project – NAHEP – provides an opportunity for ICAR to construct a new way of implementing its Development Grant to AUs.

ICAR would also seek, through NAHEP, to improve the accountability of and confirm progress toward agreed outputs, outcomes and impacts associated with the Development Grant. Furthermore, ICAR, through NAHEP, would seek to revise and update its operational criteria that govern how AUs: (a) gain access to the Development Grant (i.e., accreditation); (b) deploy these financial resources (i.e., selectivity, outcome-based); and (c) monitor and evaluate the intended outcomes from its Development Grant (i.e., effectiveness).

10. The World Bank and ICAR have a long and fruitful collaboration, most recently through the National Agricultural Innovation Project (NAIP) and the National Agricultural Technology Project (NATP). The current ICAR-AU System reform agenda requires global knowledge and international expertise to refine its approach and implementation. For this reason, ICAR has requested World Bank support as a knowledge adjunct to the proposed NAHEP.

11. The challenges faced by AUs mirror those faced in general by higher education in India. The needs of the agricultural sector resonate with other sectors, i.e., highly trained workforce and relevant cutting-edge research. Two World Bank Global Practices – Agriculture and Education – are collaborating on the proposed NAHEP to ensure that the AU reform process benefits from innovations in both sectors across India and internationally. Through strategic priority interventions at the Central and State levels, the proposed NAHEP would have far-reaching and long-term impacts on agricultural higher education in India.

C. Higher Level Objectives to which the Project Contributes

12. The proposed Project supports the Country Partnership Strategy (CPS) 2013-17 (Report No. 76176-IN) and addresses the three engagement areas of integration, transformation and inclusion. These engagement areas foresee increased agricultural productivity and support quality improvements of higher education to create a more skilled workforce that continuously improves the productivity of key sectors, including agriculture. Furthermore, by working with AUs, particularly in low-income states, the proposed NAHEP supports the CPS strategy of improving their economic performance. The proposed Project is also a multi-Global Practice collaboration (Agriculture and Education) and is expected to support activities and results directly related to cross-cutting strategic areas of climate change, jobs and gender.

13. **Relationship of the Proposed Project with the United Nations' Sustainable Development Goals.** The proposed NAHEP would contribute to the achievement of four Sustainable Development Goals, namely:

- *Goal 4 – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all* – promotes: (a) equal access to affordable vocational training; and (b) greater gender and wealth equity through universal access to quality higher education. Specifically, NAHEP would finance interventions that increase the supply of qualified technicians (through certificate programs at AUs) and teachers (through international cooperation for teacher training and faculty exchange).
- *Goal 8 – Promoting inclusive and sustainable economic growth, employment, and decent work for all* – seeks higher levels of economic productivity through diversification, technological upgradation and innovation. NAHEP would foster a stronger innovation culture by twinning participating AUs with other higher-performing centers of learning (both in India and

internationally) and strengthening AU-private sector linkages to better orient student learning toward market-relevant skill sets.

- *Goal 9 – Building resilient infrastructure, promoting sustainable industrialization, and fostering innovation* – would enhance scientific research, and substantially increase both the research and development (R&D) workforce and its associated budget. The Institutional Development Plans (IDPs) which participating AUs would prepare to access NAHEP Grant funding, would create a unique opportunity to deepen the AU’s capacity to build partnerships for scientific excellence and expand both uptake and absorption of external research funds – both of which will significantly impact student learning and faculty performance.
- *Goal 13 – Take urgent action to combat climate change and its impacts* – would improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. The proposed NAHEP would specifically target AU curricula reform to internalize climate change and resilience in current and future course content and tie this with experiential learning for certificate, undergraduate (UG) and post-graduate (PG) students for practical career applications.

II. PROJECT DEVELOPMENT OBJECTIVE

A. PDO

14. The objective of the Project is to support Participating Agricultural Universities and ICAR in providing more relevant and higher quality education to Agricultural University students.

15. NAHEP addresses *quality* by supporting interested AUs to propose and implement technically sound and verifiable investments (i.e., IDPs) that increase faculty performance, attract better students to these AUs, improve student learning outcomes and raise their prospects for future employability, particularly in the private sector. *Relevance* would be addressed through: (a) greater alignment of academic curricula and course content with the skills sets being demanded in the agriculture and allied services sector; and (b) expanded certificate-level vocational courses to fill the gap for trained technical personnel, especially in market-led extension. Finally, both quality and relevance would be augmented through investments in ICAR that improve its ability to set and enforce standards across the ICAR-AU System and build international cooperation to the benefit of agricultural higher education.

B. Project Beneficiaries

16. NAHEP would target the 75 institutions that form the ICAR-AU System, consisting of State Agricultural Universities (63), Deemed Universities (5), Central Universities with Agricultural Faculty (4) and Central Agricultural Universities (3).

- *Students* would benefit from: (a) a movement from teaching- to learning-centered education, leveraging ICT and external partnerships; (b) piloting effective stakeholder participation in curricula development, pedagogy options and course evaluation; (c) increased equity in educational access through vocational and technical certificate programs; and (d) an overall improvement in the learning and academic environment that would both expand and sharpen their skill set needed for future employment.

- *Faculty* would benefit from: (a) increased collaboration among Indian AUs and with other universities globally to raise research quality and its linkage to educational quality and relevance; and (b) training and capacity-building to improve the delivery of education and its learning outcomes.

C. PDO Level Results Indicators

- Increased AU on-time graduation rates, disaggregated by gender and SC/ST;
- Increased cut-off scores for students in ICAR Entrance Tests, disaggregated by gender and SC/ST;
- Increased student placement rates, disaggregated by gender and SC/ST;
- Increased faculty research effectiveness; and
- Number of project beneficiaries, disaggregated by students/ faculty, gender and SC/ST.

III. PROJECT DESCRIPTION

A. Project Components

17. **Component 1 – Support to Agricultural Universities (USD 146.4 million, of which IBRD USD 73.2 million):** would finance investments by participating AUs to improve the quality and relevance of agricultural education and research toward agricultural transformation. The component would competitively award significant additional resources to participating AUs and would finance goods, works, non-consulting services, training and consultants' services.

18. *Sub-component 1a – Support to AUs (USD 69.4 million, of which IBRD USD 34.7 million)* would provide Institutional Development Grants to selected participating AUs for the implementation of Institutional Development Plans (IDPs). The subcomponent would target reform-ready AUs and support competitively selected and performance-based IDPs. The IDPs would seek to improve: (a) learning outcomes and future employment for AU students; and (b) faculty teaching performance and research effectiveness. Through the IDPs, the AUs would identify and prioritize key challenges, propose interventions to respond to these challenges, and set timelines and indicators for measuring achievement of greater quality and relevance attributable to these interventions. The participating AUs, through the IDPs, would also seek to foster both technical and financial partnerships.

19. NAHEP would finance each IDP through an Institutional Development Grant directly to the participating AU. Activities financed under each IDP would include: (a) capacity building and training for agreed governance reforms that promote AU autonomy and sustained accreditation; (b) updated infrastructure (i.e., minor civil works, goods) for research and teaching; (c) faculty development (i.e., training, consultants' services); (d) networking with industry and other learning institutions, both national and international; (e) increased vocational and technical education through the launching of certificate programs; (f) more effective student job placement; and (g) own-revenue generation for AUs. Each IDP would also specify a Twinning Plan with a recognized high-performing university, either in India or abroad.

20. *Sub-component 1b – Centers for Advanced Agricultural Science and Technology – CAASTs (USD 46.2 million, of which IBRD USD 23.1 million)* would provide CAAST Grants to selected participating AUs for the establishment of Centers for Advance Agricultural Science and

Technology. The subcomponent would support competitively selected CAAST proposals from reform-ready AUs to establish multidisciplinary centers for teaching, research and extension on critical and emerging agricultural topics. Multi-stakeholder consultations would inform the geographic locations and core themes for the proposed CAASTs, after which participating AUs would compete for CAAST funding. Approved AUs would be financed through a CAAST subproject grant directly to the participating AU. The sub-component would finance: (a) research and teaching equipment (i.e., goods); (b) faculty and scientist development fellowships, (c) student scholarships, primarily at the postgraduate level; and (d) costs associated with twinning arrangements with similar centers (e.g., universities, research centers) both outside and within India (i.e., training, consultants' services, and non-consulting services).

21. *Subcomponent 1c - ICAR innovation grants to AUs (USD 30.8 million, of which IBRD USD 15.4 million)* – would provide Innovation Grants to selected participating AUs for the carrying out of Innovation Plans. The Innovation Plans would support technical assistance and consultant services, including those required to: (a) make AUs reform ready (i.e., attain accreditation); and (b) promote mentoring of non-accredited AUs by existing reform-ready AUs and other interstate and international academic partnerships.

22. The Project Implementation Plan (PIP), satisfactory to the Bank, would include detailed guidelines for developing, evaluating, awarding and implementing IDP subprojects (under subcomponent 1a), CAAST subprojects (under subcomponent 1b) and Innovation Grants (under subcomponent 1c), including procedures for inviting, reviewing and ranking specific proposals, implementation and monitoring of approved subproject grants, and targeting methodology to ensure equitable AU access – particularly among those in lagging states – to each subcomponent.

23. *Reform readiness:* The Education Division/ ICAR uses the voluntary accreditation process as a determinant of AU reform readiness. Accreditation confirms that the given AU: (a) has clearly defined and appropriate objectives (i.e., leadership); (b) has established an enabling environment that makes achievements of these objectives possible (i.e., governance); (c) is substantially accomplishing its objectives (i.e., effectiveness); and (d) is organized, staffed and supported to ensure its continuation (i.e., sustainability). ICAR awards accreditation at three levels – university, college, and program – and bases its decision to accredit a given AU on three sources of evidence: (a) AU self-examination; (b) institutional peer review; and (c) final decision by the ICAR Accreditation Board (see Annex 2). NAHEP would support AUs in their efforts to attain accreditation through subcomponent 1c.

24. **Component 2 – Investment in ICAR Leadership in Agricultural Higher Education (USD 10.4 million, of which IBRD USD 5.2 million)** – would finance the carrying out of institutional reforms within ICAR in order to enhance ICAR's effectiveness in coordinating, guiding and managing agricultural higher education and its interactions with AUs and key stakeholders nationwide through interventions that increase the quality and relevance of agricultural higher education. As ICAR is responsible for national coordination and quality assurance of agricultural higher education, the component would leverage ICAR's comparative advantage in assessing systemic challenges across the ICAR-AU System and incubating solutions.

25. The component would finance goods, training, consultant services and non-consulting services and incremental operating costs and would include: (a) assessing options in the

administration and award of ICAR’s technical and financial assistance to AUs; (b) structuring dialogue with State governments to catalyze their participation in raising the quality and relevance of agricultural higher education; (c) providing assistance to participating AUs for the development of IDPs, CAASTs and Innovation Plans; (d) establishing partnerships with globally recognized agricultural higher education institutions; (e) developing digital information systems for agricultural data collection, analysis and dissemination; (f) improving curricula review processes and methods to consolidate and disseminate global best-practices in agricultural education; (g) improving the all-India entrance examination in agriculture, including an on-line national examination system; (h) adopting next-generation management systems covering information, procurement, contract and financial management areas; (i) coordinating an External Advisory Panel of renowned agricultural education experts; (j) assisting agricultural universities to strengthen their linkages with industry; and (k) promoting the establishment of centers for career development at agricultural universities.

26. Component 3 – Project Management and Learning (USD 8.0 million, of which IBRD USD 3.9 million) – would finance goods, works, non-consulting services, training and workshops, and consultants’ services for the Project (other than those financed under subprojects) and incremental operating costs. The component would strengthen ICAR’s management capacity for project implementation, including: (a) the establishment/maintenance of a Project Implementation Unit, a Steering Committee, a Technical Committee and a Monitoring and Evaluation Cell to ensure compliance with the Project’s procurement, financial management, safeguards and reporting requirements, and the carrying out of the administration, supervision, monitoring and evaluation of IDP Grants, CAAST Grants and Innovation Grants and/or proposals therefor; (b) the provision of training to ICAR and participating AUs to achieve and sustain increased quality, relevance and effectiveness of agricultural higher education. The component would also finance the dissemination and communication of project interventions and outcomes.

B. Project Financing

27. The total project cost is USD 165.0 million over a five-year implementation period. The lending modality is Investment Project Finance. NAHEP would be financed by an IBRD loan (USD 82.5 million) and the GoI (USD 82.5 million). The table below details project financing by project component (in USD million).

Project Cost and Financing

NAHEP Cost by Component	Total	% Total	IBRD	GoI
1. Support to Agricultural Universities	146.4	89%	73.2	73.2
1a. Support to AUs	69.4	42%	34.7	34.7
1b. Support to CAASTs	46.2	28%	23.1	23.1
1c. ICAR Innovation Grants to AUs	30.8	19%	15.4	15.4
2. Investment in ICAR Leadership in Ag. Higher Ed.	10.4	6%	5.2	5.2
3. Project Management and Learning	8.0	5%	3.9	4.1
Front-end Fee	0.2		0.2	
TOTAL	165.0	100%	82.5	82.5

C. Lessons Learned and Reflected in the Project Design

28. The proposed Project draws on the cumulative experience of the following initiatives: (a) the USAID-funded Agriculture Innovations Partnership (AIP); (b) the second phase of the ongoing Bank-financed Technical Engineering Quality Improvement Project (TEQIP II); and (c) the Africa Higher Education Centers of Excellence Project. Lessons learned are detailed below.

29. *Competitive funds are highly effective in increasing the quality of tertiary education:* Competitive funds respect the perceived (and desired) autonomy of the participating institutions, while tying verifiable results to requested financial support. A bottom-up approach – based upon AUs preparing their own IDP, CAAST and Innovation proposals and requiring alignment with state and national development challenges and industry partners – increases ownership and unleashes both creativity and innovation. The overall credibility of NAHEP requires objectivity, impartiality and transparency in the merit-based approval of IDPs, CAASTs and Innovation Plans, hence the importance of clear “rules of the game” defined in the PIP. Enhancing AU autonomy to make better academic, financial and administrative decisions is an important outcome of the NAHEP. Awareness campaigns, technical assistance and capacity building are key to generate good proposals, particularly in lagging states.

30. *Agricultural higher education reform needs long-term commitment.* The potential for success of the proposed NAHEP has been demonstrated in previous activities under the USAID-supported AIP. As such, for these reforms to migrate from paper to practice, at least three conditions are necessary: (a) consensus among stakeholders and oversight bodies; (b) follow-up technical assistance and consistent capacity building; and (c) government and institutional ownership. In addition, a strong supervision role, not only for the ICAR overall but also for state governments vis-à-vis their state-level AUs, will lead to better institutional outcomes.

31. *Establish a consistent, verifiable and efficient results-based management approach.* An efficient data collection process through an MIS is recommendable. Increased use of independent (third-party) information can also permit triangulation across analytics. Performance contracts (including flexibility to re-allocate funding from low performers to high performers) ensure a continuous “results focus” during implementation. These lessons are built into the NAHEP. Measurement of outcomes in terms of student and faculty competencies is a challenge, despite their centrality to ensuring the quality and relevance of agricultural higher education.

32. *Incentives for states, institutions, faculty, and students must be aligned with the project objectives.* While self-evident, this will remain a challenge due to entrenched practices, rigid civil service policies, the state/federal dimension of the ICAR-AU System, and a need for coordination with other state and federal agencies. NAHEP includes midterm performance reviews of each IDPs, CAASTs and Innovation Plans and will apply rewards and sanctions as warranted by these reviews. Faculty training under NAHEP should be recognized in performance reviews and count towards career advancement. Students’ participation in relevant learning activities, such as internships and project-based learning, should also be formally recognized.

33. *Competitive Funds unleash AU faculty creativity and innovative skills.* They also help to create a new institution-wide climate for good governance and promote positive behavioral change. Furthermore, competitive funds channel resources to teaching and research in specific

objectives, such as employability of graduates and R&D in fields with high economic and developmental relevance.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

34. NAHEP would be implemented by the Education Division/ ICAR. An NAHEP Steering Committee – headed by the Director General, ICAR and including representatives *inter alia* from agricultural universities, Ministry of Agriculture and Farmers Welfare, the private sector and any other institution in addition to or in substitution of the aforementioned as agreed with the Bank – would provide strategic and policy guidance to the proposed Project. A Project Implementation Unit (PIU), established within the Education Division/ ICAR and led by the Deputy Director General, Education, ICAR, would be responsible for the coordination and facilitation of overall project implementation. The PIU would include: (a) technical experts to oversee the subproject grants (i.e., IDPs, CAASTs and Innovation Grants) under Component 1; (b) change management expertise under Component 2; and (c) both newly contracted and seconded ICAR staff in the areas of project administration, financial management, procurement, monitoring, evaluation, management information systems (MIS), learning and capacity building, and social and environmental safeguards.

