Annexure 4.1: Yield of Cereals, Pulses and Oilseeds

Labour and Land Yield of Cereals, Oilseeds and Pulses, 2021–22

	Yield of Cereals, Oilseeds and Pulses (kg/hectare), 2021–22			Labour Productivity of Cereals, Oilseeds and Pulses (kg/worker), 2021–22*		
State	***Cereals***	***Oilseeds***	***Pulses***	***Cereals***	***Oilseeds***	***Pulses***
Andaman & Nicobar Islands	2,518		393	1,555		75
Andhra Pradesh	3,778	899	817	1,881	576	2,406
Arunachal Pradesh	1,659	1,046	1,025	1,930	79,754	1,931
Assam	2,129	638	754	1,409	37,868	0
Bihar	2,595	1,131	874	1,414	1,119	2,701
Chandigarh	4,883			4,819		
Chhattisgarh	1,782	593	602	1,044		
Dadra & Nagar Haveli	2,089	539	1,044	1,378		
Daman and Diu	1,585		1,019			
Delhi	3,645	1,269	1,000	5,442	11,398	
Goa	2,691	2,285	916	10,409		
Gujarat	2,490	1,973	1,273	2,549	4,728	11,292
Haryana	3,929	1,940	925	21,632	5,122	60,044
Himachal Pradesh	2,140	649	1,901	1,239	1,140	2,410
Jammu & Kashmir	1,956	824	973	3,679		10,253
Jharkhand	2,082	760	1,040	937		
Karnataka	2,300	944	628	2,449	2,161	2,893
Kerala	2,861	604	975	3,030		889
Ladakh	1,604		902	4,330		
Madhya Pradesh	2,812	986	1,007	2,475	6,004	50,187
Maharashtra	1,530	1,178	868	1,478	1,851	16,183
Manipur	2,385	820	944	5,462		3,669
Meghalaya	2,482	1,061	1,433	3,207		
Mizoram	1,712	1,126	1,448	1,386		2,298
Nagaland	1,668	1,050	1,176	4,069		4,369
Odisha	2,065	766	563	1,925	9,451	66,047
Puducherry	2,997	2,048	566	10,445		
Punjab	4,568	1,505	1,014	18,304	29,170	62,524
Rajasthan	2,011	1,466	662	2,435	9,983	10,883
Sikkim	1,746	925	962			
Tamil Nadu	3,642	2,493	654	2,962	4,912	2,005
Telangana	3,542	1,808	958	2,489	2,967	14,858
Tripura	2,936	825	748	8,859		
Uttar Pradesh	3,039	1,025	1,036	2,528	2,955	28,547
Uttarakhand	2,458	947	961	6,427		664
West Bengal	3,120	1,191	876	2,043	17,192	91,843
All India	2,782	1,267	842	2,397	3,919	9,576

Sources:
Ministry of Agriculture and Farmers' Welfare. https://desagri.gov.in/statistics-type/five-year-estimates/.
PLFS 2021–22. Ministry of Statistics and Programme Implementation, Government of India. 2023. Periodic Labour Force Survey (PLFS), July 2021-June 2022. Document No.: DDI-IND-CSO-PLFS-2021-22. https://microdata.gov.in/nada43/index.php/catalog/165/study-description.

Note: The PLFS captures two activities for the surveyed individuals. One is the principal activity where the person devotes majority of his/her time in a given year (183 days and more). The subsidiary activity captures the second activity of individuals who are engaged in more than one activity. The person devotes lesser amount of time (at least 30 days and less than 183 days) to this activity. For calculating labour productivity, we are taking only the principal activity of the person as this is the activity the person devotes majority of time in a year. The PLFS estimated population is lower than the projected population for a year. As a matter of practice, the ratio between the projected census population and the PLFS estimated population is taken as an

adjustment factor and PLFS estimated figures are multiplied by the adjustment factor to arrive at the adjusted figures which are closer to the actual population.

Annexure 4.2: Definition of Skills Using PLFS

Type of Skill	*Description*
Low skilled	General education below primary, no technical and no vocational education
	General education below primary, no technical and some vocational education
Low medium skilled	General education primary to secondary, no technical and no vocational education
	General education primary to secondary, no technical and some vocational education
Medium high skilled	General education higher secondary, no technical and no vocational education
	General education higher secondary, no technical and some vocational education
	General education higher secondary, some technical and no vocational education
	General education diploma/certificate course, no technical and no vocational education
	General education diploma/certificate course, no technical and some vocational education
	General education diploma/certificate course, some technical and no vocational education
	General education diploma/certificate course, some technical and some vocational education
High skilled	General education graduate & above, no technical and no vocational education
	General education graduate & above, no technical and some vocational education
	General education graduate & above, some technical and no vocational education
	General education graduate & above, some technical and some vocational education

Source: NCAER 2022. Contribution to Overall Employment by the Auto Industry: Jobs and Skills. https://www.ncaer.org/wp-content/uploads/2022/03/NCAER-Report-Impact-of-Auto-on-Jobs-and-Skills-March-2022-1.pdf. March.

