

SECTION 1: COUNTRY OVERVIEW & GEOGRAPHIC PROFILE

1.1 Basic Country Information

Country Name	Republic of India
Capital City	New Delhi
BRICS Status	Founding Member – Original BRIC (2006 dialogue; first summit 2009).
Total Population	~1.45 billion (2024, UNFPA/World Bank) – world’s most populous country since 2023
Population Growth Rate	~0.9% per year (2024, World Bank); declining fertility rate ~2.0
Rural Population (%)	~64–65% (~910 million; Census 2011 + projections)
Urban Population (%)	~35–36% (~510 million; 2024 est.)
GDP (Nominal)	~USD 3.91 trillion (2024, IMF WEO Oct 2025); ~INR 324 lakh crore; world’s 5th largest economy; +8.2% real growth in FY24
GDP per Capita	~USD 2,695 (2024, World Bank); PPP: ~USD 10,300
Agriculture’s Share of GDP	17.8–18.2% (FY2023-24, Economic Survey 2024-25; agriculture & allied activities)
Agriculture’s Share of Employment	~42.3% of population depends on agriculture for livelihood (Economic Survey 2024); ~54.6% of workforce in agriculture & allied (Census 2011)
HDI Rank	0.644 (2023/24, UNDP) – Medium Human Development; ~134th globally
Official Language(s)	Hindi and English (official); 22 scheduled languages; 121 languages spoken by >10,000 people
Currency	Indian Rupee (INR); ~83–84 INR/USD (2024 avg)

1.2 Geographic Coordinates & Physical Extent

Total Geographic Area	3,287,263 km ² – world’s 7th largest country
Northernmost Point	37°06’ N (Siachen Glacier, Ladakh)
Southernmost Point	6°45’ N (Indira Point, Great Nicobar Island); mainland: 8°04’ N (Kanyakumari)
Easternmost Point	97°25’ E (Kibithu, Arunachal Pradesh)
Westernmost Point	68°07’ E (Ghuar Mota, Gujarat)
Coastline	~7,517 km (mainland); ~12,000+ km including islands
Land Borders	~15,200 km (borders 7 countries: Pakistan, China, Nepal, Bhutan, Bangladesh, Myanmar, Afghanistan via PoK)
Highest Point	Kangchenjunga, 8,586 m (Sikkim) – world’s 3rd highest (K2 at 8,611 m is in India-administered region)
Major Rivers	Ganges (2,525 km), Brahmaputra, Godavari, Krishna, Narmada, Mahanadi, Cauvery, Indus (in India), Yamuna

1.3 Administrative Divisions

Primary Level	28 States and 8 Union Territories
Secondary Level	~780 districts
Tertiary Level	~6,700+ blocks (tehsils/taluks); ~6.4 lakh villages; ~8,000+ urban local bodies
Key Agricultural States	Uttar Pradesh (#1 food grain + sugarcane); Punjab/Haryana (#1 wheat belt); Madhya Pradesh (#1 pulses + soybean); West Bengal/Andhra Pradesh (rice); Maharashtra (sugarcane + cotton+ horticulture); Rajasthan (oilseeds); Karnataka (coffee + millets); Kerala (spices + plantation crops); Gujarat (cotton + groundnut + dairy); Tamil Nadu (rice + horticulture)

SECTION 2: AGRO-CLIMATIC ZONES & CLASSIFICATION

2.1 National Classification

System	ICAR/Planning Commission 15 Agro-Climatic Zones
Total Zones	15 major agro-climatic zones (Planning Commission); 20 agro-ecological regions (ICAR-NBSS&LUP)
Basis	Rainfall, temperature, soil, topography, growing period length