B. Results Monitoring and Evaluation

35. A results-based M&E system would monitor project processes using the following methods and tools: (a) a Results Framework that is derived from clearly identified goals, objectives, outputs and activities with corresponding indicators, means of verification and key assumptions; (b) an M&E strategy regarding information requirements, tools and methodologies for data collection, analysis and reporting; (c) a comprehensive M&E plan with clear roles and responsibilities with respect to data collection, analysis and reporting; and (d) internal and external periodic assessments and evaluations, which include baseline studies of participating AUs, beneficiary assessments and mid-term, ex-post and impact evaluations.

36. The Education Division/ ICAR would establish no later than 90 days after Effectiveness an M&E Cell to oversee the progress of activities across all NAHEP components. An M&E expert/ consultant (firm) would be hired by The Education Division/ ICAR within 90 days following Effectiveness to support the M&E cell. The M&E Cell would: (a) develop a Project Monitoring and Tracking System (PMTS) to supervise all activities sanctioned under the NAHEP and provide inputs for any needed course corrections; and (b) coordinate overall impact assessment, including economic and financial analysis of the various NAHEP activities and components. An independent entity would be contracted within 90 days of Loan Effectiveness to conduct outcome-focused impact evaluation of NAHEP at three stages: baseline, mid-term, and project completion. NAHEP would conduct periodic performance reviews of each participating AU and its respective IDP, CAAST or Innovation Plan and would apply any rewards and sanctions as warranted by these reviews and the PIP.

37. For both IDPs and CAASTs, a PME Cell would also be established in each participating AU and would be responsible for: (a) collecting baseline data for PDO and intermediate outcome

indicators; (b) preparing an M&E work plan and budget for its respective IDP or CAAST; (c) timely preparation of semester and annual progress reports, including financial and physical performance metrics as agreed in the PIP; (d) planning and developing PME-related training programs; and (e) designing and conducting M&E exposure sessions for the participating AUs.

C. Sustainability

38. ICAR's design choice to focus NAHEP on reform of the ongoing Development Grant is a key element of the expected sustainability of the project interventions. The five-year implementation period of NAHEP affords ICAR with the opportunity to field-test, verify and later mainstream a decentralized, results-based and data-driven approach to the finance of agricultural higher education across the ICAR-AU System.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

39. The overall risk rating for NAHEP is Substantial. A primary *stakeholder risk* is securing and maintaining the political will of State governments to accord the requisite financial, administrative and academic autonomy to their respective AUs during the reform process that each IDP, CAAST or Innovation Grant would finance. Filling faculty vacancies in some AUs, especially in lagging states, and decreasing academic inbreeding will likely require these AUs to attract students and faculty from other states, but current State policies and practices may limit such inter-state mobility. An increase in AUs that attain ICAR accreditation – as envisioned under the Project – would help to mitigate this risk.

40. *Institutional capacity risks* associated with the ICAR-AU System are substantial: The Union government is responsible for coordination and setting of standards for agricultural higher education at all AUs, while the Indian Constitution devolves to the States the responsibility for carrying out agricultural higher education. Given this, ICAR, as a federal agency, cannot dictate to the State-level AUs on issues such as transparent financing, academic management, and recruiting and retaining high-quality students and faculty. However, ICAR does exercise substantial and direct oversight of Central-level AUs and Deemed Universities, both of which can serve as models to State-level AUs for academic excellence. Also, ICAR's assessment of options regarding the Development Grant, while also securing change management expertise and seeking guidance from the proposed External Advisory Panel, would contribute to making AUs more accountable for ensuring the quality and relevance of the educational experience.

41. *Institutional capacity risks* are also associated with the ability of ICAR to simultaneously conduct its ambitious internal assessment of options for its technical and financial assistance to AUs while promoting external reforms among these AUs across the ICAR-AU System. Also, while ICAR's implementation of the previous NATP and NAIP projects demonstrated its installed capacity, the innovative engagement of AUs under NAHEP as implementing agencies for IDPs, CAASTs and Innovation Grants would require: (a) an expanded skills set on the part of the Education Division/ ICAR; (b) an integrated fiduciary assessment (to determine risk levels and associated mitigation measures (for both ICAR and the participating AUs); and (c) expanded technical skills (for both ICAR and the participating AUs) to supervise this innovative approach.

As such, the NAHEP design would ensure sufficient complementarity between support to participating AUs (Component 1) and to the Education Division/ ICAR (Component 2). Effective twinning and partnerships under Component 1 with both national and international higher education institutions for both AUs and ICAR will also mitigate these capacity risks.

42. *Fiduciary risks* associated with decentralized funds flow and procurement by participating AUs are substantial. Both strong internal and external audit, as in similar decentralized operations in India, and training for participating AUs on Bank procedures, would mitigate this risk.

Risk Category	Rating
1. Political and Governance	Moderate
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Moderate
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Substantial
OVERALL	Substantial

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

43. NAHEP is designed to both support improvements in the overall quality and relevance of the ICAR-AU System and, ultimately, to drive future agricultural productivity growth. The economic analysis thus focuses on its likely impact on agricultural productivity to quantify its net incremental benefits, and assess whether the proposed Project is economically justifiable. The analysis relies on empirically estimating the impact of the agricultural higher education expenditures (i.e., State-level AU expenditures) on agricultural productivity, as distinct from and in addition to the ICAR agricultural research expenditures. To estimate the returns from investment made in agricultural research, time series data on research stock and output are used. To estimate the incremental benefits of NAHEP, the “with-project” and “without-project” scenarios are modeled as two hypothetical scenarios: (a) in the *without-project* case, State-level AU expenditure grows at a current growth rate of 4.5 percent for the next 25 years; and (b) in the *with-project* case, State-level AU expenditure will also grow at the same rate but with additional expenditures of five percent for each of the five NAHEP project years.

44. Using the incremental changes in the agricultural output (relative to the counterfactual simulated as the continuation of past trends in output growth), the estimated internal rate of return (IRR) for NAHEP investments is 42 percent and the benefit-cost ratio (BCR) is 7.1. Sensitivity analysis across four scenarios captures the robustness of these results: (a) State-level AU expenditures; (b) the returns to ICAR’s agricultural research stock; (c) the returns to State-level AU research stock elasticity for the pre-1995 period; and (d) an estimate based on the research

stock-TFP elasticity estimate from Rada and Schimmelpfennig (2015) applied to the agricultural GDP. While the first three estimates provide returns only in terms of crop productivity, the last estimate also captures the full impacts of the expenditures including on livestock productivity. The results confirm IRRs ranging from 42 percent to 67 percent, and BCRs ranging from 4.6 to 24.6, depending on the scenarios.

45. The public investments in agricultural R&D and higher education are justified, given their public goods nature and for equity considerations in India, as in many countries. Agricultural research and development are primarily public goods and their optimal provision requires sufficient and consistent public investment. The benefits of improved agricultural higher education accrue both to its direct beneficiaries (e.g., student, farmers, academia, and technical service providers) and to society (e.g., increased agricultural productivity, greater natural resource efficiency, poverty reduction, multiplier effects in allied sectors). Additionally, public investments in State-level AUs provide the private sector with a knowledge platform fueled by research and extension and facilitate thriving agribusinesses. State-level AUs have the scale and some of the basic infrastructure in place to reach large numbers of students, invest in equipment, hire high-quality faculty and reach farmers and agribusinesses.

46. Private sector involvement in these activities is increasing, but remains at a nascent stage and at a limited scale to meet India's current demands. For the foreseeable future, public investment in human resource development and agricultural technology development will remain substantial, making it important to enhance the quality and relevance of these public investments. Another important rationale for public investment is the equity consideration: the vast majority of students in the ICAR-AU System are from low- and middle-income families, and from lagging states, for whom effective demand for private higher education may be limited.

B. Technical

47. NAHEP would lay the foundation for an outcomes-based approach to ICAR's financial and technical support to AUs across India. First, AUs will be eligible only upon attainment of criteria that signal their reform readiness (i.e., ICAR accreditation). Second, funding under the proposed Project would be demand-driven, in that participating AUs would identify their investment gaps, propose needed interventions to close these gaps (i.e., IDP, CAAST and Innovation Grants) and then measure progress on intended outcomes as specified in subproject agreements. Third, for both IDPs and CAASTs, AU performance in achieving agreed targets under their respective subproject agreements would trigger subsequent release of funds.

48. The project design focuses primarily on AU subprojects (i.e., IDP, CAAST and Innovation Grants), a method that has been tested extensively in India and other countries and been shown effective in enabling institutions to improve the quality and relevance of the educational experience. The approach shows that promoting institutional autonomy is essential to enable these AUs to pursue their own excellence, build upon their specific strengths and respond to their respective stakeholders. Over time, this approach improves both student learning and faculty performance – both in teaching and in research. This approach is also relatively simple: AUs assess their priorities and request funding and technical assistance to meet them.

49. For both IDPs and CAASTs, the participating AUs will require high technical capacity to prepare and implement them. As such, the Education Division/ ICAR would procure, under NAHEP, external management consultancy services (i.e., technical assistance) to build such capacity on the part of participating AUs, as well as for the Education Division/ ICAR itself, in its role as implementing agency. This would ensure that the Education Division/ ICAR has adequate demonstrated technical capacity to monitor and supervise subprojects, especially in the initial phase of implementation. As part of IDP and CAAST subproject appraisal, the technical capacity of AUs (including key staff) would be assessed, and monitored by the Education Division/ ICAR during subproject implementation. As the number of AUs and subprojects increase, additional capacity would be required (as detailed in the Procurement Plan), particularly in performance monitoring of each IDP or CAAST.

50. The Education Division/ ICAR has a long-standing and constructive working relationship with the AUs within the ICAR-AU System and therefore has a strong understanding of the strengths and weaknesses across the system and specific to each representative AU. This is a solid basis on which to engage the AUs in a change agenda, and not just continue past practices. The Education Division/ ICAR (through its Technical Committee) would first appraise the IDPs and CAASTs prepared by participating AUs as per appraisal guidelines laid out in the PIP and later submit them to the NAHEP Steering Committee for approval.

C. Financial Management

51. The FM systems of NAHEP would rely on and be aligned with the systems already established within ICAR. The Education Division/ ICAR, the coordinating entity, has an established system for appraisal, control and oversight over development grants provided to AUs. These systems, with some strengthening, in terms of agreed reporting and audit arrangements as provided in Annex 3 and as documented in the FM Manual, will be adequate for the Project. The existing FM systems of the AUs could be adopted for the Project with some degree of modification as warranted in the FM Manual. The FM arrangements of AUs with strengthening of capacities and risk mitigation measures incorporated in the project design will be adequate to account for and report on sources and uses of sub-project funds. The FM risk rating for the Project is Substantial at this stage, due to the geographical spread, multitude of implementing agencies and FM capacities of the AUs.

52. Interim unaudited financial reports (IUFs) in agreed formats would be used for financial reporting and monitoring and would be submitted to the Bank on a quarterly basis within 45 days from the end of each calendar quarter. Reimbursement of funds will be based on expenditures reported in the IUFs. The IUFs would disclose receipt and utilization of project funds (both Bank share and counterpart contribution, as applicable). IUFs would be based on project accounts and would reflect the actual expenditure for the project components. All expenditures reported in the IUFs would be subject to annual audit by independent auditors satisfactory to the Bank as per agreed terms of reference. The Project would be subject to internal audit.

D. Procurement

53. Procurement for NAHEP would be carried out in accordance with the World Bank's "Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and

IDA Credits & Grants by World Bank Borrowers" dated January 2011 and revised July 2014 (Procurement Guidelines); and "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers" dated January 2011 (Consultant Guidelines) and revised July 2014 and the provisions stipulated in the Loan Agreement. For each contract to be financed by the proposed IBRD loan, the different procurement methods or consultant selection methods, estimated costs, prior review requirements, and time frame shall be agreed between the Borrower and the Bank in the Procurement Plan. Based on agreed cost tables the Procurement Plan for the first eighteen months has been prepared by ICAR and agreed with the Bank. The procurement plan shall be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity. It will also be posted on both the ICAR website and the Bank's external website.

54. The implementation responsibility of the proposed Project lies with the Education Division/ ICAR, which is the nodal agency, and there will be activities implemented by participating AUs. Procurement under NAHEP shall be carried out by ICAR at the central level and by the participating AUs at the decentralized/State level. ICAR has the prior experience of implementing Bank-financed projects (e.g., NAIP and NATP) and therefore is familiar with required processes and procedures. Review of AUs at the decentralized level suggests that there are fiduciary risks of transparency, fairness and capacity, but the AUs would be aligned to the Bank's procedures and benefit from ICAR's previous experience of executing Bank-financed projects. ICAR, being the nodal agency, would proactively engage in providing hand holding support and capacity building of the participating AUs to ensure that procurement is carried out as per agreed processes and procedures. The procurement arrangements are described in detail in Annex 3. The summary of risk mitigation measures to address the residual risks are: (a) selection of officials at the PIU, Education Division/ICAR, who are well-versed with Bank procurement processes and procedures and duly supported by a procurement consultant; (b) appropriate identification/selection of the procurement official at each participating AU, followed by their training in "Procurement in Bank-financed projects"; (c) use of Standard Bidding Documents (SBDs) agreed with GoI for procurement of goods and works following NCB and the Bank SBDs for ICB and consulting services; (d) use of the Project Procurement Manual by both ICAR and the participating AUs for carrying out any procurement under the Project; (e) PIU, Education Division/ ICAR's proactive engagement, oversight and handholding support to all participating AUs; (f) robust complaint redress mechanism; and (g) regular post-procurement review of the contracts on a yearly basis for close monitoring and learning.

55. The overall project risk rating for procurement is Substantial. The Bank would conduct regular procurement post reviews of ICAR and the participating AUs.

E. Social (including Safeguards)

56. No civil work involving compulsory land acquisition or involuntary resettlement will be financed. Since many of the AUs are in areas inhabited by tribal communities, the World Bank Operational Policy on Indigenous Peoples (OP/BP 4.10) has been triggered. An Equity Action Plan (EAP), prepared by the Education Division/ ICAR, constitutes an Indigenous People's Policy Framework (IPPF) for the purposes of OP/BP 4.10. The EAP addresses issues of gender equality and social inclusion, with special attention to the needs of the SC/ST students. The EAP meets

the requirements of OP 4.10 with free, prior, informed consultation held with the primary stakeholders. Key recommended actions in the EAP/IPPF are given in Annex 3.

57. The EAP/IPPF was disclosed by ICAR on April 27, 2016 and will be locally disclosed by each participating AU, once selected. The EAP/IPPF was also disclosed in the Bank's InfoShop on May 2, 2016. The Education Division/ ICAR – as well as each participating AU – will have assigned staff responsible for monitoring and supporting the implementation any AU-level Equity Action Measure (EAM), prepared by participating AUs as prescribed by the EAP/IPPF. The Bank task team and its safeguards specialists will carry out periodic field visits to and training support for the Education Division/ ICAR and the participating AUs as part of overall implementation support of the EAMs and EAP/IPPF (see Annex 4).

F. Environment (including Safeguards)

58. The expected project interventions, which would be detailed in the IDP, CAAST and Innovation Grants prepared by participating AUs, would have an overall positive impact; some specific interventions (e.g., minor civil works) may have potential yet limited adverse environmental impacts. In view of these potential impacts, the Bank's safeguards policy on Environmental Assessment (OP/BP 4.01) is triggered, and the Project is designated as Category B. With proper management, the project interventions are not likely to cause any large scale, significant or irreversible damage to the natural, physical or social environment.

59. A limited Environmental Assessment (EA) was undertaken by the Education Division/ ICAR for the proposed Project with guidance from the Bank team. The study includes a questionnaire targeting both students and faculty at AUs. As part of the EA, the capacity of the Education Division/ ICAR and the respective AUs to effectively manage environmental safeguards was reviewed. To effectively plan, design and integrate social and environmental dimensions into the overall project preparation and implementation, ICAR prepared an Environment Management Framework (EMF), which is incorporated into the Project Implementation Plan. Based on the EMF, ICAR and the participating AUs will prepare Environmental Sustainability Plans. The EMF was disclosed by the Education Division/ ICAR on April 27, 2016. The EMF was also disclosed in the Bank's InfoShop on May 3, 2016.

G. World Bank Grievance Redress

60. Communities and individuals who believe that they are adversely affected by a World Bank-supported project may submit complaints to existing project-level grievance redress mechanisms or the World Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the World Bank's independent Inspection Panel which determines whether harm occurred, or could occur as a result of World Bank non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/GRS>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

Annex 1: Results Framework and Monitoring

Country: India

Project Name: National Agricultural Higher Education Project (P151072)

Results Framework

Project Development Objectives

PDO Statement

The objective of the Project is to support Participating Agricultural Universities and ICAR in providing more relevant and higher quality education to agricultural university students.