Annexure 4.3: Agricultural Clusters

Clusters in Agriculture in India

Agricultural clusters represent geographically proximate networks of interconnected farms, markets, research institutions, and support organisations within the agricultural sector. These clusters are characterised by shared resources, knowledge, and collaborative opportunities, embodying the concept of the "Economy of Agglomeration" (Silvis et al., 2002)[5].

Determinants of National Competitive Advantage:

In the context of India, several factors contribute to the nation's competitive advantage in agriculture, shaping the landscape of agricultural clusters across the country:

1. **Factor Conditions:** India's competitive advantage in agriculture is influenced by various factor conditions such as technological advancements, availability of skilled labour, and infrastructure development. For instance, the adoption of modern agricultural practices and the availability of skilled labour contribute to increased productivity in States like Punjab and Haryana, known for their advanced farming techniques and irrigation infrastructure (Kumar et al., 2018)[6].

2. **Demand Conditions:** The demand conditions within India's diverse and populous market significantly impact the growth and innovation in the agricultural sector. For example, the demand for rice and wheat in States like Uttar Pradesh and West Bengal, with large populations and high consumption rates, drives the production and innovation of these crops to meet local dietary preferences (Joshi et al., 2017)[7].

3. **Related and Supporting Industries**: India's agricultural sector benefits from the presence of related and supporting industries such as agri-input suppliers, food processing units, and agricultural machinery manufacturers. For instance, the establishment of food processing industries in States like Maharashtra and Gujarat enhances value addition to agricultural products, fostering the development of integrated agricultural clusters (Sharma et al., 2020)[8].

4. **Firm Strategy, Structure, and Rivalry:** The competitive dynamics among agricultural firms in India influence the strategies, structures, and overall performance of the sector. For example, the presence of numerous agricultural cooperatives in States like Gujarat and Maharashtra fosters collaboration among farmers and

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[5] Silvis, H., Slangen, L. H. G., Bremmers, H., Heijman, W., & Jongeneel, R. 2002. Handboek agrarische economie en beleid: bedrijven, ketens en groene ruimte (Handbook of agricultural economics and policy: companies, chains and green space). Groningen: Wolters-Noordhoff. ISBN 90-207-3175-0.

[6] Kumar, P., Dhillon, R. S., & Kaur, G. 2018. "Agricultural Development in India: A District Level Analysis". *International Journal of Agricultural and Statistical Sciences,* 14(1). 169–180.

[7] Joshi, P. K., Birthal, P. S., & Minot, N. 2017. "Sources of agricultural productivity growth in India: The role of globalization". *Agricultural Economics,* 48(1), 51–65.

[8] Sharma, S., Anand, P., & Pandey, A. 2020. "Impact of food processing industry on Indian Agriculture". *Journal of Public Affairs,* 20(2), e2122.

enhances bargaining power, leading to better market access and improved profitability (Srivastava et al., 2019)[9].