2.2 Zone-wise Description (Major Zones)

Zone	Region	Climate	Major Crops	Key Challenges
1. Western Himalayan	J&K, Himachal Pradesh, Uttarakhand	Temperate to alpine; 1,000–2,000 mm	Apple, walnut, rice, wheat, potato, saffron, vegetables	Fragile ecology, erosion, glacial retreat, small farms
2. Eastern Himalayan	Arunachal Pradesh, Sikkim, NE Hills	Humid subtropical to temperate; 2,000–4,000 mm	Rice, maize, cardamom, tea, ginger, turmeric	Jhum cultivation, remoteness, biodiversity sensitivity
3. Lower Gangetic Plains	West Bengal	Humid subtropical; 1,200–1,600 mm	Rice (2–3 crops), jute, vegetables, fisheries	Flooding, waterlogging, fragmented land
4. Middle Gangetic Plains	Bihar, Eastern UP	Subtropical; 1,000–1,500 mm	Rice, wheat, maize, sugarcane	Floods, poor drainage, low mechanization
5. Upper Gangetic Plains	Western UP	Subtropical; 750–1,000 mm	Rice–wheat, sugarcane, potato, dairy	Groundwater depletion, soil degradation
6. Trans-Gangetic Plains	Punjab, Haryana, Delhi, Chandigarh	Semi-arid to sub-humid; 500–800 mm	Wheat, rice, cotton, maize	Over-extraction of groundwater, salinity, stubble burning
7. Eastern Plateau & Hills	Jharkhand, Chhattisgarh, Odisha, Eastern MP	Sub-humid; 1,000–1,600 mm	Rice, millets, pulses, oilseeds	Tribal areas, low irrigation, soil erosion
8. Central Plateau & Hills	MP, Bundelkhand (UP), Rajasthan (east)	Semi-arid; 500–1,000 mm	Wheat, pulses, oilseeds, soybean	Drought, land degradation
9. Western Plateau & Hills	Maharashtra, Western MP	Semi-arid; 600–1,000 mm	Cotton, soybean, sorghum, pulses	Rainfed farming, drought, farmer distress

Zone	Region	Climate	Major Crops	Key Challenges
10. Southern Plateau & Hills	Karnataka, Telangana, Rayalaseema (AP), TN uplands	Semi-arid; 500–900 mm	Millets, pulses, oilseeds, cotton	Water scarcity, erratic rainfall
11. East Coast Plains & Hills	Odisha, Andhra Pradesh, Tamil Nadu coast	Tropical; 1,000–1,500 mm	Rice, pulses, oilseeds, coconut	Cyclones, floods, salinity intrusion
12. West Coast Plains & Ghats	Kerala, Goa, Coastal Karnataka, Maharashtra	Tropical humid; 2,000–4,000 mm	Rice, coconut, rubber, spices, cashew	Landslides, soil erosion, small holdings
13. Gujarat Plains & Hills	Gujarat (plains, Saurashtra)	Semi-arid; 500–1,200 mm	Cotton, groundnut, tobacco, cumin	Salinity, rainfall variability
14. Western Dry Region	Rajasthan (Thar Desert)	Arid; <400 mm	Bajra, mustard, guar, livestock	Desertification, drought, water scarcity
15. Islands Region	Andaman & Nicobar, Lakshadweep	Tropical humid; >2,500 mm	Coconut, arecanut, spices, rice	Isolation, fragile ecosystem, climate vulnerability

SECTION 3: CLIMATE, RAINFALL & TEMPERATURE EFFECTS ON AGRICULTURE

3.1 Overall Climate

Climate Type	Tropical monsoon (dominant); also arid (NW), semi-arid (Deccan), temperate (Himalaya), humid subtropical (Indo-Gangetic)
National Avg Rainfall	~1,150-1200 mm/year (IMD); Southwest Monsoon (Jun–Sep) delivers ~75% of annual rainfall; critical for Kharif crops
Monsoon Dependence	~50-55% of net sown area is rainfed (entirely monsoon-dependent); ~45-50% irrigated