These results are at | Project Level

Project Development Objective Indicators

Indicator Name	Baseline	Cumulative Target Values						
		YR1	YR2	YR3	YR4	YR5	YR6	End Target
Increased AU on-time graduation rates. (Percentage)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased AU on-time graduate rates (Female) (Percentage - Sub-Type: Breakdown)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased AU on-time graduation rates (Male) (Percentage - Sub-Type: Breakdown)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased cut-off scores for students in ICAR Entrance Tests, disaggregated by gender and SC/ST (Percentage)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased cut-off scores for students in ICAR Entrance Tests (male) (Percentage - Sub-Type: Breakdown)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased cut-off scores for students in ICAR Entrance Tests (female) (Percentage - Sub-Type: Breakdown)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00

Increased cut-off scores for students in ICAR Entrance Tests (SC/ST) (Percentage - Sub-Type: Breakdown)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased student placement rates, disaggregated by gender and SC/ST (Percentage)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased student placement rates (male) (Percentage - Sub-Type: Breakdown)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased student placement rates (female) (Percentage - Sub-Type: Breakdown)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased student placement rates (SC/ST) (Percentage - Sub-Type: Breakdown)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Increased faculty research effectiveness (Percentage)	0.00	0.00	0.00	2.00	4.00	6.00	10.00	10.00
Direct project beneficiaries (Number)	0.00	7500.00	15000.00	35000.00	55000.00	70000.00	90000.00	90000.00
Female beneficiaries (Percentage - Sub-Type: Supplemental)	0.00	50	50	50	50	50	50	50

Intermediate Results Indicators

Indicator Name	Baseline	Cumulative Target Values						
		YR1	YR2	YR3	YR4	YR5	YR6	End Target
Reduced student inbreeding as measured by student diversity. (Percentage)	0.00	0.00	0.00	5.00	10.00	15.00	20.00	20.00
Reduced faculty inbreeding as measured by faculty diversity. (Percentage)	0.00	0.00	0.00	5.00	10.00	15.00	20.00	20.00
Improved AU own-revenue generation (Percentage)	0.00	90.00	90.00	80.00	70.00	60.00	60.00	60.00
Number of industry-sponsored projects and positions in cutting-edge areas (Number)	0.00	0.00	0.00	25.00	50.00	75.00	100.00	100.00
Increase in performance-based allocation of ICAR Development Grant (Percentage)	0.00	5.00	10.00	15.00	20.00	25.00	30.00	30.00

Accredited agricultural universities with revised norms and standards (Number)	37.00	45.00	52.00	59.00	65.00	73.00	73.00	73.00
Increased AU student satisfaction with the quality assurance role of the Education Division/ ICAR.	0.00	0.00	5.00	7.50	10.00	12.50	15.00	15.00
Increased AU faculty satisfaction with the quality assurance role of the Education Division/ ICAR.	0.00	0.00	0.00	10.00	12.00	15.00	20.00	20.00
AUs that have attained academic autonomy (Percentage)	25.00	25.00	25.00	30.00	35.00	40.00	45.00	45.00

Indicator Description

Project Development Objective Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Increased AU on-time graduation rates.	Increase in the percentage of UG students at participating AUs that graduate on-time (defined as three years).	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased AU on-time graduate rates (Female)	Breakdown by gender	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased AU on-time graduation rates (Male)	Breakdown by gender	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased cut-off scores for students in ICAR Entrance Tests, disaggregated by gender and SC/ST	Higher cut-off scores for students in ICAR Entrance Tests at participating AUs, measured in percent and disaggregated by gender and SC/ST.	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased cut-off scores for students in ICAR Entrance Tests (male)	Breakdown by gender	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased cut-off scores for students in ICAR Entrance Tests (female)	Breakdown by gender	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased cut-off scores for students in ICAR Entrance Tests (SC/ST)	Breakdown by SC/ST	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI

Increased student placement rates, disaggregated by gender and SC/ST	Increased student placement rates at participating AUs, measured as student job placement as % of graduating UG class and disaggregated by gender and SC/ST.	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased student placement rates (male)	Breakdown by gender	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased student placement rates (female)	Breakdown by Gender	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased student placement rates (SC/ST)	Breakdown by SC/ST	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased faculty research effectiveness	Change in faculty research effectiveness at participating AUs, as measured by the h-index (a combination of # peer-reviewed publications and #scientific citations).	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Direct project beneficiaries	Students and faculty that directly derive benefits under IDPs, CAASTs, Innovation Grants and activities under Component 2.	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Female beneficiaries	Direct female project beneficiaries, expressed as percentage of total beneficiaries.	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI

Intermediate Results Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Reduced student inbreeding as measured by student diversity.	Reduced student inbreeding at participating AUs, as measured by student diversity (% change in AU students admitted from other states and countries)	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Reduced faculty inbreeding as measured by faculty diversity.	Reduced faculty inbreeding at participating AUs, as measured by faculty diversity (% change in faculty with higher education degrees from more than one university and more than one state).	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Improved AU revenue generation	Improved internal revenue generation at participating AUs, in terms of sources of funds. Measured by change in % from purely state-level public funds.	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI

Number of industry-sponsored projects and positions in cutting-edge areas	Number of industry-sponsored projects and positions in cutting-edge areas at participating AUs.	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increase in performance-based allocation of ICAR Development Grant	Increase in performance-based allocation of ICAR Development Grant to AUs.	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Accredited agricultural universities with revised norms and standards	Accredited agricultural universities with revised norms and standards	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI
Increased AU student satisfaction with the quality assurance role of the Education Division/ ICAR.	The change in the satisfaction index (as measured and calculated from annual AU student surveys) of AU students at participating AUs regarding the Education Division/ ICAR and its role in quality assurance of agricultural higher education.	Annual	AU Student Survey; Accreditation Self- Report	Education Division/ ICAR, IASRI
Increased AU faculty satisfaction with the quality assurance role of the Education Division/ ICAR.	The change in the satisfaction index (as measured and calculated from annual AU faculty surveys) of AU faculty at participating AUs regarding the Education Division/ ICAR and its role in quality assurance of agricultural higher education.	Annual	AU Faculty Survey; Accreditation Self- Report	Education Division/ ICAR, IASRI
AUs that have attained academic autonomy	The number of AUs in the ICAR-AU System that have attained academic autonomy as defined by the ICAR Accreditation Board and published in NISAGENET, expressed as a percentage of all AUs in the ICAR-AU System.	Annual	NISAGENET/ EKTA/ AEDIS	Education Division/ ICAR, IASRI

Annex 2: Detailed Project Description

INDIA: National Agricultural Higher Education

1. The Indian Council of Agricultural Research (ICAR) carries the mandate for the coordination and quality assurance of Agricultural Higher Education at AUs in India. The ICAR-AU System comprises 63 State Agricultural Universities, five Research Institutes (known as Deemed Universities), four Central Agricultural Universities, and three Central Universities with agricultural faculty. With some 265 constituent colleges in this System and a combined annual student-intake capacity of some 78,500, the AUs impart education in 11 major disciplines at undergraduate and about 95 subjects at post-graduate level (see Table 1). About 55% of students at the higher agricultural education level are from rural backgrounds and 36% are women. Besides, about 100 private colleges, affiliated to general universities, and a few in States of Chhattisgarh, Maharashtra, and Tamil Nadu, affiliated to State-level AUs, impart higher agricultural education (see Policy for Higher Agricultural Education <http://www.icar.org.in/files/Draft-Policy-21-11-2012%20.pdf>).

Table 1: Annual Enrollment – ICAR-AU System

Type of AU	Bachelors	Masters	Ph.D.	Total
State-level AUs	46,050	17,023	4,505	67,578
Deemed and Central AUs	4,694	4,195	2,116	11,005
TOTAL	50,744	21,218	6,621	78,583

Source: NISAGENET-IASRI

2. Globally, several strategic funding programs have been implemented to promote excellence in higher education, e.g., China’s 985 Project, Japan’s Centers of Excellence and World Premier International Research Centers, the Brain Korea 21 Program, and Germany’s Centers of Excellence. India can emerge as a knowledge power only if an appropriate architecture for higher education is put in place. The GoI has decided to recast the country as a “knowledge economy” by placing higher education atop the national agenda and creating world-class universities.

3. ICAR, through its Education Division, has a mandate to ensure the quality of agricultural higher education across the ICAR-AU System (see Box 1). Embedded in this mandate is the goal of increasing effective skill development on the part of AU graduates to improve their employment prospects, primarily in the private sector. Today, it is quite common to find students who have a solid academic record yet fail to exhibit the minimum skill set demanded by their prospective employers. This phenomenon speaks to the need to increase not only the quality of the students’ learning experience, but also the relevance of this experience to their career paths.

4. At the same time, agricultural higher education need not always result in a UG/PG degree. In fact, there is a growing gap in the supply of service provision in the agriculture sector that could be closed by a focus on vocational and technical skill development. While non-agricultural sectors in India have already made such progress, AUs lag significantly. Through NAHEP, ICAR seeks to transform agricultural higher education in at least two ways:

- Increase experiential learning opportunities for UG students to sharpen their skill set and prepare them for the job market; and

- Establish vocational and technical programs that meet labor market demand for skilled technicians along the diverse set of agricultural value chains. Under the USAID-supported AIP, three State-level AUs and six Land Grant Universities in the USA – led by Cornell University – developed curricula for thirty such courses. These customized curricula for Indian agriculture can be effectively made use of by Indian AUs across the country.

Box 1

The Education Division/ ICAR undertakes planning, development, coordination and quality assurance in agricultural higher education in India and, thus, strives for maintaining and upgrading its quality and relevance through partnership with the ICAR-AU System. The Education Division is also home to the National Academy of Agricultural Research Management (NAARM) at Hyderabad – which facilitates capacity building of the National Agricultural Research System in research and education policy, planning and management – and the National Center for Agricultural Economics and Policy Research. Located at the ICAR headquarters in New Delhi, the division is headed by the Deputy Director General (Education) and has three sections, namely, (a) Human Resource Development, (b) Education Planning and Development and (c) Educational Quality Assurance and Reforms, each headed by an Assistant Director General.

The focus of the Education Division is on the following:

- Quality assurance in agricultural higher education through policy support, AU accreditation, academic regulation, personnel policies, review of course curricula and delivery systems, development support for creating/strengthening infrastructure and facilities, improving faculty competence and student admission through All India competitions.
- Enhancing performance and visibility of AUs by augmenting their strategic strength in a specific niche area of research and education, facilitating experiential learning towards imparting an appropriate blend of knowledge, skill and attitude to the students, and fostering need-based partnership and linkages.
- Promoting excellence and expertise in education and research by creating chairs/positions through National Professor, National Fellow and Emeritus Scientist schemes, and by providing incentives and rewards through scholarships and fellowships to students and best teacher awards.
- Facilitating capacity building of the National Agricultural Research System including through NAARM, and fostering national and international linkages for capacity building.

5. Perhaps the most significant tool at ICAR’s disposal to stimulate and encourage progress in these two areas is the financial support it offers to AUs in the form of the Development Grant. As such, the norms and standards which ICAR sets in deploying the Development Grant can play a critical role in enhancing the quality of higher agricultural education. Yet, historically these standards have been more procedural than substantive: to date, ICAR has essentially served as a pass-through mechanism for disbursing the Development Grant to the AUs. Starting in 2016, AU accreditation will be a factor in determining AU eligibility for the Development Grant. What is now needed is a refinement in how ICAR and the AUs engage with respect to the Development

Grant: greater transparency, attention to quality outcomes, links to student and faculty performance, and objective and verifiable metrics need to be incorporated.

6. NAHEP provides an opportunity for ICAR to assess options for its delivery of the Development Grant with respect to the AUs. Furthermore, ICAR, through NAHEP, would seek to revise and update its operational criteria that govern how AUs: (a) gain access to the Development Grant (i.e., accreditation); (b) deploy these financial resources (i.e., selectivity, outcome-based); and (c) monitor and evaluate the intended outcomes from its Development Grant finance (i.e., effectiveness).

7. *Experiential learning:* Education in India is predominantly “classroom-oriented” and lacks the real-world exposure that is vital to transform learning into action. Since agriculture plays a pivotal role in the Indian economy, global problems affect national agriculture in significant and complex ways. Therefore, agricultural students and professionals benefit exponentially from being exposed to not only practical, but also experiential learning, in both agriculture and rural development sectors. NAHEP would promote experiential learning by supporting interdisciplinary exchanges (physical and virtual) of AU students and faculty between with: (a) other AUs within India – both public and private; (b) US land-grant and other international agricultural universities; and (c) private sector and industry. ICT would be leveraged to bring cost-effectiveness to these experiential learning opportunities.

8. *Vocational learning:* While Industrial Training Institutes offer vocational training to prepare individuals for skilled jobs in the industrial sector, no such institutions currently fulfill a similar role to train manpower in agriculture. Fisheries, seed production, poultry rearing and horticulture farming have long been practiced in India, yet many modifications have been made to the traditional methods. Today, climate-smart approaches to maximize productivity and competitiveness will require access to and adoption of new technologies and practices. At present, the seed, agrochemical, agricultural machinery, micro-irrigation and agricultural trade firms experience severe shortage of trained manpower to work at the field level. Thus, the dissemination of useful technologies and information, along with providing solutions to farmers’ problems at their door steps, are seriously constrained. Furthermore, AUs can provide industry-specific and focused vocational training to rural youth. The duration for such courses may range anywhere from two months to one year to ensure that the trainees will acquire adequate practical knowledge besides understanding the science of agriculture and related disciplines.

9. *Empowering women:* NAHEP would support greater gender equity through further revision of agricultural curricula to include cross-cutting socio-economic themes to ensure gender equity and the training of rural women who lack farming skills in simple but effective natural resource management techniques.

10. *International collaboration:* NAHEP would stimulate increased international collaboration by AUs through: (a) faculty and student exchange visits to develop and implement new and revised curricula; (b) partnerships and twinning arrangements that bring mutual benefit to AUs in the ICAR-AU System and collaborating international universities; (c) workshops that train participants in the areas of library science, e-learning, and teaching excellence; and (d) technology dissemination and income improvement activities that train smallholders to improve their livelihood using sustainable land and crop management practices. NAHEP would link

academia, industry and policy planners from across the world to collaborate on interventions that enhance curricula at Indian AUs and augment rural transformation across agricultural value chains.

11. *Educational delivery*: The methodology of teaching has undergone significant recent changes. The explosion of knowledge and information, developments in arts, science, engineering, management, medicine, agriculture, and other fields, and rapid development in ICT, have led to the need for modernizing current teaching methodologies. Teachers need to be trained in pedagogy, use of audio-video tools, web content development, modern methods of teaching, examination and evaluation methods and use of software for scientific data analysis. To address these changes in teaching methodologies, NAHEP would support participating AUs to introduce teaching excellence tools for faculty and students.

12. *E-learning*: Students would benefit from digital learning through lecture video capture. “Blended learning” that combines on-line support to students with their classroom learning experience would result in improved outcomes. Video and ICT make the classroom “global”: students and faculty from around the world can engage in mutual learning. Cyber-libraries make global knowledge accessible locally. Mobile applications can take learning “to the field”.

Project Development Objective

13. The objective of the Project is to support Participating Agricultural Universities and ICAR in providing more relevant and higher quality education to agricultural university students.

14. NAHEP addresses *quality* by supporting AUs in preparing and implementing technically sound and verifiable investments (i.e., IDPs) that increase faculty performance, attract better students to these AUs, improve student learning outcomes and raise their prospects for future employability, particularly in the private sector. *Relevance* would be addressed through: (a) greater alignment of academic curricula and course content with the skills sets being demanded in the agriculture and allied services sector; and (b) expanded certificate-level vocational and technical courses to fill the gap for trained technical personnel, especially in market-led extension. Finally, both quality and relevance would be augmented through investments in ICAR that improve its ability to set and enforce standards across the ICAR-AU System and build international cooperation to the benefit of agricultural higher education.

Project Beneficiaries

15. NAHEP would target the 75 institutions that form the ICAR-AU System, consisting of 63 State-level AUs (including Horticulture, Veterinary, Animal Science and Fishery), five Deemed Universities, four Central Universities with Agricultural Faculty and three Central Agricultural Universities.

- *Students* would benefit from: (a) a movement from teaching- to learning-centered education, leveraging ICT and external partnerships; (b) piloting effective stakeholder participation in curricula development, pedagogy options and course evaluation; (c) increased equity in educational access through vocation and technical certificate programs; and (d) an overall improvement in the learning and academic environment that would both expand and sharpen their skill set needed for future employment.

- *Faculty* would benefit from: (a) increased collaboration among Indian AUs and with other universities globally; and (b) training and capacity-building to improve the delivery of education and its learning outcomes.

PDO Level Indicators

- Increased AU on-time graduation rates, disaggregated by gender and SC/ST;
- Increased cut-off scores for students in ICAR Entrance Tests, disaggregated by gender and SC/ST;
- Increased student placement rates, disaggregated by gender and SC/ST;
- Increased faculty research effectiveness; and
- Number of project beneficiaries, disaggregated by students/ faculty, gender and SC/ST.