Role of Clusters in the context of India

1. **Increasing Static Productivity**: Agricultural clusters in India contribute to enhancing static productivity through several mechanisms. Firstly, they provide access to specialised inputs and skilled labour, which is essential for efficient agricultural production. For example, clusters focusing on horticulture in regions like Maharashtra and Karnataka benefit from access to specialised seeds, fertilisers, and agri-technologies, leading to higher yields and improved productivity (Gupta et al., 2019)[10]. Additionally, clusters facilitate the flow of information and knowledge among participants, enabling farmers to adopt best practices, innovative techniques, and technological advancements. This exchange of knowledge often occurs through farmer cooperatives, agricultural extension services, and research institutions linked to the clusters. Furthermore, clusters foster complementarities between different agricultural activities, such as crop cultivation, livestock rearing, and agro-processing, thereby optimising resource utilisation and enhancing overall productivity. Lastly, clusters provide access to essential institutions and public goods, including agricultural research centres, irrigation facilities, and market infrastructure, which further support productivity enhancement efforts (Saxena et al., 2020)[11].
2. **Increasing Capacity for Innovation**: Agricultural clusters serve as hubs for innovation by facilitating collaboration, knowledge sharing, and joint marketing initiatives among stakeholders. These clusters often bring together farmers, agri-businesses, research institutions, and government agencies, creating fertile ground for innovation diffusion and adoption. For instance, clusters specialising in organic farming in States like Sikkim and Uttarakhand promote innovation in sustainable agricultural practices, soil conservation techniques, and organic certification standards through collaborative research and knowledge exchange platforms (Sharma & Singh, 2018)[12]. Moreover, the presence of agri-start-ups and entrepreneurial ventures within clusters encourages experimentation with novel technologies, value-added products, and market-driven solutions, thereby fostering a culture of innovation and entrepreneurship in the agricultural sector.
3. **Stimulation of New Business Formations:** Agricultural clusters in India stimulate the entry of new firms by providing various incentives and reducing barriers to entry. Firstly, they serve as information hubs, signalling market demand, emerging trends, and business opportunities to potential entrants. For example, clusters focusing on high-value crops like spices in Kerala or floriculture in Tamil Nadu attract new entrepreneurs by highlighting the demand for these

[9] Srivastava, A. K., Singh, R., & Bhagat, R. B. 2019. "Impact of agricultural credit on agriculture and allied sector in India: A spatial analysis". *International Journal of Agricultural and Statistical Sciences*. 15(2): 557–566.

[10] Gupta, R. K., Kumar, A., & Gaurav, K. 2019. "Role of Agricultural Clusters in Sustainable Agriculture Development: Evidence from India". *Indian Journal of Agricultural Economics*. 74(4): 5 49–562.

[11] Saxena, A., Singh, M., & Tiwari, S. 2020. "Agricultural clusters in India: Current status, opportunities and challenges". *Agriculture and Food Security*, 9(1): 11.

[12] Sharma, V., & Singh, S. 2018. "Organic Farming Clusters: A Sustainable Pathway for Agricultural Development in India". *Indian Journal of Agricultural Economics,* 73(3): 312–325.

products in domestic and international markets (Saravanan et al., 2019)[13]. Additionally, the collaborative ecosystem within clusters lowers entry barriers by providing access to shared infrastructure, technical expertise, and financial resources. This collaborative environment fosters mentorship, peer learning, and risk-sharing among existing and new businesses, thereby encouraging entrepreneurship and fostering the growth of Small and Medium Enterprises (SMEs) in the agricultural value chain.

Types of Clusters in Indian Agriculture

1. **Types of Clusters by Knowledge**:
    - **Factor Endowment Clusters:** In India, factor endowment clusters emerge in regions with abundant natural resources, fertile land, and favourable agro-climatic conditions. For instance, the Punjab-Haryana belt is renowned for its wheat and rice cultivation, benefitting from rich alluvial soil and well-irrigated fields (Singh et al., 2017)[14]. Similarly, regions like Andhra Pradesh and Telangana exhibit factor endowment clusters for horticultural crops like mangoes and bananas due to favourable soil and climatic conditions.
    - **Techno Clusters**: India boasts techno clusters in agricultural biotechnology, precision farming, and agri-informatics, often cantered around premier research institutions and technology parks. For instance, the Biotech Park in Hyderabad serves as a hub for biotechnology start-ups and research organisations, driving innovation in crop genetics, bioinformatics, and agri-biopharmaceuticals (Sujatha & Reddy, 2018)[15].
    - **Historic Knowhow-Based Clusters:** Historic knowhow-based clusters in India are exemplified by traditional agricultural practices passed down through generations. Regions like Kerala's Kuttanad and Tamil Nadu's Cauvery delta have thriving rice cultivation clusters, benefiting from centuries-old knowledge of paddy farming techniques, water management, and crop rotation (Kumar et al., 2019)[16].
2. **Types of Clusters by Form of Development**:
    - **Geographical Clusters**: Geographical clusters in India arise due to specific agro-ecological conditions and resource availability. For instance, the Western Ghats region hosts geographical clusters of spice cultivation, including pepper, cardamom, and cinnamon, owing to its tropical climate and hilly terrain (Balasubramanian et al., 2019)[17].

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[13] Saravanan, S., Sharma, P., & Bhagat, R. B. 2019. "Growth Dynamics of Agricultural Clusters in Tamil Nadu, India: An Economic Analysis". *Asian Journal of Agricultural Extension, Economics & Sociology,* 35(1): 1–10.