3.5 Climate-Resilient Agriculture and Climate Action

Initiative	Institution	Description	Impact
PM-KISAN	MoAFW / Gol	Direct income support: INR 6,000/year to ~11 crore farmer families in 3 installments	Total disbursement: >INR 3.04 lakh crore since 2019; world's largest DBT scheme for farmers
PMKSY (Per Drop More Crop)	MoAFW	Micro-irrigation expansion: drip and sprinkler; ~90-100 lakh ha covered by Dec 2024; up to 55% subsidy for small farmers	Water use efficiency improved 30–50%; ~INR 21,968.75 crore released to states
National Mission for Sustainable Agriculture	MoAFW	Climate-resilient agriculture; soil health cards; rainfed area development; organic farming	Soil testing transformed; nutrient-specific fertiliser recommendations
e-NAM	MoAFW	Electronic National Agriculture Market: ~1,300+ mandis integrated; ~1.77 crore farmers + ~2.56 lakh traders registered	Price transparency; reduced market fragmentation; online trading
PM-PRANAM	MoAFW	Incentivise states to reduce chemical fertiliser use; promote nano urea/DAP, organic fertilisers	Reduce subsidy burden; improve soil health; nano urea adopted by large number of farmers
National Food Security Act	Ministry of Consumer Affairs	Under current policy (PMGKAY merged), free foodgrains (₹0/kg) provided to ~81.35 crore beneficiaries; world's largest food safety net	~60% of population covered; INR 2+ lakh crore annual food subsidy

SECTION 4: CROPPING PATTERNS & AGRICULTURAL CALENDAR

4.1 Seasonal Cropping System

Season	Months	Regions	Major Crops
Kharif (Monsoon)	Jun–Oct (sowing Jun–Jul; harvest Oct–Nov)	Nationwide (monsoon-dependent)	Rice, maize, sorghum, bajra, pulses (tur/moong), soybean, cotton, groundnut, sugarcane
Rabi (Winter)	Oct–Mar (sowing Oct–Dec; harvest Mar–Apr)	Indo-Gangetic Plains; irrigated areas	Wheat, barley, gram (chickpea), mustard, lentils, peas; largely irrigated
Zaid (Summer)	Mar–Jun	Limited irrigated areas	Watermelon, muskmelon, cucumber, moong (summer), vegetables; short-duration crops
Perennial/Year-Round	Year-round	S. India, NE India, plantation belts	Sugarcane, coconut, tea, coffee, rubber, spices, banana, mango; plantation crops

4.2 Major Food Crops (3rd Advance Estimates 2024-25, MoAFW)

Total Foodgrain (2024-25)	~357.73 MT (RECORD – Final Estimate; +8% over 332.30 MT in 2023-24). Over 106 MT added in last decade (from 251.54 MT in 2015-16).
Rice	~150.18 MT (RECORD; 3rd Adv. Est. 2024-25); ~46M ha; India is world's 2nd largest rice producer and #1 exporter
Wheat	117.94 MT (RECORD; 3rd Adv. Est. 2024-25); ~31–32M ha; Punjab, Haryana, UP, MP, Rajasthan. World's 2nd largest producer.
Pulses	25.68 MT (2024-25); chickpea ~11.11 MT, moong ~4.24 MT, tur ~3.62 MT. India is world's largest pulse producer, consumer, and importer.
Coarse Cereals/Nutri-Cereals	~57–60 MT (maize ~39–40 MT, bajra ~9–10 MT, jowar ~4–5 MT, ragi ~2–3 MT). India declared 2023 as 'International Year of Millets' (UN).
Oilseeds	42.99 MT (RECORD; 2024-25); soybean 15.27 MT (RECORD), groundnut 11.94 MT (RECORD), mustard ~12–13 MT. Self-sufficiency drive ongoing.
Sugarcane	~430–450 MT cane (MoAFW); India is world's 2nd largest sugar producer (~35 MT sugar); UP, Maharashtra, Karnataka.

4.3 Cash Crops & Industrial Crops

Cotton	~32–34 million bales (170 kg each; ~5.4–5.8 MT lint); India is world's 2nd largest producer; Karnataka, Gujarat, Maharashtra. Bt cotton covers ~93% of cotton area.
Tea	~1.2-1.3 MT (Tea Board); world's 2nd largest producer; Assam, West Bengal (Darjeeling), Tamil Nadu (Nilgiris), Kerala
Coffee	~0.36–0.38 MT (Coffee Board); world's 6th largest producer; Karnataka (Coorg, Chikmagalur), Kerala, Tamil Nadu. 70% Robusta, 30% Arabica.
Spices	India is 'Spice Bowl of the World': ~12 million metric tonnes- largest producer, consumer, exporter; black pepper (Kerala), cardamom (Kerala/Karnataka), turmeric (Telangana/TN), chilli (AP/Telangana), cumin (Rajasthan/Gujarat), ginger, coriander