16. **Component 1 - Support to Agricultural Universities (USD 146.4 million, of which IBRD USD 73.2 million)** would finance investments by participating AUs to improve the quality and relevance of agricultural education and research toward agricultural transformation. The component would competitively award significant additional resources to participating AUs and would finance goods, works, non-consulting services, training and consultants' services.

17. *Sub-component 1a – Support to AUs (USD 69.4 million, of which IBRD USD 34.7 million)* would provide Institutional Development Grants to selected participating AUs for the implementation of Institutional Development Plans (IDPs). The subcomponent would specifically target reform-ready AUs and support competitively selected and performance-based IDPs. The IDPs would seek to improve: (a) learning outcomes and future employment for AU students; and (b) faculty teaching performance and research effectiveness. Through the IDPs, the AUs would identify and prioritize key challenges, propose interventions to respond to these challenges, and set timelines and indicators for measuring achievement of greater quality and relevance attributable to these interventions. The participating AUs, through the IDPs, would also seek to foster both technical and financial partnerships. NAHEP would finance each IDP through a subproject grant directly to the participating AU. Activities financed under each IDP would include: (a) capacity building and training for agreed governance reforms that promote AU autonomy and sustained accreditation; (b) updated infrastructure (i.e., minor civil works, goods) for research and teaching; (c) faculty development (i.e., training, consultant services); (d) networking with industry and other learning institutions, both national and international; (e) increased vocational and technical education through the launching of certificate programs; (f) more effective student job placement; and (g) own-revenue generation for AUs.

18. Participating AUs within the ICAR-AU System would receive grant funding (i.e., IDP Grant) upon approval of their respective IDP. The goal of the IDP would be, *inter alia*: (a) improved student learning outcomes; and (b) increased undergraduate employability. The IDPs will specify the key needs of an AU, activities, timelines and indicators to verify attainment of agreed outcomes. IDP activities would include: (a) improving student learning; (b) improving student employability; (c) ensuring equity for both students and faculty; and (d) faculty upgrading, both in number and quality. Each IDP would also specify a Twinning Plan with a recognized high-performing university, either in India or abroad. ICAR would maintain a positive roster of potential universities from which participating AUs could then choose a twinning institution.

19. The Project, through IDPs, would finance minor civil works (including refurbishment) and equipment, up to a maximum of 25 percent of an AU's IDP. Each AU would receive specialized support from ICAR and the External Advisory Panel during IDP development. IDPs would draw on consultations with stakeholders, including faculty, administrators, students and industry. IDP funding would be performance-linked: AUs that fail to make significant, verifiable progress toward achievement of the IDP would incur a reduction in funding. Given the funding envelope for Component 1a, it is expected that 10-15 AUs would benefit through IDPs.

20. *Reform readiness:* The Education Division/ ICAR uses the voluntary accreditation process as a determinant of an AU's reform readiness (see Box 2). Accreditation confirms that the given AU: (a) has clearly defined and appropriate objectives (i.e., leadership); (b) has established an enabling environment that makes achievements of these objectives possible (i.e., governance); (c) is substantially accomplishing its objectives (i.e., effectiveness); and (d) is organized, staffed and supported to ensure its continuation (i.e., sustainability). ICAR awards accreditation at three levels – university, college, and program – and bases its decision to accredit a given AU on three sources of evidence: (a) AU self-examination (i.e., self-study report); (b) institutional peer review; and (c) final decision by the ICAR Accreditation Board. Those AUs that currently lack the enabling environment to prepare and implement an IDP could, upon request, apply for funds calls for proposal under Component 1c – Innovation Grants – to assist in forging such an environment. These funds could be used to encourage both faculty and students toward collaborative improvements at their AU and finance support to students' learning, such as: campus Wi-Fi; e-library; campus environment plan and smart classrooms.

21. *Sub-component 1b – Centers for Advanced Agricultural Science and Technology – CAASTs (USD 46.2 million, of which IBRD USD 23.1 million)* would provide CAAST Grants to selected participating AUs for the establishment of Centers for Advance Agricultural Science and Technology. The subcomponent would support competitively selected CAAST proposals by reform-ready AUs to establish multidisciplinary centers for teaching, research and extension on critical and emerging agricultural topics (e.g., globalization; climate change and resilience; land and water use efficiency; scalable technology; effective pedagogy and knowledge transfer; agro-industry; and agro-entrepreneurship). Multi-stakeholder consultations would inform the geographic locations and core themes for the proposed CAASTs, after which participating AUs would compete for CAAST funding. Approved AUs would be financed through a CAAST subproject grant directly to the participating AU. The sub-component would finance: (a) research and teaching equipment (i.e., goods); (b) faculty and scientist development fellowships, (c) student scholarships, primarily at the postgraduate level; and (d) costs associated with twinning arrangements with similar centers (e.g., universities, institutes, research centers, private sector) both outside and within India (i.e., training, consultant services, and non-consultant services).

ICAR-AU Accreditation: Accreditation in the ICAR-AU System seeks to improve and sustain the quality, relevance and overall integrity of agricultural higher education, and to improve transferability and marketability of students, both nationally and internationally. ICAR extends accreditation at three levels: (a) university; (b) college; and (c) individual program, faculty and department. Accreditation constitutes a statement to general public that the given institution:

- Has clearly defined and appropriate objectives (Leadership).
- Has established an enabling environment that makes achievements of these objectives possible (Governance).
- Is substantially accomplishing its objectives (Effectiveness).
- Is so organized, staffed and supported that it is expected to continue to do so (Sustainability).

Criteria and Indicators for Assessing Accreditation in ICAR-AU System

The institution:	Indicators
1. Has clearly stated objectives consistent with its mission and goals.	<ul style="list-style-type: none"> • Short- and long-term institutional goals and objectives which are understood by different constituents of the university. • Sound decision making, review and evaluation processes. • Public information system including published materials.
2. Has human, financial and physical resources, necessary to accomplish its objectives.	<ul style="list-style-type: none"> • Board of Management per Models Act. • Effective administration through well-defined policies and procedures. • Faculty members with acceptable educational credentials. • Safe and healthy environment for faculty, staff and students. • Physical facilities for good teaching and learning. • Adequate infrastructure and academic/ financial resources.
3. Is accomplishing its educational objectives	<ul style="list-style-type: none"> • Educational programs that are clearly defined and executed. • Appropriate assessment mechanism for academic achievements. • On-going support for staff professional development. • Evidence of achievement in education, research and extension.
4. Can effectively sustain the quality of its educational programs.	<ul style="list-style-type: none"> • Resource base - human, physical and financial. • Structured assessment process that are continuous. • Effective planning process. • Commitment from appropriate authorities for continued support.

The ICAR-AU accreditation process has four steps: (a) The institutional self-study report examines the institution's achievement of the accreditation criteria; (b) An Evaluation team visits the institution to validate its self-study report; (c) The Accreditation Board Secretariat reviews the self-study and Evaluation team reports, and (d) The Accreditation Board awards accreditation. ICAR-AU accreditation is voluntary. Nonetheless, financial assistance may be linked with accreditation status. If accreditation is conditional, the stipulated conditions have to be met within the specified time frame. In case of non-compliance, ICAR financial assistance may be reduced / stopped.

Box 2

22. It is expected that up to ten CAASTs would be funded under the subcomponent. An indicative list of themes includes: Soil Health Management, Seed and Tissue Culture, Precision Farm Technology, Protected Horticulture, Agro-processing and Aquaculture (Hatchery/Ornamental fish). These centers would complement ICAR's research on climate

change under National Initiative on Climate Resilient Agriculture and under a Consortium Research Platform for research on secondary agriculture, including food safety.

23. An indicative list of activities to be financed under Subcomponent 1b includes:

- New PG course development and existing PG course revision, with emphasis on applied problem solving and entrepreneurship.
- Development of certificate courses for skill development in areas such as high-tech horticulture, food processing and precision farm technology.
- Master and Ph.D. students sandwich program to facilitate student exposure to national and international universities.
- Modern research facilities to conduct high-quality advanced research by faculty and students.
- Faculty upgradation through international and national training with mentor universities.
- Targeted research collaboration with national and international centers of excellence to increase both faculty/student productivity and research quality and relevance (see Box 3).
- Adjunct/Visiting Professorship opportunities to stimulate innovation in ongoing PG research and to mentor PG students.
- Distinguished Lecture Series/Special lectures to bring about much needed vibrancy in the academic atmosphere and inspire students and faculty to perform better.
- Collaboration with private sector, industry and civil society organizations related to the specialized areas to develop market-oriented programs and produce industry-ready graduates.
- Transfer of technology to end users, e.g., farmers; this can be done effectively through KVKs in that region so that the research-education-extension synergy is revitalized.

24. **CAAST AU Eligibility:** In addition to reform readiness (i.e., accreditation), AUs would be required to verify the qualifications and experience of faculty and staff to successfully establish and maintain the proposed CAAST, including:

- *Faculty and Research Staff Strength:* At least ten permanent multi-disciplinary faculty with demonstrable expertise and research accomplishment relevant to the proposed CAAST;
- *Scientific partnership* with national and international professional institutions.
- *Existing and functional advanced center* in the proposed thematic area.

University Innovation Alliance: Driving Excellence and Innovation
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“The challenge for leaders in higher education, then, is to figure out how to incentivize collaborative behavior to drive innovation that meets the needs of the country and of students—namely, by helping more students’ access opportunities for higher education and attain degrees and skills to advance their own and the nation’s economic success. It’s time to share what we know about how to serve students better, so that the beneficial effects of innovation can multiply rapidly across academic cultures, across regions, and across the diverse student populations striving for a college degree at thousands of postsecondary institutions....”

- University Innovation Alliance (UIA) 2015

Leaders of eleven public research universities representing the geographic, economic, and social diversity of the United States have formed the UIA to develop a new, collaborative innovation model for higher education—a model that will overcome the four key obstacles to enhancing quality and innovation generation capacity in universities:

- **Competition discourages collaboration.** Colleges and universities can accelerate the progress of higher education by combining intellectual resources to learn and innovate together.
- **Current structures encourage exclusivity.** The UIA rejects the premise that colleges/ universities cannot simultaneously expand access and pursue excellence. Institutions can commit to working together to increase enrollments of racially and economically diverse student populations while enhancing the excellence of teaching, research, and learning on campuses. Students also benefit from being educated in academically diverse environments.
- **Colleges and universities need more effective ways to share ideas.** Successful startups and innovative industries demonstrate that learning from failure is central to people’s ability to adapt, spread, and scale-up proven ideas. Smaller groups (like the eleven UIA institutions) allow for deeper relationships, trust, and a continuous feedback loop to improve results. By having multiple lead universities offering guidance to collaborating institutions, the ‘collaboration’ burden on any one innovator can be reduced.
- **Higher education needs a useful method for scale.** The UIA provides valuable insight into how to scale more effectively and thus expand the reach of promising innovations.

The UIA demonstrates that research universities have much to learn about (and a special role to play in) accelerating innovations to improve student success rates and enhance social and economic mobility. UIA collaboration and sharing is built around a "lead" and "collaborator" university relationship, in which universities that are using innovative practices to increase low-income students’ progression, success, and completion rates serve as mentors ("leads") to universities that would like to adopt and implement similar practices at their own campuses ("collaborators").

Link to UIA: <http://goo.gl/buBuBZ>

Box 3

25. *Sub-component 1c - ICAR innovation grants to AUs (USD 30.8 million, of which IBRD USD15.4 million)* would provide Innovation Grants to selected participating AUs for the carrying out of Innovation Plans. The Innovation Plans would primarily support technical assistance and consultant services, including those required to: (a) make AUs reform ready (i.e., attain

accreditation); and (b) promote mentoring of non-accredited AUs by existing reform-ready AUs and other interstate and international academic partnerships.

26. Since the Deemed Universities and Central Agricultural Universities are directly governed by ICAR, these are ideal candidates for incubating global best practices, including institutional reforms for developing state-of-the-art systems and facilities for agricultural higher education in the country. Also, currently accredited AUs can form a consortium with other non-accredited AUs to benefit from such mentoring, particularly in lagging states.

27. Subproject Cycle – IDPs, CAASTs and Innovation Grants:

- Following a dissemination campaign to create overall NAHEP awareness, interested AUs would define their institutional development goals and develop associated activities and outcomes (with technical assistance as required) into IDPs/ CAAST Proposals (or develop Innovation Grant proposals), which are submitted to the Education Division/ ICAR.
- IDPs/ CAAST Proposals (or Innovation Grants proposals) are competitively evaluated by the Technical Committee for eligibility (i.e., reform readiness), technical merit and compliance with environmental, financial, institutional, social and technical guidelines (as per the PIP).
- Subproject agreements are signed between competitively selected participating AUs and the Education Division/ ICAR to support finance of approved IDPs/ CAASTs (or Innovation Grants) and would specify the use of subproject resources, and the rights and responsibilities of participating AUs and the Education Division/ ICAR.
- The Education Division/ ICAR transfers subproject resources to participating AUs for IDP/ CAAST (or Innovation Grant) implementation.
- Participating AUs contract goods, works, consultant services and non-consultant services, in accordance with the approved IDP/ CAAST (or Innovation Grant) and the norms established in the PIP, and prepare progress reports (including Financial Utilization Certificates) which they submit to the Education Division/ ICAR to document the use of subproject resources.

28. Component 2 – Investment in ICAR for Leadership in Agricultural Higher Education (USD 10.4 million, of which IBRD USD 5.2 million) – would finance ICAR’s internal reforms to enhance its effectiveness in coordinating, guiding and managing agricultural higher education across the ICAR-AU System and its interactions with AUs and key stakeholders nationwide through interventions that increase the quality and relevance of agricultural higher education. As the Education Division/ ICAR is responsible for national coordination and quality assurance of agricultural higher education, the component would leverage ICAR’s comparative advantage in: (a) assessing systemic challenges across the ICAR-AU System; and (b) incubating solutions.

29. The component would finance goods, works, non-consulting services, training and workshops, and consultants’ services (other than those financed under Subprojects), and incremental operating costs and would include: (a) assessing options in the administration and award of ICAR’s technical and financial assistance to AUs; (b) structuring dialogue with State governments to catalyze their participation in raising the quality and relevance of agricultural higher education; (c) providing assistance to participating AUs for the development of IDP, CAAST and Innovation Grants; (d) establishing partnerships with globally recognized agricultural higher education institutions; (e) developing digital information systems for agricultural data collection, analysis and dissemination; (f) improving curricula review processes and methods to

consolidate and disseminate global best-practices in agricultural education; (g) improving the all-India entrance examination in agriculture, including and on-line examination system; (h) adopting next-generation management systems covering information, procurement, contract and financial management areas; (i) coordinating an External Advisory Panel of renowned agricultural education experts; (j) assisting AUs to strengthen their linkages with industry; and (k) promoting the establishment of centers for career development at AUs.

30. ***Strengthening Education Division of ICAR:*** Due to the establishment of new agricultural, horticultural, veterinary and fisheries universities by the state governments, initiation of new schemes and substantial expansion of the earlier educational and human resource development programs, the work load of the Education Division has substantially increased. For example, the number of AUs in India has increased from 15 in 1970 to 75 at present. Also, over the last four decades, several new programs have been introduced and the existing programs substantially expanded. These include admission of students through all-India entrance examinations; award of merit scholarships, junior, senior and international fellowships for promoting inter-state migration of students and human resource development in cutting-edge science; appointment of national professors, national fellows, adjunct professors and emeritus scientists; strengthening of information technology infrastructure; up-gradation of laboratories, class rooms and instruction farms; strengthening of libraries, including online access to 3,490 journals through the Consortium on e-resources in Agriculture (CeRA), introduction of experiential learning and niche areas of excellence, strengthening centers of advanced studies, etc.

31. The component would strengthen the Education Division by providing need-based support, including incremental staff and other relevant resources. The focus will be on making the Education Division an agile, proactive and forward-looking Division to meet the challenges of 21st century agricultural higher education in India. To effectively carry out its defined reform agenda, the Education Division/ ICAR would contract, under terms of reference satisfactory to the Bank, consultant services for change management to provide guidance during NAHEP implementation.

32. ***External Advisory Panel:*** To benefit from both global and India-specific lessons regarding educational reforms, the Education Division/ ICAR would establish an External Advisory Panel, consisting of renowned agricultural education experts from academia and the private sector. It is expected that the External Advisory Panel would primarily leverage ICT to provide just-in-time guidance during project implementation, supplemented by periodic site visits to both participating AUs and ICAR.