[14] Singh, S., Singh, B., & Kumar, A. 2017. "Wheat Crop Production and Its Future Prospects in India". *International Journal of Current Microbiology and Applied Sciences*, 6(6): 3925–3933.

[15] Sujatha, P., & Reddy, S. 2018. "Technological Clusters in India: A Case Study of Agricultural Biotechnology Industry in Hyderabad". *Economic Affairs,* 63(2): 315–326.

[16] Kumar, P., Jain, P. K., & Prasad, R. K. 2019. "Traditional Rice Cultivation in Kuttanad Region: A Sustainable Farming Practice in Kerala, India". *International Journal of Current Microbiology and Applied Sciences,* 8(6): 1092–1098.

[17] Balasubramanian, S., Murali, K. S., & Ramakrishnan, B. 2019. "Clusters and Spices Sector: A Study in Western Ghats Region". *Journal of Agribusiness in Developing and Emerging Economies,* 9(2): 188–203.

- **Sectoral Clusters**: Sectorial clusters in India are prevalent across diverse agricultural domains, such as dairy farming, floriculture, and sericulture. For example, the dairy clusters in Gujarat's Anand district, home to the Amul dairy cooperative, represent a sectorial cluster renowned for its milk production and dairy processing capabilities (Patel & Prajapati, 2020)[18].
- **Horizontal and Vertical Clusters:** Horizontal clusters in India foster collaboration and resource-sharing among agri-businesses operating at the same level of the value chain. An example is the collaboration between multiple small-scale organic farms in Uttarakhand, collectively marketing their produce under a unified brand, thereby leveraging economies of scale and enhancing market access. Vertical clusters, on the other hand, involve integration along the agricultural supply chain, such as the linkage between contract farming companies, agro-processing units, and retail chains in the fresh fruit and vegetable sector (Gupta et al., 2020)[19].

Methods for Identifying Agricultural Clusters:

1. **Shift Share Analysis:** This method evaluates regional competitiveness by examining changes in employment and associated competitiveness over time. In India, it can provide insights into the dynamic nature of agricultural clusters across different States and regions.

    a. Actual Total Shift:

$$Actual\ Total\ Shift = \sum \Delta E_{ij} - \Delta E_{ti}$$

ΔE_{ij}: Change in employment per sector i in region j from year o to year t

ΔE_{ti}: Change in employment per sector i in the total economic area from year o to year t

b. Relative Actual Shift (RAS):

$$Relative\ actual\ shift = \sum (\frac{E_{ij}}{E_{ti}})$$

E_{ij}: Employment per sector i in region j from year o to year t

E_{ti}: Employment per sector i in the total economic area from year o to year t

2. **Location Quotient Analysis**: Location quotient analysis helps assess the relative economic strength of specific agricultural industries within regions compared to the national average. By comparing employment data, it highlights areas where certain agricultural sectors are particularly concentrated, indicating potential cluster formations.

[18] Patel, D., & Prajapati, J. (2020). Dairy Clusters: A Boon for Rural Development in Gujarat. Indian Journal of Dairy Science, 73(3): 301–305.

[19] Gupta, R. K., Yadav, R. K., & Sharma, A. 2020. "Contract Farming: A Case Study of Fruit and Vegetable Growers in Jharkhand, India". *International Journal of Agriculture, Environment and Biotechnology,* 13(5): 637–644.

$$Location\ Quotient = \frac{\frac{E_i^j}{E_i^N}}{\frac{E^j}{E^N}}$$

E_i^j: Employment in activity i in region j

E_i^N: Employment in activity i in the nation

E^j: Total employment I region j

E^N: Total employment in the nation

3. **Clustering Based on Number of Farms:** Analysing the distribution of farms across regions offers another perspective on agricultural clustering. By comparing the prevalence of specific agricultural sectors in different areas, researchers can identify clusters based on the concentration of farming activities.

$$Percentage\ of\ farms\ in\ the\ sector = \left(\frac{C_j}{C}\right) \times 100$$

C_j: Number of farms of a sector in region j

C: Number of farms of a sector in nation

4. **Clusters based on machinery usage per capita**: Clusters based on machinery usage per capita refer to geographically concentrated areas where agricultural machinery is extensively utilised relative to the population engaged in agricultural activities. These clusters often indicate regions where mechanisation plays a significant role in agricultural production and where there is a high density of machinery use per agricultural worker or per capita. This concept is important in understanding the spatial distribution of agricultural mechanisation and its impact on agricultural productivity, labour efficiency, and overall economic development within specific regions or countries.