Horticulture (2024-25)	~367.72 MT total (1st Adv. Est.); India is world’s 2nd largest fruits & vegetables producer. Mangoes: ~21 MT (#1 globally); bananas: ~35 MT (#1); onions: ~28 MT; potatoes: ~56 MT; tomatoes: ~22 MT
Rubber	~0.77–0.80 MT natural rubber (Rubber Board); Kerala (~75%), NE India; world’s 5th largest producer
Jute	~1.5–1.8 million bales (180 kg each); West Bengal is #1; India is world’s largest jute producer

4.4 Major Crop Varieties and Yield/ha

Crop	Varieties	Avg Yield (t/ha)	Notes
Rice	Pusa Basmati 1121, 1509, 1718; Swarna, BPT 5204, Samba Mahsuri; hybrid: DRRH 2, Arize series	~2.7–3.0 (national avg)	~46M ha; Basmati rice is premium export (\$5B+/year); WB/AP/TN: 3–4 t/ha
Wheat	HD 3226, HD 2967, WH 1105, PBW 343, DBW 187, DBW 222 (IARI/PAU/IWBR)	~3.5–3.7	~31–32M ha; Punjab/Haryana yields 5+ t/ha; RECORD 117.94 MT in 2024-25
Maize	Hybrid: HQPM 1, DHM 117, Pioneer 30V92, NK30; QPM varieties	~3.2–3.5	~10M ha; Karnataka, Bihar, MP, Rajasthan; hybrid adoption >70%
Soybean	JS 9560, JS 2034, NRC 142, MACS 1407 (ICAR-IISR)	~1.0–1.3	~12–13M ha; MP alone: ~55% of national area; RECORD 15.27 MT
Cotton (Bt)	Bt hybrids (Bollgard II + refugia): numerous private sector hybrids (Mahyco, Nuziveedu, Rasi)	~0.45–0.55 (lint/ha)	~12–13M ha; 93% Bt adoption; world’s largest cotton area
Groundnut	TAG 24, TG 37A, GG 20, ICGV varieties	~1.5–1.8	~5–6M ha; Gujarat, Rajasthan, AP, TN; RECORD 11.94 MT

SECTION 5: AGRICULTURAL LAND USE & LAND RESOURCES

5.1 Land Use Classification

Total Geographic Area	~328.7 million ha
Net Sown Area	~140–141 million ha (MoAFW; relatively stable; India has world's 2nd largest arable area after USA)
Gross Cropped Area	~200–201 million ha (due to double/triple cropping); Cropping Intensity: ~142%
Forest Area	~71.4 million ha (~21.7% of total; India State of Forest Report 2023, FSI)
Permanent Pastures	~10–11 million ha (only ~3% of total – very low for livestock population)
Irrigated Area	Net irrigated: ~70–75 million ha (~52% of net sown area; India has world's largest irrigated area); Gross irrigated: ~106–110 million ha
Fallow Land	~24–26 million ha (current + other fallow)

5.2 Irrigation Infrastructure

Net Irrigated Area	~70–75 million ha (world's largest; ~52% of net sown area)
Major Sources	Canals (~23%); tubewells/borewells (~64%); tanks (~3%); other wells/sources (~10%). Groundwater is DOMINANT source.
Key Canal Systems	Indira Gandhi Canal (Rajasthan); Bhakra-Nangal (Punjab/Haryana); Hirakud (Odisha); Nagarjuna Sagar (Telangana/AP); Sardar Sarovar (Gujarat/MP/Maharashtra/Rajasthan)
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana: micro-irrigation (drip/sprinkler): 95.58 lakh ha covered by Dec 2024; INR 21,968.75 crore released; 55% subsidy for small/marginal farmers
Groundwater Crisis	India is world's largest groundwater user: ~250 km ³ /year (~25% of global total); >1,000 blocks classified as 'over-exploited'; Punjab/Haryana/Rajasthan water tables falling 0.5–1.0 m/year

5.3 Land Tenure & Farm Structure

Total Operational Holdings	~146.45 million (Agriculture Census 2015-16; next: 2025-26)
Average Farm Size	1.08 ha (2015-16 Census); declining due to fragmentation. 86.2% of holdings are <2 ha (small/marginal).
Small & Marginal Farmers	~126 million holdings (<2 ha); operate ~47% of cultivated area but produce ~51% of foodgrains. Average marginal holding: 0.38 ha.
Land Ceiling	Land ceiling acts limit individual ownership (varies by state: 7–18 ha irrigated, 20–54 ha rainfed). Tenancy laws vary by state.