33. ***Enhancing the Effectiveness of ICAR's Development Grant:*** NAHEP would work with the existing ICAR mechanisms to enhance its effectiveness in promoting quality and relevance in agricultural higher education in the country. The flagship program of ICAR for supporting educational programs in the AUs is through annual development grants amounting to about INR 5 crore per AU. The Development Grant is ICAR's primary vehicle for funding the 75 institutions under the ICAR-AU System.² This grant is provided for infrastructure development, gender mainstreaming including girls' hostels, other new civil works related to student amenities, including boys and international hostels, educational museums, examination halls and

² ICAR Guidelines for the Development Grant: <http://www.icar.org.in/files/edu/Guidelines-%20Development-Grant-Education-2015.pdf>

auditoriums, repair/ refurbishing/ renovation and modernization of educational structures etc. This also includes faculty development, strengthening of sports and games facilities, employment placement cells, equipment/ computers/ implements for higher education; strengthening of library, e-resources including existing e-courses and ICT facilities. Support also includes preparation of quality instructional material and writing university-level textbooks and manuals for effective teaching and learning process.

34. Beyond the share of ICAR's financial contribution, which currently stands at about 5-15% of the overall AU annual budget, the Development Grant, as the main source of capital expenditure in the AU budget, is critical for implementing educational programs and improving the quality of India's agricultural higher education. As of GoI FY2016-17, the Development Grant is available only to those AUs and constituent colleges which have ICAR accreditation.

35. **Accreditation of Agricultural Universities:** For critical quality assurance, ICAR accredits AUs, a practice it has followed since 2003. The present system of accreditation of AUs and their constituent colleges evaluates academic programs in terms of minimum standards. At present, 58 of the 75 AUs in the ICAR-AU System are accredited. AUs in lagging states represent 25% of all AUs, while one-third of accredited AUs are in these lagging states, indicating that AUs in lagging states are achieving equitable access to accreditation. NAHEP would build the capacity of the Education Division for accreditation of the remaining AUs.

36. **Expanding Use of ICT:** To address increased AU demand for online services, ICAR's Central Data Center at the Indian Agricultural Statistics Research Institute (IASRI), New Delhi would be upgraded to include real-time connectivity with AUs. The compilation of union catalogue, digital repository and digital libraries would be strengthened under the existing *e-Granth* to facilitate knowledge exchange among researchers, teachers, students and extension professionals. Communication management would also be expanded to permit greater dissemination of events and achievements of the AUs using both print and electronic media, including social media. To improve communication among ICAR and the AUs, a video conferencing facility connecting participating AUs with the Education Division/ICAR would be financed under NAHEP.

37. **NISAGENET:** The National Information System on Agricultural Education Network in India (NISAGENET) is an on-line portal administered by the Indian Agricultural Statistics Research Institute (IASRI). Under the support and supervision of the Education Division/ ICAR, NISAGENET focuses on providing a unified database for collection, compilation and analysis of information about the activities of the ICAR-AU System. Under NISAGENET, the information on academic, infrastructural facilities, budget provision, manpower and R&D activities of all the AUs in the ICAR-AU System (along with their constituent/affiliated colleges) is collected, compiled and integrated.

38. NAHEP would also finance a web-based national Agricultural Education Digital Information System (AEDIS) for collecting and regularly updating real-time information about AUs, constituent colleges, academic programs, faculty, students, financial, physical and other resources, program-wise passing out graduates and their employment placement. The AEDIS will form an integral part of the flagship 'Digital India' initiative of GoI. The data will be regularly updated by AUs and analyzed by the Education Division/ICAR to evaluate and improve quality

metrics in agricultural higher education and to regularly monitor outputs and outcomes for improving accountability and efficiency of the ICAR-AU System. AEDIS would also be used as the basis for the AUs' own data management systems. While AEDIS is being developed, ICAR will continue to improve its existing data collection system, i.e., NISAGENET.³ The Education Division/ ICAR would contract consultant services to construct AU data verification protocols, drawing on global best practice, particularly from Land-Grant Universities in the U.S.A.

39. **Online national examination system:** The Education Division/ ICAR conducts entrance examinations annually for UG, PG and PhD programs. This current process is costly in terms of manpower, time, and financial resources. During the year 2015-16, UG examination took place at 47 centers, PG examination at 34 centers and PhD examination at 17 centers nationwide, covering about 157,000 students. On-line administration of these examinations be more cost effective for ICAR and increase access to students. A first phase of this migration to on-line examination would target PG admissions, making use of the existing facility created under the recently concluded Bank-financed NAIP.

40. **Introduction of next-generation MIS and FM systems:** Considering the power of ICT, an attempt has been made under NAIP to develop a Management Information System (MIS), including procurement and contract management and Finance Management System (FMS) in the ICAR. At present FMS is operational in all the ICAR Institutes. Similar facilities would be encouraged in AUs and their constituent colleges. This will also require the formation of a "financial wing" in the Education Division/ICAR, through its PIU, for effective monitoring of financial resources.

41. **Remodeling Financial and Procurement Systems (RFPS):** Efficiency with transparency and accountability are the key words in implementing Financial and Procurement Systems. Under NAIP, in compliance with the World Bank guidelines, Financial and Procurement Systems were introduced across all subprojects. On one hand it brought transparency to the system and on other hand it improved efficiency. Accordingly, such a system will be extended to all AUs. The requisite capacity building will also be included.

42. **Center for Career Development:** To be established at participating AUs, these Centers would facilitate engagement with prospective employers and potential student placement, as well as capacity development of students in business communication and job search skills. The Center would be responsible for website development related to placement, information brochures, and organize, *inter alia*: (a) pre-placement workshops; (b) skills testing; (c) peer group learning sessions; and (d) on-campus interviews with prospective employers. AU faculty from various disciplines will provide need-based support to the Center through joint appointments.

43. **Strengthening ICAR – AU – Industry Linkages:** NAHEP will strengthen linkages of ICAR institutes and Agricultural Universities with industry. This will be done at two levels – first at the national level and second at the state/regional level. The Project will support development of institutionalized linkages of ICAR-AU-Industry with relevant national level apex organizations like the Confederation of Indian Industry, the Federation of Indian Chambers of Commerce and

³ Including EKTA (*Eakikrit Krishishiksha Takniki Aayam* in its Hindi name) and AEDIS, which together will form an integrated agricultural education technology portal to consolidate system-wide data and knowledge across the ICAR/AU system.

Industry (FICCI) and the Associated Chambers of Commerce of India (ASSOCHAM). Linkages with private industry will be coordinated by one of the three National Coordinators, who will be provided additional staff and logistical support for this activity. The focus will be on fostering collaboration between ICAR, AUs and private industry and trade at the national level.

44. Through NAHEP, the Education Division/ ICAR will guide and support AUs in developing and strengthening linkages with industry in agricultural education and research. NAHEP would support development of a comprehensive national, regional and state level database of private sector, industry and trade. The goal is the institutionalization of well-structured stakeholder and advisory inputs to better inform education, research and extension across the ICAR-AU System. This would also help in generating additional fiscal resources for AUs, e.g., through private sector endowments, contract research, fellowships and internships.

45. **Component 3 – Project Management and Learning (USD 8.0 million, of which IBRD USD 4.1 million)** would finance goods, works, non-consulting services, training and workshops, and consultants' services for the Project (other than those financed under subprojects) and incremental operating costs. The component would strengthen ICAR's management capacity for project implementation, including: (a) the establishment/maintenance of a Project Implementation Unit, a Steering Committee, a Technical Committee and a Monitoring and Evaluation Cell to ensure compliance with the Project's procurement, financial management, safeguards and reporting requirements, and the carrying out of the administration, supervision, monitoring and evaluation of IDP Grants, CAAST Grants and Innovation Grants and/or proposals therefor; and (b) the provision of training to ICAR and participating AUs to achieve and sustain increased quality, relevance and effectiveness of agricultural higher education.

46. A results-based M&E system would monitor project processes using the following methods and tools: (a) a Results Framework that is derived from clearly identified goals, objectives, outputs and activities with corresponding indicators, means of verification and key assumptions; (b) a well-defined M&E strategy regarding information requirements, tools and methodologies for data collection, analysis and reporting; (c) a comprehensive M&E plan with clear roles and responsibilities with respect to data gathering and reporting; and (d) internal and external periodic assessments and evaluations, which include baseline studies of participating AUs, beneficiary assessments, mid-term evaluations, ex-post evaluations and impact evaluations. The Education Division/ ICAR, with support from the Bank task team and the Indian Agricultural Statistics Research Institute (IASRI) would, by Loan Effectiveness, establish baseline indicators where possible from existing data in NISAGENET. In those cases where baseline data are not available in NISAGENET, baseline data will be collected as part of the IDP, CAAST and Innovation Grant proposals under Component 1.

47. The Education Division/ ICAR would establish a Monitoring and Evaluation (M&E) Cell no later than 90 days after Effectiveness to oversee the progress of activities across all NAHEP components. An M&E expert/ consultant (firm) would be hired by The Education Division/ ICAR within 90 days following Effectiveness to support the M & E cell. The M&E Cell would: (a) develop a Project Monitoring and Tracking System (PMTS) to supervise all activities sanctioned under NAHEP and provide inputs for any needed course corrections; and (b) coordinate overall impact assessment, including economic and financial analysis of the various NAHEP activities and components. An independent entity would be contracted within 90 days

of Loan Effectiveness to conduct comprehensive outcome-focused impact evaluation of NAHEP at three stages: baseline, mid-term, and project completion. NAHEP includes midterm performance reviews of each participating AU and its IDP and will apply rewards and sanctions as warranted by these reviews.

48. A PME Cell would also be established in each participating AU for its respective IDP/ CAAST and would be responsible for: (a) collecting baseline data for PDO and intermediate outcome indicators;⁴ (b) preparing an M&E work plan and budget for its respective IDP/ CAAST; (c) timely preparation of semester and annual progress reports, including financial and physical performance metric as agreed in the PIP; (d) planning and developing PME-related training programs; and (e) designing and conducting M&E exposure sessions for the participating AUs.

49. **Project Reporting:** The Education Division/ ICAR, through its PIU, would submit semester reports to the World Bank containing: (a) up to-date physical and financial expenditure data compared to annual and end-of-project targets; (b) updated indicators of project performance compared to annual and end-of-project targets; (c) successes and problems encountered during the reporting period with suggested remedial actions; and (d) social and environmental impacts of the Project.

⁴ Once competitive selection of participating AUs is completed under Components 1a and 2b, baseline measurements would be taken and updated annually. In parallel, a control group of non-participating AUs would be formed, data from which would serve as comparator.

Annex 3: Implementation Arrangements

INDIA: National Agricultural Higher Education

Project Institutional and Implementation Arrangements

1. NAHEP would be implemented by the Education Division/ ICAR. An NAHEP Steering Committee – led by the Director General, ICAR and including representatives *inter alia* from agricultural universities, Ministry of Agriculture and Farmers Welfare, the private sector and any other institution in addition to or in substitution of the aforementioned as agreed with the Bank – would be established no later than 90 days after Effectiveness. The Steering Committee would: (a) provide strategic guidance to the Technical Committee and the PIU, setting up policy directives and determining priority interventions for agricultural higher education; (b) approve IDPs, CAAST Proposals, and Innovation Plans vetted by the Technical Committee, and award the respective IDP Grants, CAAST Grants and Innovation Grants; and (c) monitor and evaluate the progress made in the implementation of the Project and the achievement of its development objectives.

2. A Project Implementation Unit (PIU), established within the Education Division/ ICAR and led by the Deputy Director General, Education, ICAR – who is also the National Director for NAHEP – would be responsible for the coordination and facilitation of overall project implementation. The PIU would include: (a) technical experts to oversee the subproject grants (i.e., IDPs, CAASTs and Innovation Grants) under Component 1; (b) change management expertise under Component 2; and (c) both newly contracted and seconded ICAR staff in the areas of project administration, financial management, procurement, monitoring, evaluation, management information systems (MIS), learning and capacity building, and social and environmental safeguards.

3. A Technical Committee – composed of a rotating roster of external experts including academic and industry representatives – would be established no later than six months after Effectiveness. The Technical Committee would: (a) screen, evaluate and select participating AUs and their respective IDPs, CAAST Proposals and/or Innovation Plans, pursuant to the eligibility criteria set forth in the Project Implementation Plan, and recommend them to the Steering Committee for approval and the provision of IDP Grants, CAAST Grants and Innovation Grants; and (b) apprise the Steering Committee on the overall performance of the selected participating AUs in the implementation thereof.

4. Participating AUs would be responsible for the direct implementation of Component 1 activities, in that these AUs would prepare and execute IDPs, CAASTs and Innovation Grants with funds under subprojects. All participating AUs would meet the technical, financial, procurement and management capacity requirements for subproject implementation, as detailed in the PIP.

Project administration mechanisms

5. **Financial Management:** NAHEP responds to the underlying limitations of current ICAR-AU System in the context of a fast changing global agriculture sector. The mere collection of financial management data from participating AUs, its project-level consolidation and timely analysis will require:

- Preparation of a financial management manual (FMM) to bring uniformity in the operational procedures and reporting among participating AUs. In this context, the PIU has adopted the FMM developed for the NAIP (predecessor project) and updated it to incorporate: (a) the NAHEP PDO, project description and components; (b) project costs; (c) project staffing; (d) implementation arrangements; and (e) delegation to the PIU of financial powers for NAHEP.
- Identification of financial management personnel at PIU, ICAR and each participating AU and provision for their training on the financial management procedures for each subproject.

6. **Budgeting:** The Education Division/ ICAR acquires funds for NAHEP through the Department of Agricultural Research and Education under its annual budget. The NAHEP budget will be approved at the central level before March 31 of each year of implementation. The budgeting exercise starts with the approval of the Project Paper, which contains the contours of the Project and the overall financial envelope for the life of the Project, by the GOI and subsequent signing of the Loan Agreement. To distinguish the NAHEP budget, a separate budget line has been assigned. This simplifies the identification of the NAHEP budget and helps in monitoring actual utilization.

7. The NAHEP budget – compiled by the Finance wing of the Education Division/ ICAR, through its PIU – would be submitted to Department of Agricultural Research and Education/ ICAR. Upon receipt of the sanctioned budget (as communicated in the Sanction Letter), the Education Division/ ICAR would re-allocate the annual budget to the AUs based on their budgetary requirements as given in the IDPs, CAASTs and Innovation Grants. During the fiscal year, the Finance wing of the Education Division/ ICAR would monitor the quarterly fund utilization status, based on expenditure statements (i.e., fund utilization certificates).

8. **Flow of Funds:** After signing the IDP/ CAAST/ Innovation Grant subproject, the funds for revenue expenditures would be released at periodic intervals against the sanctioned budget provision of the given financial year. The fund for capital expenditures would be disbursed in a single instalment at the beginning of each financial year. Subsequent release of funds to the AUs would be linked to: (a) the physical progress of the subproject; and (b) the financial progress relative to the previous reporting period. The release of installments will be conditional to submission of expenditure statements/audited Utilization Certificates as laid down in the FMM. Each AU will open a project-specific bank account to allow identification of project expenditures.

9. **Report-based disbursement:** Interim unaudited financial reports (IUFs) would be used for reporting as well as financial monitoring and would be submitted in agreed format to the Bank on a quarterly basis within 45 days from the end of each calendar quarter. The IUFs would disclose receipt and utilization of project funds (both Bank share and counterpart contribution). IUFs would be based on project accounts and would reflect the actual expenditure for the project components. IUFs would provide contract-wise details and payments for contracts beyond an agreed threshold. In terms of disbursement, the Education Division/ ICAR would first spend from the budget and then claim reimbursement from the Bank. All expenditures reported in the IUFs would be subject to annual project external audit.

10. **External Audit:** The annual external audit of the Project Financial Statements (PFS) would be carried out by the Comptroller and Auditor General of India (CAG) for Education Division/ ICAR and by private CA firms for participating AUs. The PFS, in agreed formats, would

be subject to audit under terms of reference already agreed between the Bank and CAG/private audit firms. A private CA firm will be appointed through competitive selection under terms of reference agreed with the Bank to issue a consolidated audit report based on audit report of each participating AU. All supporting records and documents under the Project would be subject to the external audit. The PFS would summarize all receipts and expenditures reported in the IUFs. The annual audit reports would consist of: (a) annual audited PFS; (b) the audit opinion; and (c) a management letter highlighting weaknesses, if any, and identifying areas for improvement. The annual project audit reports and accounts would be submitted to the Bank within nine months after the end of each fiscal year (i.e., by December 31). The following audit reports would be monitored:

Implementing Agency	Audit	Auditors	Due Date for Audit Submission
1. Education Division/ICAR	Project Financial Statements	C&AG	December 31
2. Participating AUs	Consolidated Project Financial Statements	Private CA Firms	December 31

11. **Internal Audit:** Internal auditing would be an integral part of the project design and would cover all activities under the Project to be carried out by the Education Division/ ICAR and the participating AUs. The internal audit would be carried out by a Chartered Accountancy firm. The terms of reference for the internal audit would cover a review of internal controls for sub-project management including procurement and contract managements. The auditors would be appointed based on selection criteria agreed with the Bank. The internal auditor would be appointed within nine months of Loan Effectiveness. The internal audit reports, along with the compliance, would be periodically shared with the Bank on an agreed timetable. Also, the Education Division/ ICAR would establish an audit committee, chaired by the Project Director, to monitor follow up actions on key audit issues.