$$Machinery\ usage\ per\ capita = \frac{Total\ Agricultural\ Machinery\ Usage}{Population\ engaged\ in\ Agricultural\ activities}$$

Annexure 4.4: Indicators of Cereals (including Rice), Leguminous Crops and Oilseeds Producing Clusters

Pillars	*Sub-Pillars*	*Indicators*	*Source of data*	*State-wise data available (Yes/No)*	*District-wise data available (Yes/No)*
Institutional	Social Capital	Primary Agricultural Societies	National Cooperative Database, Ministry of Cooperation, Government of India, 2023 https://cooperatives.gov.in/en/home/cooperative-sector-wise-list-reports/sector/77	Yes	Yes
		% of farm households where any of the household member is a member of registered farmer's organisation	MoSPI: Situation Assessment Survey Agricultural Households		
	Network & Partnership	FPOs	Directory of Farmer Producer Organisations of India (https://ccsniam.gov.in/images/pdfs/Directory_of_Farmer_Book_NIAM.pdf) Or https://fpo.tci.cornell.edu/dashboard http://www.sfacindia.com/PDFs/Tenders/State%20wise%20list%20of%20registered%20FPOs%20details%20under%20Central%20Sector%20Scheme%20for%20Formation%20and%20Promotion%20of%2010,000%20FPOs%20by%20SFAC%20as%20on%2031-12-2023.pdf	Yes	Yes
	Leadership and Vision	State Agricultural Marketing Boards/Directorates	https://enam.gov.in/NAMV2/home/usefullinks.html#	Yes	Not Applicable
		National Agricultural Federation	National Cooperative Database, Ministry of Cooperation, Government of India, 2023 https://cooperatives.gov.in/en/home/federation-reports	Yes	Not Applicable
	Entrepreneurship and Culture	No. of agri tech-start-ups	https://www.startupindia.gov.in/digital-map/maps	Yes	Not Available
	Competition	Not relevant in Indian Agricultural Scenario	Not Applicable	Not Applicable	Not Applicable
Business Infrastructure	Information Access	% of crop growers who are accessing technical advise	MoSPI: Situation Assessment Survey of Agricultural Households	Yes	Yes
	Market Access	Access to market sources for selling their produce	MoSPI: Situation Assessment Survey of Agricultural Households	Yes	Yes
		Market information System: Number of APMC Market registered in eNAM portal/000 farmers	https://enam.gov.in/NAMV2/home/mandis.html#	Yes	Yes
	Specialist Service	Soil Testing Laboratories	https://soilhealth.dac.gov.in/soil-lab https://pib.gov.in/PressReleseDetail.aspx?PRID=1988294	Yes	Yes

Pillars	*Sub-Pillars*	*Indicators*	*Source of data*	*State-wise data available (Yes/No)*	*District-wise data available (Yes/No)*
		Custom Hiring Centres Established	https://agrimachinery.nic.in/ https://agrimachinery.nic.in/GraphReport/SMAMFmtti/SMAMFmtti.aspx https://sansad.in/getFile/annex/263/AU835.pdf?source=pqars	Yes	Yes
		State-wise Storage capacity: State-wise list of the Warehouses Registered with the Warehousing Development and Regulatory Authority (WDRA)	https://wdra.gov.in/web/wdra/registered-warehouses	Yes	Yes
		State -wise seed Testing Laboratories	https://seednet.gov.in/Material/SeedTestingLabs.aspx	Yes	
		State Seed Corporations	https://seednet.gov.in/Material/State_SeedCorporation.aspx	Yes	
		Seed Certification Agencies	https://seednet.gov.in/Material/SSCA.aspx	Yes	
		State-wise number of Fertiliser sale points	Page I-66 Table 5.02 https://fertiliserindia.com/wp-content/uploads/2023/05/Fertiliser-Stat-Book-2021-22.pdf	Yes	
	Specialist Service	State-wise number of fertiliser quality control Laboratories	Pages I-191 Table 9.03 (b) and I-192 https://fertiliserindia.com/wp-content/uploads/2023/05/Fertiliser-Stat-Book-2021-22.pdf	Yes	No
	Financial Access	State wise number of operative KCC	Page II-98 Table 9.04 https://fertiliserindia.com/wp-content/uploads/2023/05/Fertiliser-Stat-Book-2021-22.pdf	Yes	
Human Resources	Competence & Expertise	% of workers who are employed in growing of cereals, pulses and oilseeds industry	PLFS	Yes	Yes, but not reliable
	Innovation	Training Institutes **Seeds:** National Seed Research and Training Centre, Varanasi No. of Farm Machinery training institutes National Centre for Organic and Natural Farming (Regional Training Stations)	http://nsrtc.nic.in/seed_testing.html https://agrimachinery.nic.in/ https://agrimachinery.nic.in/GraphReport/SMAMFmtti/SMAMFmtti.aspx https://nconf.dac.gov.in/	Yes	Could be adapted to district level
		R &D Investment in Agriculture (Crops)	https://niap.icar.gov.in/pdf/PP44.pdf Table 5.3. Per cent share of sub-sectors in agricultural R&D in States, 2011-2020	Yes	
		% of ICAR institutes and State Agricultural Universities devoted to crop sciences	https://icar.org.in/state-agricultural-universities, https://icar.org.in/institutes# and https://icar.org.in/state-agricultural-universities	Yes	Could be adapted to district-level