SECTION 6: MAJOR SOIL TYPES, SOIL HEALTH & NUTRIENT MANAGEMENT

6.1 Soil Classification

System	ICAR-NBSS&LUP soil classification; mapped to USDA Soil Taxonomy and WRB
Survey Authority	ICAR-NBSS&LUP (National Bureau of Soil Survey & Land Use Planning, Nagpur); Soil Health Card scheme

6.2 Major Soil Types

Soil Type	Region	Properties	Suitable Crops
Alluvial	Indo-Gangetic Plains; river deltas	Deep; fertile; well-drained; loamy	Rice, wheat, sugarcane, pulses, vegetables – India's most productive
Black (Regur/Vertisol)	Deccan Plateau (Maharashtra, MP, Gujarat, Karnataka)	High clay; shrink-swell; self-mulching; high CEC	Cotton ('black cotton soil'), soybean, sorghum, pulses, sugarcane
Red & Yellow	E. Deccan, Odisha, Chhattisgarh, Jharkhand, parts of NE	Low fertility; acidic; porous; iron-rich	Rice, groundnut, millets, tobacco; needs heavy fertilisation
Laterite	W. Ghats, Malabar, NE India, E. Ghats	Leached; acidic; high iron/aluminium; hard pan	Tea, coffee, rubber, cashew, coconut; poor for cereals without amendment
Desert/Arid	Rajasthan, Gujarat (Kutch)	Sandy; alkaline; low OM; saline in parts	Bajra, guar, mustard, dates; irrigation transforms productivity
Mountain/Forest	Himalaya, NE India, W. Ghats	Variable; acidic; high OM in forest areas; steep slopes	Tea, coffee, spices, fruits, vegetables; erosion-prone

6.3 Soil Health & Conservation

Soil Health Cards	~23-25 crore (230 million) Soil Health Cards issued to farmers (Phase I + II); nutrient-specific fertiliser recommendations based on soil testing; India's single largest soil testing initiative
Degradation	~147 million ha degraded (NBSS&LUP/ISRO); water erosion (~94M ha), wind erosion (~16M ha), chemical degradation (~14M ha), waterlogging/salinity (~11M ha)
Fertiliser Use	~170–190 kg/ha NPK (among highest in developing world); highly imbalanced: N:P:K ratio ~7:2.7:1 vs ideal 4:2:1; urea overuse due to subsidy distortion
Organic Farming	India's organic farming area: ~4-5 million ha (FIBL-IFOAM 2024); Paramparagat Krishi Vikas Yojana (PKVY) + Mission Organic Value Chain Development (MOVCD-NER)

SECTION 7: LIVESTOCK SECTOR PROFILE

7.1 Livestock Population (20th Livestock Census 2019, DAHD)

Total Livestock	536.76 million (+4.8% over 2012 Census). 21st Census launched Oct 2024; results expected 2025.
Cattle	193.46 million (cows 145.91 million; +18.6% female cattle); exotic/crossbred: 51.36 million; indigenous: 142.10 million
Buffalo	109.85 million (+1.1%); Murrah (Major breed; UP/Rajasthan/Punjab); India has ~57% of world's buffalo population
Goats	148.88 million (+10.1%); Rajasthan, UP, Bihar, WB, MP
Sheep	74.26 million (+14.1%); Telangana, Rajasthan, Karnataka, AP, J&K
Pigs	9.06 million (-12.0%); NE India, Goa
Poultry	851.81 million (+16.8%); commercial: 534.74M; backyard: 317.07M. Broiler industry concentrated in TN, AP, Maharashtra, Karnataka, WB
Equines	~0.63 million (horses, ponies, mules, donkeys – declining)
Camels	~0.25 million (Rajasthan; declining)