12. **AU Audits and disclosure:** As mentioned above, the IDP/ CAAST/ Innovation Grant subproject accounts for participating AUs would be audited by a Chartered Accountancy firm appointed by ICAR. These audits would certify the IDP/ CAAST/ Innovation Grant subproject accounts annually and would highlight any issues relevant for ICAR and AU management action. AUs would prepare a simplified monthly financial report summarizing: (a) the sources and uses of funds, indicating the balances in cash/bank; (b) any contributions in labor and materials; and (c) physical progress of works/activities as agreed in the IDP/ CAAST/ Innovation Grant. Quarterly submission of financial reports to the Education Division/ ICAR would be required as a pre-condition for subsequent fund releases. In terms of public disclosure, participating AUs would publicly post on the university website the receipts and expenditure from the IDP/ CAAST/ Innovation Grant subproject.

13. **Internal Control:** The internal control framework would be based on the agreed Delegation of financial powers, the Financial Management and Procurement Manuals for the Project. The Manuals developed for the earlier Bank-financed NAIP will be suitably modified to meet the requirements of the Project.

14. **Disclosure of information:** The Education Division/ ICAR would be required to disclose the following on the project website: (a) Quarterly IUFRRs; (b) Annual Audited Project Financial Statements; (c) Annual Project Audit Reports; and (d) contract details of major contracts.

15. **Action plan for FM:** The following action plan has been agreed with the Client:

Action	By whom	By when
FM Staffing at PIU, Education Division/ICAR	The Education Division/ ICAR	By Loan Effectiveness
Appointment of internal auditor	The Education Division/ ICAR	Nine months after Loan Effectiveness

16. **Supervision:** FM supervision would entail semi-annual supervision, given the Substantial risk. In the initial year of implementation, more frequent visits would take place to ensure that the agreed FM arrangements are in place and functional.

Disbursement

17. **Disbursement Arrangements:** Disbursements would be made based on quarterly IUFRRs. The Project would submit withdrawal applications supported by IUFRRs to CAA&A in DEA for submission to the Bank for reimbursement. The Bank would reimburse an amount equivalent to the eligible expenditures claimed as reported in the IUFRRs. All expenditures reported in the IUFRRs would be subject to confirmation/certification by the annual audit reports. Any difference between the expenditure reported in the IUFRRs and those reported in the annual audit reports would be analyzed and those expenditures which are confirmed by the Bank to be ineligible for funding (i.e., refundable to IBRD), would be adjusted in the subsequent disbursements.

18. **Retroactive financing:** Withdrawals up to an aggregate amount not to exceed USD 16,500,000 may be made for Eligible Expenditures on or after September 1, 2016 or the date one year prior to Loan signing, whichever is the shortest retroactive period.

19. **Disbursement categories:** Three disbursement categories would finance: (a) goods, works, non-consulting services, training and workshops and consultants' services under Subprojects; (b) goods, works non-consulting services, consultants' services, Training and Workshops (other than under Subprojects), and Incremental Operating Costs; and (iii) the Front-end Fee. The overall disbursement percentage would be 50%.

Category	Amount of the Financing Allocated (USD)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(1) Goods, works, non-consulting services, training and workshops and consultants' services under Subprojects.	73,200,000	50%
(2) Goods, works non-consulting services, consultants' services, Training and Workshops (other than those financed under Subprojects), and Incremental Operating Costs.	9,093,750	50%
(3) Front-end Fee	206,250	
TOTAL AMOUNT	82,500,000	

Procurement

20. Procurement for the proposed Project would be carried out in accordance with the World Bank's "Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers" dated January 2011 (Procurement Guidelines) and revised July 2014; and "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers" dated January 2011 (Consultant Guidelines) and revised July 2014; and the provisions stipulated in the Loan Agreement. For each contract to be financed by the proposed Loan, the different procurement methods or consultant selection methods, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank project team in the Procurement Plan. The Procurement Plan would be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

21. **Procurement Activities: Works** procured under the Project may include small civil, refurbishment works. These works would be mostly procured within NCB/shopping thresholds. No ICB procurement in works is envisioned under NAHEP. **Goods** procured under the Project would include Information Technology Equipment (e.g., computers, printers, network infrastructure and servers), office equipment and furniture. Some sophisticated R&D equipment and some software, being proprietary in nature, would be procured by Direct Contracting; other goods and software would be procured by ICB, NCB, Shopping and or using Directorate General of Supply and Disposal rate contracts within the Shopping threshold. The NCB standard bidding documents of the Bank, as agreed with GoI task force (and as amended from time to time), would be used for procurement of all NCB Goods. For ICB/Limited International Bidding (LIB) contracts, the Bank's latest SBDs would be used. **Consultancy services** may include specialized technical training, development of internet-based information systems, an external M&E agency and internal auditor. Short lists of consultants for services estimated to cost less than USD 800,000 or equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines. The Bank's Standard Request for

Proposal Document would be used as a base for all procurement of consultancy services to be procured under the Project. All procurement to be carried out shall be included in the procurement plan and agreed with Bank.

22. **Training:** Training would include study tours, workshops and training for ICAR staff, and AUs. Appropriate training shall be carried out in accordance with the PIP prepared by the Education Division/ ICAR, or by specialized training agencies, and agreed with the Bank. ICAR will have a full-time procurement officer who will be the nodal point for all procurement related matters at ICAR and at the AU level for NAHEP. ICAR would appoint a consultant to provide support to AUs in the preparation of IDP, CAAST and Innovation Grant procurement plans, bidding documents, carry out capacity-building training, conduct regular procurement reviews and provide hand holding support. The participating AUs that implement IDPs, CAASTs and/or Innovation Grants under subprojects would carry out procurement in accordance with the arrangements agreed for NAHEP. This includes prior and periodic post review of contracts by the Bank.

23. **Assessment of the agencies' capacity to implement procurement:** Education Division /ICAR is the nodal agency responsible for execution of the Project in compliance with agreed processes and procedures. ICAR has past experience in successfully carrying out procurement under NAIP and NATP in compliance with World Bank Guidelines. Assessment of some of the AUs that will be engaging in most of the procurement at the decentralized level suggests fiduciary risks of limited capacity, staffing, delays and inconsistency in processes and procedures. Proactive engagement, handholding support and capacity building by ICAR would be important for ensuring compliance by the participating AUs and mitigating these fiduciary risks.

24. In view of the decentralized nature of procurement by AUs with limited capacity, the overall procurement risk is Substantial.

25. The Education Division/ ICAR has overall implementation responsibility of NAHEP procurement activities and would ensure that participating AUs procure goods, works and services as per the agreed Procurement Plan using the procedures and forms detailed in the agreed Project Procurement Manual. In addition, the procurement arrangements below will help mitigate risks.

Procurement Arrangements

26. The Education Division/ ICAR is the nodal agency and has overall responsibility for implementation of NAHEP in compliance with agreed procedures and processes. For the Project, the PIU, Education Division/ICAR will be the single point of contact with AUs for communication to and from the Bank. PIU, Education Division/ ICAR will ensure that participating AUs procure goods, works and services as per the agreed procurement arrangements. To mitigate the various identified risks and to ensure compliance the following arrangements have been put in place:

- **Procurement Plan (PP):** The Education Division/ ICAR has prepared a Procurement Plan which provides the basis for the procurement methods and review by the Bank for the first eighteen months of project implementation. This Plan has been agreed between the Borrower and the Bank and is published on the ICAR website and uploaded in the Bank's electronic STEP system. The updated Plan shall only be submitted and cleared by the Bank through

electronic STEP system annually (or earlier as required) to reflect the actual implementation. Similarly, all the participating AUs will prepare their respective draft procurement plan for the initial 18 months and send it to the procurement officer at PIU, education division/ICAR for vetting. The procurement officer at ICAR shall vet the plan as per agreed cost tables, collate all the procurement plans and send them for Bank clearance and no objection.

- **Procurement Manual:** The NAIP procurement manual has been suitably updated /revised as per the applicable Bank guideline by the Education Division/ ICAR to reflect the NAHEP project implementation arrangements. This Manual shall be the basis for procurement to be carried out by AUs and the Education Division /ICAR. No amendment to the Procurement Manual shall be carried out without review and clearance from the Bank.
- **Procurement Staff and Capacity building:** The Education Division/ICAR, through its PIU, will be staffed with a procurement officer supported by a procurement consultant and required support staff. Each participating AU will identify a procurement officer. The pre-requisite for staff to handle project procurement would be familiarity with Bank procurement. All officials handling procurement under the Project shall attend procurement training at ASCI /NIFM to learn the Bank's procurement procedures and methods. A list of all selected procurement officials at ICAR and AUs with status of their completion of procurement training shall be shared with the Bank for information and records. The list shall be suitably updated as and when required. In addition, ICAR will develop a regular training calendar of workshops and clinics to be conducted for all participating AUs by the ICAR officials and the consultant.
- **Procurement and contract management MIS:** To ensure regular and close proactive monitoring, the Education Division/ ICAR would develop and establish a procurement and contract management MIS where all contract information by ICAR and all participating AUs shall be updated online. This procurement MIS will ensure that regular and effective monitoring, expeditious action, timely corrective actions, need-based support and guidance, sharing of knowledge and information on commonly procured items, standardize specification for certain equipment, promote cross learning and help to develop an inventory of available equipment with various participating AUs.
- **Transparency and Disclosure:** The following documents shall be disclosed on the ICAR website: (a) the Procurement Plan and all subsequent updates; (b) invitations for bids for goods and works for all NCB contracts; (c) requests for expression of interest for selection/hiring of consulting services; (d) contract awards of goods and works procured following NCB procedures; (e) lists of contracts/purchase orders placed following Shopping procedure on a quarterly basis; (f) short lists of consultants; (g) contract awards for all consultant services; (h) lists of contracts following Direct Contracting (DC), Consultant Qualification Selection (CQS) or Single Source Selection (SSS) on a quarterly basis; and (i) action-taken reports on the complaints received on a quarterly basis.
- **Complaint Handling Mechanism:** To address procurement complaints received by the Education Division/ ICAR, a complaint handling mechanism would be established no later than 90 days after Effectiveness. The complaint handling mechanism would draw on that which was developed under the previous Bank-financed NAIP. On receipt of complaints, the Education Division/ ICAR and participating AUs would take immediate action to acknowledge

the complaint and redress, within a reasonable time frame, as per the Project Implementation Plan. All complaints would be addressed at levels higher than that of the level at which the procurement process was undertaken. The Bank would be kept informed after the complaint received and its redressal.

- **Oversight and Procurement review:** The Education Division/ ICAR would engage with participating AUs to regularly review the procurement processes being followed and how the contracts are being managed. This will be in addition to the annual post-procurement review to be conducted by the Bank for both ICAR and the participating AUs.

27. **Methods of procurement:** The following methods of procurement shall be used for procurement under the Project. If a particular invitation for bid comprises several packages, lots or slices, and invited in the same invitation for bid, then the aggregate value of the whole package determines the applicable threshold amount for procurement and for the review by the Bank.

Table 1: Procurement Methods

Category	Method of Procurement	Threshold (USD Equivalent)	Prior review threshold
Goods and Non-consulting services	ICB	>3,000,000	All Direct contracts above USD 10,000 and all other contracts equal to or greater than USD 1 million equivalent;
	LIB	wherever agreed by Bank	
	NCB	Up to 3,000,000 (with NCB conditions)	
	Shopping	Up to 100,000	
	DC	As per para 3.7 of Guidelines	
	Force Account	As per para 3.9 of Guidelines	
	Framework Agreements	As per para 3.6 of Guidelines	
	Community Participation	As per para 3.19 of Guidelines	
Works	ICB	>40,000,000	All Direct contracts above USD 10,000 and all other contracts equal to or greater than USD 10 million equivalent
	NCB	Up to 40,000,000 (with NCB conditions)	
	Shopping	Up to 100,000	
	DC	As per para 3.7 of Guidelines	
	Force Account	As per para 3.9 of Guidelines	
	Community Participation	As per para. 3.19 of Guidelines	
Consultants' Services	CQS/LCS	Up to 300,000	All Single source selection contracts above USD 10000 and all other
	SSS	As per para 3.9-3.11 of Guidelines	

Category	Method of Procurement	Threshold (USD Equivalent)	Prior review threshold
	Individuals	As per Section V of Guidelines	contracts equal to or greater than USD 500,000 equivalent for firms; and equal to or greater than USD 200,000 equivalent for individuals
	QCBS/QBS/FBS	for all other cases	
	(i) International shortlist	>800,000	
	(ii) Shortlist may comprise national consultants only	Up to 800,000	

28. For all NCB procurement, the following NCB provisions shall apply:

- a) Only the model bidding documents for NCB as agreed with the GoI Task Force (and as amended from time to time), shall be used for bidding.
- b) The Invitation to Bid shall be advertised in at least one widely-circulated national daily newspaper (or on a widely-used website or electronic portal with free national and international access, along with an abridged version of said advertisement published in a widely-circulated national daily *inter alia* giving the website/electronic portal details from which the details of the invitation to bid can be downloaded), at least 30 days prior to the deadline for the submission of bids.
- c) No special preference will be accorded to any bidder either for price or for other terms and conditions when competing with foreign bidders, state-owned enterprises, small-scale enterprises or enterprise from any given State.
- d) Except with the prior concurrence of the Bank, there shall be no negotiation of price with the bidders, even with the lowest evaluated bidder.
- e) Extension of bid validity shall not be allowed regarding Contracts subject to Bank prior review without the prior concurrence of the Bank: (i) for the first request for extension if it is longer than four weeks; and (ii) for all subsequent requests for extension irrespective of the period (such concurrence will be considered by Bank only in cases of Force Majeure and circumstance beyond the control of the Purchaser/Employer).
- f) Re-bidding shall not be carried out regarding Contracts subject to Bank prior review without the prior concurrence of the Bank.
- g) The system of rejecting bids outside a pre-determined margin or “bracket” of prices shall not be used in the Project.
- h) Rates contracts entered into by Directorate General of Supplies and Disposal will not be acceptable as a substitute for NCB procedures unless agreed with the Bank on a case-by-case basis. Such contracts will be acceptable however for any procurement under the Shopping method.
- i) The two or three envelope system will not be used (except when using e-procurement system assessed and agreed by the Bank).

Review by the Bank

29. **Supervision:** In the initial year of implementation, more frequent visits would take place to ascertain risk and available capacity of selected AUs followed by appropriate mitigations measures to adequately build capacity so that the processes are well understood and are being followed. Annual Procurement post review shall be conducted by the Bank or a Bank-appointed consultant for ICAR and participating AUs. Procurement supervision would entail semi-annual supervision, given the Substantial risk rating.

Environmental and Social (including safeguards)

30. *Environment:* The negative impacts on environment are limited and localized (restricted to minor civil works within the premises of State-level AUs). However, there are opportunities for integration across AU curricula of climate resilience, sustainable production systems, and overall reduction of the environmental foot print of Indian agriculture. Such integration can also be extended to faculty development (e.g., training and capacity-building), as well as ongoing and future research and extension programs.

31. The limited environment and social assessment considered: (a) issues regarding minor civil works in refurbishing buildings and laboratory construction, upgrade, use and safety; (b) screening of IDPs, CAASTs and Innovation Grants where they are expected to have a physical footprint or include use of hazardous materials; and (c) cultural practices centering on the use of agrochemicals, particularly pesticides. The methodology included stakeholder consultations – faculty, students, researchers, laboratory technicians, farmers etc. and survey of research facilities, especially laboratories. The Environmental Management Framework (EMF) contains guidelines for construction works, lists out the applicable laboratory/research standards and includes screening criteria of IDPs, CAASTs and Innovation Grants. In addition to safeguards, a ‘safeguards-plus’ approach will be suggested at a later stage in the Project - integration of climate resilience, sustainable production systems, and low foot print of agriculture. The EMF will guide the participating AUs in the preparation of their respective Environmental Sustainability Plans. The EMF was disclosed by the Education Division/ ICAR on April 27, 2016. The EMF was also disclosed in the Bank’s Infoshop on May 3, 2016.

32. *Social:* NAHEP would finance minor civil works within the existing premises, and is not expected to cause any significant environmental or social impacts. Likely environmental and social impacts, which will be limited in nature, may include temporary construction-related impacts. No civil work involving compulsory land acquisition or involuntary resettlement shall be financed. The project institutions, especially those in low-income states, are located in states and communities inhabited by tribal communities, and hence, Operational Policy on Indigenous Peoples (OP/BP 4.10) has been triggered.