Pillars	*Sub-Pillars*	*Indicators*	*Source of data*	*State-wise data available (Yes/No)*	*District-wise data available (Yes/No)*
		Agri-clinics And Agri-business Centers	https://acabcmis.gov.in/ACABC_dashboard_Chart.aspx https://acabcmis.gov.in/ACABC_dashboard_Chart.aspx	Yes	
Government Support	Infrastructure	No. of Primary Agricultural Credit Society(PACS) by State	PACS https://pib.gov.in/PressReleasePage.aspx?PRID=1946740	Available	Available
		% of (Agriculture) capital expenditure to total government expenditure	RBI https://rbi.org.in/Scripts/PublicationsView.aspx?id=22323	Yes	Not Applicable
	Policies	Agri-tech	https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2003181		
		State Agriculture Infrastructure Development Plan (SAIDP) State Agriculture Plan (SAP) District Agriculture Plan (DAP)	https://rkvy.nic.in/	Yes	
		National Agriculture Infra Financing Facility	https://agriinfra.dac.gov.in/Home/FundAllocation https://agridashboard.dac.gov.in/		
		State Extension Programmes for Extension Reforms (ATMA)	https://extensionreforms.da.gov.in/DashBoard_Statusatma.aspx		

Source: NCAER Compilation of Indicators and framework adapted from the Paper by Sutawi, I. Prihartini, L. Zalizar, A. Wahyudi, L. Hendraningsih (The Success Indicators of a Dairy Farming Cluster in Indonesia) in Asian Journal of Dairy and Food Research,

Annexure 4.5: Occupational Mapping of Job Roles Listed in PLFS and Agriculture Skill Council of India in the Agriculture Sector

March, 2022).

NCO Code	*NCO Description*	*Agriculture Skill Council of India Job Roles*
112	Managing Directors and Chief Executives	
1120.2800	Director, Storage and Warehousing	
121	Business Services and Administration Manager	
1211.0100	General Manager, Bank	
1211.0200	General Manager, Insurance	
122	Sales, Marketing and Development Managers	
1223	Research and Development Managers	
131	Production Managers in Agriculture, Forestry and Fisheries	Climate Change & Risk Mitigation Manager, Risk Analyst. Manager-Agri Commodity, Produce Mapping Surveyor
1311	Agricultural and Forestry Production Managers	
1311.0300	General Manager, Agricultural Farm	Farm Supervisor
1311.0700	Manager, Agricultural Farm	Farm Manager
1311.1000	Manager, Aerial Planting and Cultivation	Plant Tissue Culture Technician
1311.9900	Agricultural and Forestry Production Managers, Others	
132	Manufacturing, Mining, Construction and Distribution Managers	
1321.0500	Manager, Food Processing Plant	
1324	Supply, Distribution and Related Managers	
1324.1200	Manager, Storage and Warehousing	Agri Warehouse Supervisor
1324.2200	General Manager, Storage and Warehousing	
1324.9900	Supply, Distribution and Related Managers and General Managers, Other	
214	Engineering Professionals (Excluding Electrotechnology)	
2141.0900	Agricultural Engineer	
221	Medical Doctors	
235	Other Teaching Professionals	
241	Finance Professionals	
2412.0501	Agriculture Field Officer	Farm Worker
261	Legal Professionals	
311	Physical and Engineering Science Technicians	
3111.0200	Laboratory Assistant, Soil	Soil & Water Testing Lab Analyst, Soil & Water Testing Lab Technician, Soil Sampler/Collector
3116.0200	Laboratory Assistant, Food & Beverages/ Chemist/ Analytical Supervisor/Lab Chemist	
3119.0600	Weather Observer	
312	Mining, Manufacturing and Construction Supervisors	
3122.6900	Supervisor and Foreman, Food Processing/Production Supervisor	
314	Life Science Technicians and Related Associate Professionals	
3142	Agricultural Technicians	Service Technician-Watershed
3142.0101	Micro Irrigation Technician	Irrigation Service Technician, Micro Irrigation Technician
3142.0201	Bare Foot Technician (BFT)	
3142.99	Agricultural Technicians, Others	Solar Pump Technician
332	Sales and Purchasing Agents and Brokers	
3323.0601	Associate – Supply Chain Management	Electronic Trading Supervisor-Agri Commodity, Agri Commodity Procurement Manager
3323.0602	Supply Chain Field Assistant	Supply Chain Field Executive
333	Business Service Agents	
3339.0300	Auctioneer	
411	General Office Clerks	
413	Keyboard Operators	
4132.1300	Bookkeeping Machine Operator	
4132.0401	Data Entry Machine Operator	