7.2 Livestock Production (BAHS 2024, DAHD)

Milk	239.30 MT (2023-24, BAHS 2024 – RECORD; +3.78% YoY; CAGR 5.62% over 10 years from 146.31 MT in 2014-15). India is WORLD'S #1 MILK PRODUCER (24.76% of global). Per capita availability: 459 g/day (vs world avg 322 g/day).
Eggs	~143–150 billion (2023-24 est.; ~130 billion in 2021-22; per capita ~95–110/annum; growing rapidly)
Meat	~9.3–10.0 MT (2023-24 est.; 9.29 MT in 2021-22); buffalo meat (#1 in exports, ~43% of world buffalo meat production), poultry, goat/sheep
Wool	~33–35 million kg (declining; Rajasthan, J&K, HP)
Honey	~133,000 MT (2022-23; National Beekeeping & Honey Mission); India is among top 10 honey producers globally
Livestock GVA	30.23% of agriculture & allied GVA (2022-23, current prices); livestock sector CAGR ~12.99% from 2014-15 to 2022-23; contributing 5.50% of total national GVA

7.3 Livestock Production Summary

Sector	Key Info	Major Regions	National Production
Dairy (Milk)	World's #1; White Revolution (AMUL/NDDDB); cooperative model	Gujarat (AMUL), Rajasthan, UP, MP, AP, Maharashtra	239.30 MT (2023-24 RECORD)
Poultry (Broiler)	Fastest growing; per capita consumption rising	TN, AP, Maharashtra, Karnataka, WB, Telangana	~4.0–5.0 MT meat; 851.81M birds

Sector	Key Info	Major Regions	National Production
Eggs	Rapidly growing sector	AP (#1 – Namakkal cluster), TN, Telangana, Haryana, Maharashtra	~143–150 billion (2023-24 est.)
Buffalo Meat	World’s largest exporter; UP is #1 producer	UP, MP, Maharashtra, Bihar, AP	~1.5–1.8 MT; export value ~\$3–4B/year
Sheep/Goat	Small ruminants critical for rural livelihoods	Rajasthan, Telangana, AP, Karnataka, J&K	74.26M sheep; 148.88M goats
Fisheries	World’s 3rd largest fish producer; 2nd in aquaculture	AP, WB, Gujarat, Kerala, TN, Odisha	~17.5-19.5 MMT (2023-24 est.)

SECTION 8: FISHERIES & AQUACULTURE SECTOR

8.1 Resource Base

Coastline	~8,118 km (including islands); EEZ: ~2.02 million km ²
Inland Waters	Rivers (~14 major river systems); reservoirs (~2.36 million ha); ponds/tanks (~2.41 million ha); wetlands, backwaters
Marine Fisheries Potential	5.31 MT/year (CMFRI,2020)
Inland Fisheries Potential	~14 MT/year (MFAHD)

8.2 Production Statistics

Total Fish Production	~19.5 MT (2023-24 est.; 14.16 MT inland + 5.31 MT marine in 2020 framework). India is world's 3rd largest fish producer.
Aquaculture	India is world's 2nd largest aquaculture producer (after China); ~8–9 MT; shrimp (vannamei – AP/Gujarat/TN); freshwater: rohu, catla, mrigal (carp polyculture – WB/AP/Bihar)
Shrimp	~0.9–1.1 MT; India is among world's top 3 shrimp producers; AP #1 (50%+); vannamei dominant; export value ~\$5–6B/year
Per Capita Consumption	~8–10 kg/year (low; govt promoting through Blue Revolution/PMMSY)
PMMSY	Pradhan Mantri Matsya Sampada Yojana: INR 20,050 crore investment (2020-25); targets: additional 70 lakh MT fish; 55 lakh employment
Key Institutions	CMFRI (marine), CIFRI (inland), CIBA (brackishwater), CIFA (freshwater aquaculture), MPEDA (export promotion)