33. An Equity Action Plan (EAP), prepared by the Education Division/ ICAR, constitutes an Indigenous People's Policy Framework (IPPF) for the purposes of OP/BP 4.10. The EAP addresses issues of gender equality and social inclusion, with special attention to the needs of the SC/ST students. The EAP meets the requirements of OP 4.10 with free, prior, informed consultation held with the primary stakeholders. Key Recommendations were as follows:

- *Modification in the Selection Process:* Participating AUs to assess their admission processes and explore possible incentives, such as specialized knowledge-intensive areas, sector-specific scholarships, awards and rewards. Incentives/job security to those opting agriculture as a career option.
- *Measures for Improving Academic Performance of students:* Participating AUs to identify and support students who need extra support, through (i) diagnosing student weaknesses and continuous tracking of performance, (ii) enhancing communication and presentation skills, (iii) organizing innovation and knowledge exchange workshops to improve knowledge sharing, etc.
- *Making curriculum industry oriented:* The ICAR-AU System to provide for updating of curriculum over more regular frequencies to help learning match industry requirement; improving the employability skill.
- *Academic reforms:* (i) participating AUs, through IDPs, to improve non-cognitive and soft skills including communication and presentation skills through their wide use in curricula / project-based work, and where needed, to provide special skills training to students with priority to the weak students, (ii) training of faculty in subject matter and pedagogy, particularly to improve the performance of weak students, (iii) providing opportunities to young faculty for upgrading their domain knowledge.
- *Making campuses physically and socially gender friendly:* especially provide adequate and suitable facilities to women students and faculty, and establishing a two-tier grievance redress mechanism.

34. The EAP/IPPF was disclosed by ICAR on April 27, 2016 and will be locally disclosed by each participating AU, once selected. The EAP/IPPF was also disclosed in the Bank's Infoshop on May 2, 2016. The Education Division/ ICAR - as well as each participating AU - will have assigned staff responsible for monitoring and supporting the implementation of each AU-level EAM, to be prepared by participating AUs as prescribed by the EAP/IPPF. The Bank task team and its safeguards specialists will carry out periodic field visits to and training support for the Education Division/ ICAR and the participating AUs as part of overall implementation support of the EAMs and EAP/IPPF, respectively (see Annex 4).

35. *Environmental Management Framework and Equity Action Plan:* For the purposes for NAHEP, the combined EMF and EAP ensure that there are no adverse environmental and social impacts as a consequence of NAHEP implementation and that the activities under NAHEP are socially acceptable and environmentally sustainable. The EMF and EAP were prepared using mostly qualitative research methodologies, including intensive stakeholder interviews and focus groups discussions with male and female students and faculties from various social backgrounds, including SC/ST groups, and poor and disadvantaged communities.

Monitoring and Evaluation

36. A results-based M&E system would monitor project processes using the following methods and tools: (a) a Results Framework that is derived from clearly identified goals, objectives, outputs and activities with corresponding indicators, means of verification and key assumptions; (b) an M&E strategy regarding information requirements, tools and methodologies for data collection, analysis and reporting; (c) a comprehensive M&E plan with clear roles and responsibilities with respect to data gathering and reporting; and (iv) internal and

external periodic assessments and evaluations, which include baseline studies of participating AUs, beneficiary assessments, mid-term evaluations, ex-post evaluations and impact evaluations.

37. The Education Division/ ICAR would establish no later than 90 days after Effectiveness a Monitoring and Evaluation (M&E) Cell to oversee the progress of activities across all NAHEP components. An M&E expert/ consultant (firm) will be hired by The Education Division/ ICAR to support the M&E cell. The M&E Cell would: (a) develop a Project Monitoring and Tracking System (PMTS) to supervise all activities sanctioned under NAHEP and provide inputs for any needed course corrections; and (b) coordinate overall impact assessment, including economic and financial analysis of various activities and components of the Project. An independent entity will be contracted to conduct comprehensive outcome-focused impact evaluation of NAHEP at three stages: baseline, mid-term, and project completion.

38. For IDPs and CAASTs, a PME Cell would also be established in each AU for its respective subproject and be responsible for: (a) collecting baseline data for PDO and intermediate outcome indicators; (b) preparing an M&E work plan and budget; (c) ensuring timely preparation of semester and annual progress reports, including financial and physical performance metrics; (d) planning and developing PME-related training programs; and (e) designing and conducting M&E exposure sessions for the respective AUs.

39. **Project Reporting:** The Education Division/ ICAR would submit to the World Bank: (a) up-to-date physical and financial expenditure data compared to annual and end-of-project targets; (b) updated indicators of project performance compared to annual and end-of-project targets; (c) successes and problems encountered during the reporting period with suggested remedial actions; and (d) social and environmental impacts of the Project. Each Project Report shall cover the period of one calendar semester, and shall be furnished to the Bank not later than forty-five (45) days after the end of the period covered by such report.

40. ICAR would establish by no later than six months after Effectiveness, and thereafter maintain and operate throughout the period of project implementation, a grievance redressal mechanism for the handling of any stakeholder complaints/grievances arising out of the implementation of project activities (including the Participating AUs' Subprojects), in a manner and substance agreed with the Bank.

Annex 4: Implementation Support Plan
INDIA: National Agricultural Higher Education

Strategy and Approach for Implementation Support

1. The Bank's implementation support plan (ISP) for NAHEP lays out the approach to be followed to help the project implementation agencies achieve the expected project results, based on the project's nature and risk profile. The ISP identifies specific actions to: (a) better manage key risks identified in the SORT; (b) support increased AU and ICAR institutional development; and (c) ensure compliance with the loan agreement signed between the GoI and the Bank. The ISP relies on project design, technical assistance and monitoring features as enabling tools.
2. The implementation support strategy combines periodic supervision with timely technical assistance and policy advice as necessary. The ISP includes: (a) ICAR-Bank reviews every six months; (b) interim technical discussions and field visits by Bank and ICAR staff; and (c) monitoring and reporting by the Education Division/ ICAR on NAHEP implementation progress and achievement of results; (d) capacity building of AUs to both development and implement IDPs, CAASTs and Innovation Grants; (e) third-party impact evaluation (baseline, mid-term, final); (f) annual internal and external financial audits and FM reporting; and (g) periodic procurement post-review.
3. Six-monthly joint review missions: The Education Division/ ICAR and the Bank task team jointly conduct NAHEP implementation reviews every six-months following Effectiveness. These joint reviews would initially focus on key start-up and capacity-building activities to facilitate and accelerate early stages of NAHEP implementation. The Education Division/ ICAR would prepare and submit to the Bank an Implementation Progress Report in an agreed format at least 15 days prior to the start of each joint review. During the joint review, the Education Division/ ICAR and the Bank task team would: (a) review NAHEP progress in the context of the PIP and associated Procurement Plan; (b) identify key issues affecting project performance (both positive and negative); and (c) agree on any actions as needed to sustain and/or accelerate project implementation. Documentation of the joint review would consist an Aide Memoire – which summarizes items (a)-(c) above – and a Management Letter from the Bank to ICAR.
4. In addition to the joint review missions, the Bank task team would meet periodically with the Education Division/ ICAR during the 18 months of NAHEP implementation, to ensure timely implementation. The Bank task team would include the Bank Task Team Leader (TTL) and co-TTL, FM, Procurement, Environmental and Social Safeguard specialists, and technical experts (both Bank staff and consultants) as identified over the course of NAHEP implementation (e.g., AU accreditation, specific technical fields, own-revenue generation). Bank task team composition would vary based on the requirements of each joint review.

Implementation Support Plan

5. The Bank task team is based in both Washington, D.C., USA and New Delhi, India. During the joint reviews and any interim reviews, detailed inputs from the Bank task team would consist of the following:

- a. **Technical inputs:** would be provided to the Education Division/ ICAR and those AUs visited during the reviews to facilitate NAHEP implementation. The Bank task team would maintain regular phone and email contact with the Education Division/ ICAR to facilitate ongoing work-flow, such as: (i) review of terms of reference; (ii) prior review of procurement; (iii) identification and deployment of international expertise as required under NAHEP; and (iv) other “just-in-time” review and advice as may be required. The Education Division/ ICAR would review and update the PIP as needed during project implementation and submit these updates to the Bank task team for review and mutual agreement.
- b. **Fiduciary inputs:** The Bank team would support the Education Division/ ICAR through training and other capacity-building needs with respect to FM and procurement. Procurement and FM compliance would be a part of the joint reviews described above. The Bank task team would also ensure any timely support required by the Education Division/ ICAR to meet the agreed fiduciary requirements as given in the Loan Agreement.
- c. **Safeguards:** The Bank task team would monitor EMF and EAP compliance during the joint reviews provide technical assistance to ICAR specialists as needed.

A summary of implementation support is provided in Tables A.4.1 and A.4.2.

Table A.4.1 Staff Resource Estimates for Project Implementation Support

Time	Focus	Skills Needed	Resource Estimate (SWs)	Partner Role
First 18 months	Technical support	M&E Specialist	8	(i) USAID
		Education Specialists	16	(ii) Emb. Netherlands
		Technical Specialists	12	
	Fiduciary training and supervision	FM Specialist Procurement Specialist	6 6	(iii) Land-Grant Universities
	ESMF monitoring and reporting	Social Dev. Specialist Environment Specialist	6 6	
	Team Leadership	TTL/ co-TTL	30	
Annually for each year of implementation	Technical Support	M&E Specialist	4	(i) USAID
		Ag. Education Specialists	12	(ii) Emb. Netherlands
		Technical Specialists	8	
	Fiduciary Monitoring and Reporting	FM Specialist Procurement Specialist	4 4	(iii) Land-Grant Universities
	ESMF monitoring and reporting	Social Dev. Specialist Environment Specialist	4 4	
	Team Leadership	TTL/ co-TTL	24	

*SW=Staff Weeks

Table A.4.2 Skills Mix Required

<i>Skills Needed</i>	<i>Annual SWs</i>	<i>Annual Number of Trips</i>	<i>Comments</i>
Education Specialists	12	6	Country office/ HQ
Technical Specialists	8	4	Country office/ HQ
M&E Specialist	4	2	Country office/ HQ
FM Specialist	4	2	Country office
Procurement Specialist	4	2	Country office
Social Specialist	4	2	Country office
Environment Specialist	4	2	Country office
TTL	24	4	Country office/ HQ

Partners

Name	Institution/Country	Role
USAID	India	Technical Assistance
Embassy of the Netherlands	India	Technical Assistance
Land-Grant Universities	USA	Technical Assistance

Annex 5: Economic and Financial Analysis

INDIA: National Agricultural Higher Education Project

1. Agricultural higher education is central to the research-education-extension (REE) system. Through its support to improve the relevance and quality of the agricultural higher education system in India, the main contribution of NAHEP is expected to accrue through its impact on the scientific human resource capacity that is the core of the agricultural innovation system, and ultimately on agricultural productivity. Trained scientific human capital is the main ingredient of “technology capital” (i.e., the accumulated stock of human, physical and institutional research and extension stock) which has been empirically shown to be the main driver of agricultural productivity, globally and in India. In this context, the decline in full-time equivalents (FTE) of research staff in India’s overall technology system indicates a decline in India’s agricultural technology capital. This will eventually impact agricultural productivity growth, with potentially far reaching consequences for food security, nutrition and sustainability, especially in terms of building resilience to climate change.

2. Past studies on India have consistently shown high internal rates of return to investment in agricultural research, summarized in Table 1 (e.g. Evenson, Pray and Rosegrant 1999, Chand, Kumar and Kumar 2004, Pal and Byerlee 2006). These investments have also contributed to significant reductions in poverty (e.g., Fan, Hazell and Throat 1999). These studies define “research” investments broadly to include all three key components of “technology capital” – research, agricultural higher education and agricultural research) (Evenson and Fuglie 2009). This innovation system drove the famed Green Revolution through the 1970s, 80s and 1990s, and is credited as the main factor behind the total factor productivity (TFP) growth in Indian agriculture, estimated to about 2 percent annually between 1980 and 2008.

Table 1: Internal Rate of Return (IRRs) of Indian Agricultural Research and Education Investment

Measure	Aggregate Analysis	Analysis of Individual	All
Mean	75.4	69.9	71.8
Median	58.5	53.0	57.5
Minimum	46.0	6.0	6.0
Maximum	218.2	174.0	218.2
Number of Studies	10	18	28

Source: Pal and Byerlee, 2006

3. Heavy and dedicated public investments in agricultural research and the State-level AUs made India one of the largest and successful REE systems globally, producing high-quality scientists and researchers. More recently, however, there are growing concerns about deteriorating quality of the higher agricultural education, as well as the declining FTE of research staff across the Indian agricultural research system. In this context, NAHEP is designed to support the once-illustrious State-level AUs to improve the overall quality and relevance of the ICAR-AU System, and ultimately drive future productivity. This economic analysis of the NAHEP thus focuses on its likely impact on agricultural productivity to quantify its net incremental benefits, and assess whether the proposed Project is economically justifiable.

4. Accordingly, to assess the overall contribution of the proposed NAHEP, this analysis focuses on the impact of the accumulated “stock” of expenditures on higher agricultural education

through the State-level AUs on agricultural productivity. The pathways through which this impact will materialize are both in the public and private sectors (e.g., research; extension and advisory services; output marketing and agro-processing; input marketing and product development). It is difficult to map out and quantify the likely benefits of agricultural higher education, largely because the data required to do so are not available. Furthermore, the analysis is conceptually challenging as the likely impacts are complex, with both private and social returns and costs.

5. Typical economic analysis of education might rely on graduates' earnings as a proxy for productivity, extrapolated to assess the aggregate impacts (in net private returns) against the intervention costs. In the case of agricultural higher education in India, this is difficult because of the student dynamics. Based on data from a recent needs-assessment conducted by the USAID-funded Agricultural Innovations Partnership Project, about half of the undergraduates go on for further degrees. Among the rest, about 10-15 percent find employment, either in the public or the private sectors, but the rest are unaccounted for, as they likely set up their own businesses or go back to farming. Information on the earnings of this share of the student body is not available, nor are the salaries of students (and also graduates subsequently) who go into the private sector. Among the undergraduates and graduates who take up salaried employment, a majority end up in the public sector (the central- or State-level AUs within the REE system). For these institutions, the salary structure follows established and uniform public sector pay scales, making it difficult to assess quality differentials based on starting salaries alone. As such, the *a priori* impact of NAHEP, in terms of quality and relevance of graduating students, cannot be measured.

6. To overcome these conceptual and empirical challenges, the analysis here instead relies on empirically estimating the impact of the agricultural higher education expenditures (i.e., State-level AU expenditures) on agricultural productivity, as distinct from and in addition to the ICAR agricultural research expenditures. The expenditures on agricultural higher education are expected to have a long-term impact, not immediate or short-term impacts. A recent study has empirically estimated that investments in agricultural research generates lagged impacts lasting about 20 years after the initial expenditures. Since agricultural higher education expenditures directly feed into this research system, investments in agricultural higher education are also expected to have a similar long-term flow of benefits. To capture this, an expenditure "stock" variable is used (a weighted average of lagged State-level AU expenditures, as explained below) to measure the cumulative future impact of current expenditures.

7. The public investments in agricultural R&D and higher education are justified given their public goods nature and for equity considerations in India, as in many countries. Agricultural research and development are primarily public goods and their optimal provision requires sufficient and consistent public investment. The benefits of improved agricultural higher education accrue both to its direct beneficiaries (e.g., student, farmers, academia, and technical service providers) and to society as a whole (e.g., increased agricultural productivity, greater natural resource efficiency, poverty reduction, multiplier effects in allied sectors). Additionally, public investments in State-level AUs provide the private sector with a knowledge platform fueled by research and extension and facilitate thriving agribusinesses. State-level AUs have the scale and some of the basic infrastructure in place to reach large numbers of students, invest in equipment, hire high-quality faculty and reach farmers and agribusinesses.

8. Private sector involvement in these activities is increasing, but still remains at a nascent stage and at a limited scale to meet India's current demands. For the foreseeable future, public

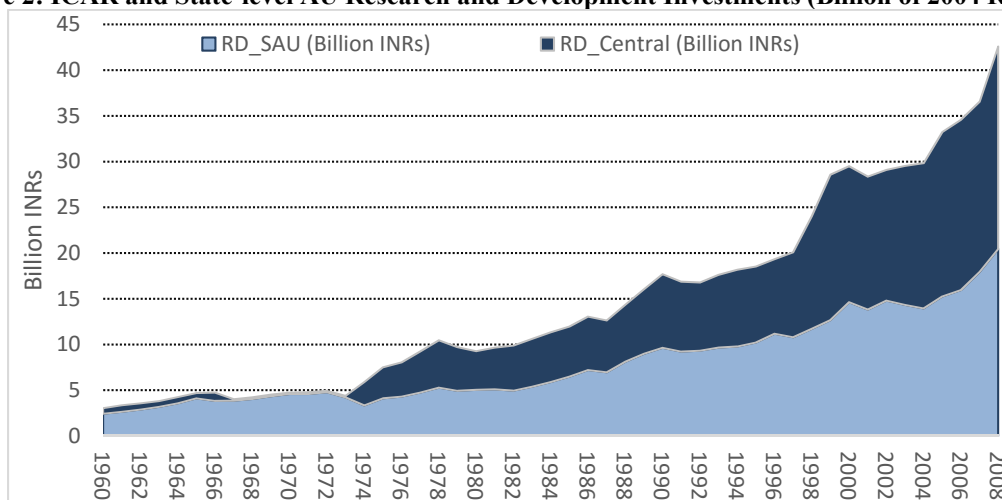
investment in human resource development and agricultural technology development will remain substantial, making it important to enhance the quality and relevance of these public investments. Another important rationale for public investment is the equity consideration: the vast majority of students in the ICAR-AU System are from low- and middle-income families, and from lagging states, for whom effective demand for private education may be limited.