NCO Code	*NCO Description*	*Agriculture Skill Council of India Job Roles*
432	Material Recording and Transport Clerks	
4321	Stock Clerks	Commodity Account manager
4321.01	Store Keeper	
4321.0200	Store Distributor	
4321.0401	Manager Stores Operation	Packhouse Worker
441	Other Clerical Support Workers	
4419.0200	Patwari	
4419.0300	Patrol, Irrigation	
511	Travel Attendants, Conductors and Guides	
512	Cooks	
515	Building and Housekeeping Supervisors	
521	Street and Market Salespersons	
522	Shop Salespersons	
524	Other Sales Workers	
5244	Contact Centre Salespersons	
5245	Service Station Attendants	
5249.0600	Selling Agent	
5249.0700	Stockist	
531	Child Care Workers and Teachers' Aides	
541	Protective Service Workers	
6	Skilled Agricultural, Forestry and Fishery Workers	
61	Market-Oriented Skilled Agricultural Workers	
611	Market Gardeners & Crop Growers	
6111	Field Crop and Vegetable Growers	Green House Operator, Group Farming Practitioner
6111.01	Cultivator, General	
6111.0101	Paddy Farmer	
6111.0200	Cultivator, Crop	Cereal Crop Grower
6111.0201	Wheat Cultivator	Wheat Cultivator
6111.0301	Maize Cultivator	Maize Cultivator
6111.0401	Pulses Cultivator	Pulses Cultivator
6111.0501	Soybean Cultivator	Soyabean Cultivator
6111.9900	Field Crop and Vegetable Growers, Other	
6111.2000	Fieldman, Agriculture	
6114.9900	Mixed Crop Growers, Other	
6116	Agriculture Information Management	
6116.0101	Agriculture Extension Executive	
6116.0102	Agriculture Extension Service Provider	Agri Service Input Dealer
6116.0112	Community Service Provider	
612	Animal Producers	
6121.0100	Farmer	
6121.0201	Farmer, Dairy/Dairy Farmer/Entrepreneur	
6122.0101	Farmer, Poultry/Broiler Farm Supervisor	
6122.0200	Farmer, Poultry Breeding	
6129.0100	Farmer, Fur-Bearing Animals	
613	Mixed Crop and Animal Workers	
6130.0201	Seed Grower/Quality Seed Grower	Quality Seed Grower
6130.0202	Seed Processing Worker	Seed Analysis In-charge, Seed Plant Production Supervisor, Seed Processing Plant Technician, Seed Processing Worker
6130.99	Mixed Crop and Animal Workers, Other	
621	Forestry and Related Workers	