SECTION 9: GOOD AGRICULTURAL PRACTICES & SUSTAINABLE FARMING

9.1 GAP Certification & Standards

National Standards	IndGAP (Indian Good Agricultural Practices); India Organic (NPOP – National Programme for Organic Production; APEDA-accredited); FSSAI (Food Safety and Standards Authority) regulates food safety
International	GlobalG.A.P. for export horticulture; Rainforest Alliance/UTZ for tea/coffee; ISO 22000 in major processors; HACCP in seafood export units
Organic	India's organic farming area: ~4.0-5.0 million ha (FIBL-IFOAM 2024); Sikkim is world's first 100% organic state (2016); PKVY + MOVCD-NER for NE India

9.2 Integrated Pest Management

National System	Directorate of Plant Protection, Quarantine & Storage (DPPQS); Central Integrated Pest Management Centres (CIPMCs) in 35 locations; state extension networks
Key Programmes	IPM for cotton (reduce pesticide use by ~30–40%); desert locust monitoring (Locust Warning Organisation, Jodhpur); Fall Armyworm management (since 2018)

9.3 Farm Mechanisation

Mechanisation Rate	~45-47% overall (MAFW); ~90%+ for wheat harvesting (Punjab/Haryana); <20% in NE/hilly states; highly uneven across regions
Tractor Fleet	~9–10 million tractors; India is world's largest tractor market (~0.9–1.0 million tractors sold/year). Manufacturers: Mahindra (#1 globally), TAFE, Escorts/Kubota, Sonalika, John Deere India
Custom Hiring Centres	~36,000+ CHCs under Sub-Mission on Agricultural Mechanisation (SMAM); enables small farmers to access machinery without ownership
Drones	Kisan Drone: subsidy scheme for agri-drones; Made in India: Garuda Aerospace, IoTechWorld, Dhaksha; regulatory framework by DGCA

SECTION 10: AGRICULTURAL EXPORT COMMODITIES & TRADE

10.1 Trade Profile

Agricultural Exports (FY25)	~INR 4,40,000 crore (~USD 51.86 billion) – ALL-TIME RECORD; +11% over FY24's ~Rs 3,95,793 crore (IBEF/APEDA)
Agricultural Imports	~USD 25–30 billion/year; vegetable oils (palm oil, soybean oil ~\$10–12B), pulses (~\$2–3B), fresh fruits (apples, almonds), sugar (when deficit), fertilisers
Trade Balance	Net agricultural exporter; agricultural exports ~9-11% of total merchandise exports

10.2 Top Agricultural Export Products

Rank	Commodity	Description	Key Destinations
1	Rice (Non-Basmati + Basmati)	World's #1 exporter; ~19–22 MT exported (before 2023 ban/restrictions); Basmati: ~\$5B; non-Basmati: ~\$4–5B	Saudi Arabia, Iran, Iraq, UAE, Bangladesh, Nepal, Africa
2	Spices	World's largest exporter; chilli, cumin, turmeric, pepper, cardamom; ~\$4–5B	US, China, EU, UAE, Vietnam, Bangladesh
3	Marine Products	Shrimp (#1 export item), fish; ~\$6–7B/year; MPEDA coordinates	US, China, EU, Japan, SE Asia
4	Buffalo Meat	World's largest exporter; ~\$3–4B; frozen boneless	Vietnam, Malaysia, Egypt, Iraq, UAE
5	Sugar	World's 2nd largest exporter (when surplus); ~\$2–4B; ~35 MMT (USDA 2025)	Indonesia, Bangladesh, UAE, Africa, Afghanistan
6	Tea	World's 2nd largest producer; exports ~0.2 MT; ~\$600M–\$1B	Russia, Iran, UK, UAE, US
7	Cotton (Raw)	Exports ~\$1–2B/year; world's 2nd largest producer	Bangladesh, China, Vietnam, Pakistan
8	Oil Meals	Rapeseed/castor meal; ~\$1.5B; growing demand from China	China, South Korea, Vietnam, Thailand