Data, Public Expenditure and Research Stock Generation

9. The approach taken here is to estimate the anticipated overall effects of NAHEP on national agricultural productivity and output. To estimate the returns from investment made in agricultural research, time series data on research stock and output are used. Public agricultural research and education investments, between 1960 and 2008, are available for each State-level AU from Rada and Schimmelpfennig (2015). All research expenditures are normalized to 2004 constant rupees by the World Bank’s GDP deflator specific to India. Agricultural production data are from the Cost of Cultivation (CoC) surveys conducted annually by the Directorate of Economics and Statistics (DES), Ministry of Agriculture. Agricultural productivity (yields) are measured from these data to estimate the impact of agricultural research and State-level AU expenditure stock.

10. The trends in annual public agricultural research and higher education expenditures (in real 2004 Rupees) are shown in Figure 2. Overtime, State-level AU expenditures have increased more rapidly to the point that by 2008 (latest year for which the data are available) the ICAR (central) research and State-level AU expenditures are almost equal.

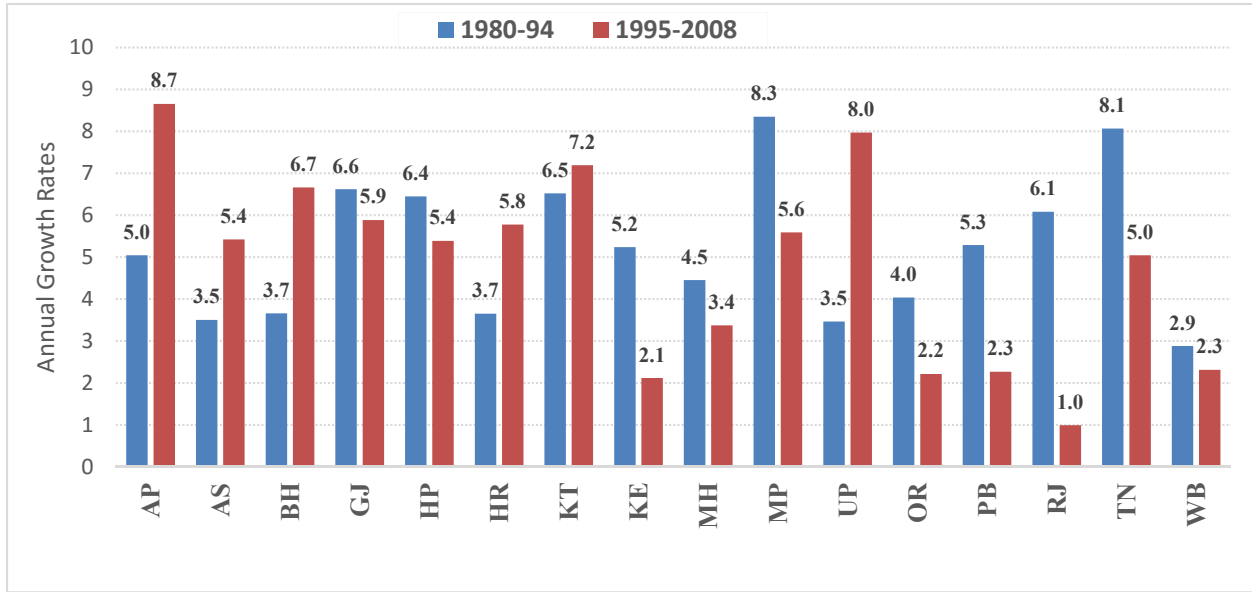
Figure 2: ICAR and State-level AU Research and Development Investments (Billion of 2004 Real Rs)



Source: Rada and Schimmelpfennig (2015)

11. State-level AUs do not receive equal funding. The funding levels vary significantly across states and among respective State-level AUs, but for many states, their AU spending growth rates have slowed down significantly. For example, average annual growth of State-level AU expenditure in Kerala and Rajasthan has been declined from 5.2 percent and 6.1 percent to 2.1 percent and 1.0 percent respectively after 1996. Punjab, Orissa and Tamil Nadu also experienced sharp decline in State-level AU expenditure in the same period (Figure 3). These change trends and varying levels of funding across states help in the estimation of the impact of public State-level AU expenditures on productivity.

Figure 3: State-level AU's R&D Spending Growth Rates



12. The effects of research spending on the agricultural productivity growth are captured by creating a research stock generated by the accumulation of past annual research expenditures. Knowledge capital accumulates with a lag such that the impact of a typical year's research investment is spread over several years before the knowledge generated is entirely translated into higher TFP growth. To capture this, the annual service flows from State-level AU (and research) spending are assumed to increase over time, reach a peak and then die out. These effects are added together to form a moving average of expenditure impacts on productivity.

Productivity Impact of Agricultural Research Stocks

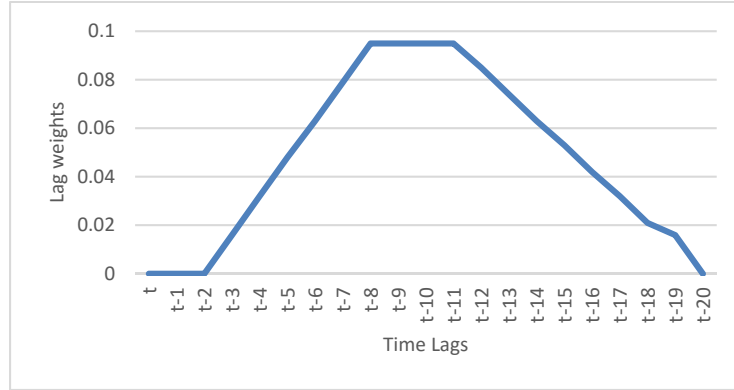
13. Using a stochastic frontier function estimation, and a flexible functional form (translog), productivity is modeled to estimate productivity elasticities with respect to area, variable production inputs, time trend, State-level AU expenditure stock and the central research expenditure stock, controlling for state and crop fixed effects.

14. The results show a significant impact of both the State-level AU and central research expenditure stocks on agricultural productivity. The State-level AU stock elasticity is estimated at 0.07 and the ICAR research stock-output elasticity at 0.101. These estimates are consistent with the literature, though no other study has estimated the impact of State-level AU expenditures separately from the ICAR research expenditures. Other studies have also generally estimated the impacts on TFP. For example, Rada and Schimmelpfening (2015) estimate the impact of research stock on productivity as 0.12.

15. In creating such "stock variables", their typical formulations in the literature allow for an initial gestation period, followed by adoption, sustained application and eventual obsolescence. Testing various specifications for India, Evenson et al. (1999) concluded that research investments generated knowledge and technology benefits for 27-year period. A more recent study empirically tests for alternative lag structures and concludes that an asymmetric trapezoidal shape lag structure spanning 20 years best approximates the lagged impacts of research and education investments (Rada and Schimmelpfennig 2015). The estimated weights for this structure are used in this

analysis, with a gestation period of 3 years, followed by rising impacts for the subsequent 5 years, plateauing at this peak for the next 4 years, then diminishing over the last 8 years through technology obsolescence (Figure 4). Using these weights, State-level AU and central research stocks are calculated for each state, using state specific expenditures, as in Equation 1.

Figure 4: R&D Stock Generation from R&D Investments



Equation (1):
$$RS_{it} = 0.00(RE_{i,t}) + 0.000(RE_{i,t-1}) + 0.000(RE_{i,t-2}) + 0.016(RE_{i,t-3}) + 0.032(RE_{i,t-4}) + 0.048(RE_{i,t-5}) + 0.064(RE_{i,t-6}) + 0.079(RE_{i,t-7}) + 0.095(RE_{i,t-8}) + 0.095(RE_{i,t-9}) + 0.095(RE_{i,t-10}) + 0.095(RE_{i,t-11}) + 0.085(RE_{i,t-12}) + 0.074(RE_{i,t-13}) + 0.063(RE_{i,t-14}) + 0.053(RE_{i,t-15}) + 0.042(RE_{i,t-16}) + 0.032(RE_{i,t-17}) + 0.021(RE_{i,t-18}) + 0.016(RE_{i,t-19}) = \sum_{l=0}^{19} \gamma_l RE_{i,t-l}$$

Where γ reflects the lag weights and $\sum \gamma_l = 1$.

16. To estimate the incremental benefits of NAHEP, the “with-project” and “without-project” scenarios are modeled as two hypothetical scenarios: (a) in the *without-project* case, State-level AU expenditure grow at a current growth rate of 4.5 percent for the next 25 years; and (b) in the *with-project* case, State-level AU expenditure will also grow at the same rate but with additional expenditures of 5 percent for each of the 5 NAHEP project years.

17. Using data from 1980 onwards, a robust State-level AU expenditure stock-agricultural productivity elasticity is estimated, which provides a sound basis of assessing the expected impact of the interventions on the final outcomes – agricultural productivity. This assessment is appropriate as it directly and rigorously relates the primary inputs (expenditures) to final outcomes (agricultural productivity), obviating the need to trace out and quantify the myriad intermediate outputs and outcomes, and allows a credible assessment of the likely economic impact of NAHEP.

18. A recent detailed study estimating the returns to investment in agricultural research (a combined stock of ICAR research and State-level AU expenditures aggregated as total REE expenditures) indicates that a 1 percentage point change in agricultural research stock in India would increase the agricultural productivity up to 0.12 percentage points. As such, the economic rate of return is estimated at a high 67 percent.

19. Using the State-level AU expenditures, modeled in addition to and distinct from the ICAR research expenditures, crop productivity elasticity is estimated at 0.07. Using this elasticity, the

net returns to the incremental project costs (assuming the current trends in higher agricultural education expenditures are maintained into the future as the “without project” scenario) are estimated at a healthy 42 percent (Table 2). The benefit-cost ratio, using a discount rate of 6 percent, is estimated at 7.2; applying a 10 percent discount rate the benefit-cost ratio reduces to 4.6. To test the robustness of the project investments, a sensitivity analysis, assuming a plus or minus 20 percent change in the estimated elasticity, shows still impressive returns, ranging from a low of 37 percent to a high of 46 percent.

20. An important outstanding concern relates to the declining human resource capacity (both in quantity and possibly quality) discussed earlier. The downward trend in FTE research staff started about 2000. In support of the concerns, estimation results indeed show a lower elasticity for the post-1996 period (also a statistically significant reduction in the trend). The pre-1996 elasticity is estimated at 0.074. This result is indicative and conservative, as the time period for analysis is limited; with long-term lagged effects, the full impact is likely not fully captured. Nevertheless, the finding is more important in that it provides validation to the concerns that, allowing for the lags in the expected results from current expenditures, the future impact of a deterioration of State-level AU quality could be much more severe, providing a strong rationale for investing in strengthening the State-level AUs, as is the intent of NAHEP.

Table 2: IRR and BCR - NAHEP

		Research Stock-Yield Elasticity	IRR (%)	Benefit-Cost Ratio (BCR)	
				Discount Rates	
				6%	10%
Crop Output	SAU ¹	0.069	42	7.2	4.6
	ICAR	0.101	51	11	7
Pre-1996 Elasticity	SAU_2	0.074	43	7.7	5
Agriculture GDP		0.120	67	20.3	13.4
If the elasticities are 20 percent higher					
Crop Output	SAU	0.083	46	8.8	5.7
	ICAR	0.121	55	13.3	8.7
Pre-1996 Elasticity	SAU_2	0.089	47	9.5	6.1
Agriculture GDP		0.144	72	24.6	16.3
If elasticities are 20 percent lower					
Crop Output	SAU	0.055	37	5.6	3.5
	ICAR	0.081	45	8.6	5.5
Pre-1996 Elasticity	SAU_2	0.059	38	6	3.8
Agriculture GDP		0.096	60	16.2	10.6

¹ State-level AU

Source: Team Calculations based on Cost of Cultivation data and public expenditures data provided by Rada and Schimmelpfenning (2015)

Cost-Benefit Analysis

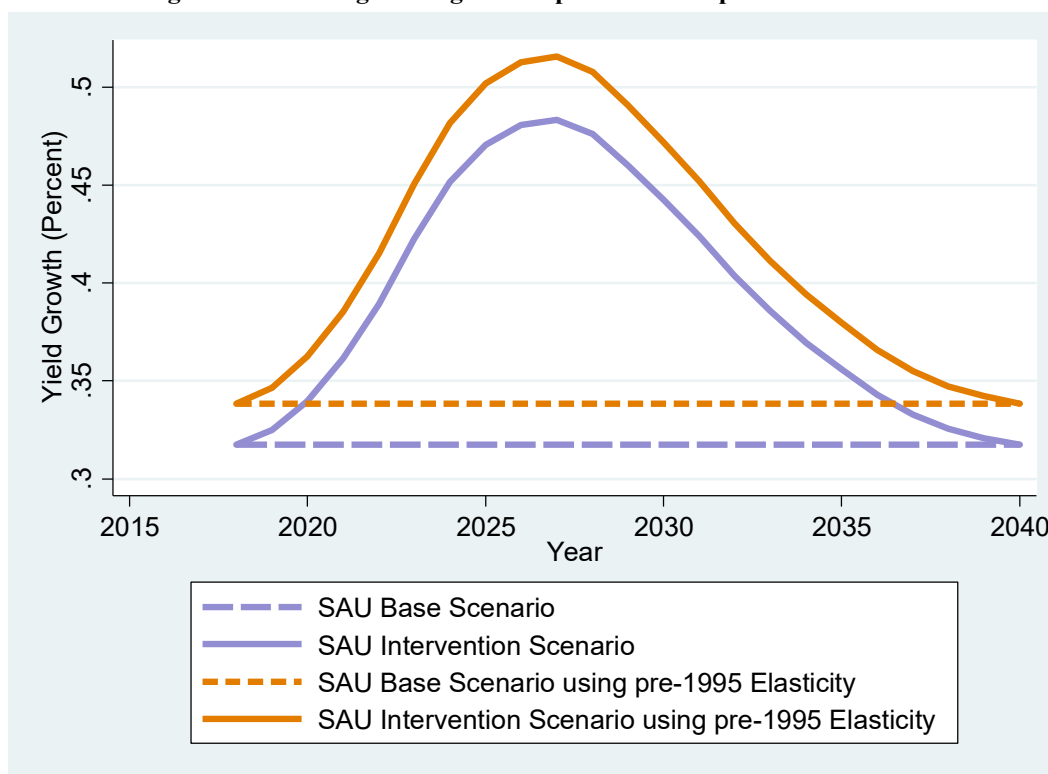
21. The economic feasibility of NAHEP is established by estimating the Internal Rate of Return (IRR) and the benefit-cost ratio (BCR) of NAHEP project costs. The benefits of NAHEP investment are calculated with the estimated impact of research and higher education expenditures

on agricultural productivity, but they do not account for the indirect impacts of these investments, such as the efficiency gains due to the use of better input mixes.

22. Using the estimated stock-output elasticities, the incremental stream of benefits is estimated to arrive at an IRR and BCR for the Project. The project costs are spread evenly across the 5 years of its implementation, raising current expenditures by about 5 percent for each of the project years. Allowing for lagged impacts, the impacts of changes in research and State-level AU expenditure stocks are estimated to 2039 using equation (1). Figure 4 shows: (a) the expected incremental output flow due to NAHEP between 2020 and 2040; and (b) the yield growth based on the current yield-stock elasticity, which is smaller compared to the yield-stock elasticity in 1980s and in early 1990s.

23. Using the incremental changes in the agricultural output (relative to the counterfactual simulated as the continuation of past trends in output growth), the estimated IRR and BCR for NAHEP investments are shown in Table 1. The table shows IRRs and BCRs for four scenarios to capture the robustness of the results: (a) State-level AU expenditures; (b) the returns to ICAR’s agricultural research stock; (c) the returns to State-level AU research stock elasticity for the pre-1995 period; and (d) an estimate based on the research stock-TFP elasticity estimate from Rada and Schimmelpfennig (2015) applied to the agricultural GDP. While the first three estimates provide returns only in terms of crop productivity, the last estimate also captures the full impacts of the expenditures including on livestock productivity. The results confirm very high returns to NAHEP investments, ranging from 42 percent to 67 percent, depending on the scenarios.

Figure 4: Percentage Change in Output due to Proposed Investments



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