NCO Code	*NCO Description*	*Agriculture Skill Council of India Job Roles*
622	Fishery Workers, Hunters and Trappers	
631	Subsistence Crop Farmers	
6310.9900	Subsistence Crop Farmers, Others	
6330	Subsistence Mixed Crop and Livestock Farmers	
723	Machinery Mechanics and Repairers	Farm Workshop/Service Manager
7231.0300	Tractor Mechanic	Tractor Service Mechanic
7233	Agricultural and Industrial Machinery Mechanics and Repairers	Service & Maintenance Technician- Farm Machinery
7233.2800	Agriculture Engineering Technician	Agriculture Machinery Demonstrator
7233.9900	Machinery Mechanics and Fitters, Other	Farm Workshop Foreman/ Supervisor
752	Wood Treaters, Cabinet Makers and Related Trades Workers	
753	Garment and Related Trades Workers	
754	Other Craft and Related Workers	
7543	Product Graders and Testers (Excluding Food and Beverages)	
7543.0202	Quality Assessor	Agri Commodity Quality Assayer
7544	Fumigators and Other Pest and Weed Controllers	Agri Commodity Fumigation Operator
814	Rubber, Plastic and Paper Products Machine Operators	
816	Food and Related Products Machine Operators	
8160.0700	Miller, Food Grains	
8160.0800	Husker, Machine (Food Grains)	
8160.0900	Rollerman, (Food Grains)	
8160.1000	Flour Mill Operator	
8160.1100	Siever, Machine	
8160.1200	Oil Crusher Operator, Power	
8160.1300	Filter Press Operator (Oil)	
8160.1900	Flake Miller, Wheat and Oats (Grain-Feed Mills)	
8160.2700	Processing Man (Food Canning and Preserving)	
8160.3100	Peanut Blancher	
831	Locomotive Engine Drivers and Related Workers	
832	Car, Van and Motorcycle Drivers	
833	Heavy Truck and Bus Drivers	
834	Mobile Plant Operators	
8341	Mobile Farm and Forestry Plant Operators	
8341.0101	Tractor Operator, Farm	Tractor Operator
8341.0200	Operator, Farm Machines	Kisan Drone Operator
8341.0201	Harvesting Machine Operator	Operator-Reaper, Thresher and Crop Residue Machinery
8341.9900	Farm Machinery Operators, Other	Custom Hiring Service Provider
911	Domestic, Hotel and Office Cleaners and Helpers	
912	Vehicle, Window, Laundry and Other Hand Cleaners	
921	Agricultural, Forestry and Fishery Labourers	
9211	Crop Farm Labourers	
9211.0100	Ploughman	
9211.0200	Labourer, Agriculture	

NCO Code	*NCO Description*	*Agriculture Skill Council of India Job Roles*
9211.9900	Farm Hands and Labourers, Other	
9213	Mixed Crop and Livestock Farm Labourers	
9215.0100	Labourer, Plantation	
931	Mining and Construction Labourers	
932	Manufacturing Labourers	
933	Transport and Storage Labourers	
9332	Drivers of Animal-Drawn Vehicles and Machinery	
9332.0500	Supervisor, Animal-Drawn and Manually Operated Transport Equipment	
9332.9900	Animal and Animal Drawn Vehicle Drivers, Other	
9333.01	Loader and Unloader	
9333.0101	Loader/Loading and Unloading Operator	
9333.0201	Warehouse Worker	Agriculture Warehouse Worker
9333.0202	Loader, Transport Associate/Loader/Unloader	
951	Street and Related Service Workers	
961	Refuse Workers	
962	Other Elementary Workers	

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Annexure 4.6: Indicative Computation of the Extent of the Need & Vacancy Rate (NCAER computations for 2026–27)

Drone Operator	
Area to be covered (hectares (hac))	13,93,00,000
Drone coverage (hac/flight)	20 hac/day (8 hours) (means four flights)
Flight time (hour/flight)	0.5 hour/flight
Daily operational hour	8 hours
No of flights required to cover 3497000 hac (Number)	27,8,60,000
Total flight time required (hour)	1,3930,000
Total operator required to cover the entire area	17,41,250
If 100 % Net Sown Area (NSA) is to be covered	17,41,250
If 50 % NSA is to be covered	8,70,625
if 25% NSA is to be covered	4,35,313
Farm -Machinery Service Technician	
Total Operational Holdings	14,64,50,000
Total number of farmers using farm Machinery (70% of total Operational Holdings)	10,25,15,000
Average Number of Equipment per Farmer	2
Utilisation rate (Each piece of equipment is used 20 hours per season) Total Usage Hours per Equipment	4,10,06,00,000
Maintenance Frequency: Each equipment requires maintenance every 50 hours of use. (maintenance sessions)	8,20,12,000
Time Per maintenance session (Average 2 hour)	16,40,24,000
Average Repair Incidents: 1 incident per piece of equipment per season, with an average repair time of 3 hours. Total Repair Hours	61,50,90,000
Total Work Hours Required (Total Maintenance Hours + Total Repair Hours)	77,91,14,000
Available Work Hours per Technician (8 hours/day*250 days)	2,000
Technician Requirement ((Total Work Hours Required/Available Work Hours per Technician)	3,89,557.00
Total technician requirement	3,89,557

Sources:

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