SECTION 11: COMMERCIAL & EMERGING TECHNOLOGIES

11.1 Digital & Precision Agriculture

Kisan Suvidha/mKisan	Mobile-based agri-advisory; 6+ crore farmers registered; weather, market prices, expert advice via SMS/app
AgriStack	India Digital Ecosystem for Agriculture (IDEA): farmer registry (Unique Farmer ID), geo-referenced land records, crop sown data; foundational digital infrastructure for agriculture
Drones	Kisan Drone programme; agri-drones are increasing; subsidies up to INR 10 lakh for drone purchase; Made-in-India drone ecosystem (Garuda, IoTechWorld)
AI/Satellite	ISRO's RISAT/Cartosat for crop mapping; Cropin (AI-based crop intelligence); DeHaat, Ninjacart, Waycool – agritech startups transforming supply chains; India has \$4B+ agritech startup ecosystem

11.2 Biotechnology & Crop Improvement

GM Crops	Bt cotton: only GM crop approved for commercial cultivation (since 2002); covers ~93% of cotton area (~12M ha); Bt brinjal (Mahyco) approved 2009 but under moratorium since 2010; GM mustard (DMH-11) approved by GEAC 2022 but field trials contested
ICAR System	Indian Council of Agricultural Research: 113 institutes, 74 agricultural universities, 731 Krishi Vigyan Kendras (KVKs – farm science centres); world's largest agricultural research system
Hybrid/Improved Varieties	India releases 100+ new crop varieties annually through ICAR/SAUs; hybrid rice adoption ~6–8% (vs China >50%); hybrid maize >70%; Pusa Basmati series globally renowned

11.3 Protected Cultivation

Greenhouse/Polyhouse Area	~50,000–60,000 ha (MIDH/NHB data); growing rapidly; mainly for flowers, vegetables, capsicum, tomatoes, strawberries
Key Regions	Pune/Nashik (Maharashtra); Bangalore (Karnataka); HP/Uttarakhand (off-season vegetables); J&K; NE India
Technology	Fan-and-pad/naturally ventilated polyhouses dominant; high-tech climate-controlled greenhouses (~4,000-5,000 ha); Israeli technology influence strong; NHB subsidies (50–75%)

SECTION 12: FOOD SECURITY & NUTRITION

12.1 Production Overview

Total Foodgrain (2024-25)	357.73 MT (RECORD; Final Estimate, MoAFW): Rice 150.18 MT, Wheat 117.94 MT, Pulses 25.68 MT, Coarse Cereals ~57–60 MT, Oilseeds 42.99 MT
Horticulture (2024-25)	362.08-367072 MT (MoAFW); fruits + vegetables + spices + plantation crops + flowers
Milk (2023-24)	239.30 MT (MoAFW, PIB) – world’s #1
Fish (2023-24)	~197.75 MT (MoFAHD) – world’s 3rd largest
Agricultural Exports (FY25)	~USD 51.1 B (FY25)– (MoAFW, PIB)

12.2 Food Security & Nutrition

National Food Security Act	~81.35 crore (813 million) beneficiaries receive subsidised foodgrains; 5 kg/person/month; World’s largest food safety net.
Public Distribution System	One Nation One Ration Card (ONORC) has achieved 99.8 percent Aadhaar seeding of ration cards; ~5.43 Lakh Fair Price Shops are equipped with electronic point-of-sale (ePoS); In FY24, Rs.267.6 crore was transferred through Direct Benefit Transfer (DBT) to over 10 lakh beneficiaries, improving targeting efficiency and accountability (MoAFW, PIB)
Global Hunger Index	Score: 25.8 (2025, GHI) – Serious; ranking ~102th/123 countries (India disputes methodology)
Stunting	~32.9% of children under 5 (2025, GHI)
Undernourishment	~12.0% (2025, GHI); declining but significant
Poshan Abhiyaan	National Nutrition Mission: targets reduction in stunting, wasting, underweight, anaemia; Integrated Child Development Services (ICDS); Mid-Day Meal Scheme for ~11-12 crore school children
India’s Food Paradox	India produces RECORD foodgrains (357.73 MT) AND has ~12% population undernourished – distribution, access, and dietary quality remain challenges despite production surplus

SECTION 13: KNOWLEDGE EXCHANGE – BEST PRACTICES

13.1 What India Can Offer BRICS Nations

#	Achievement	Description
1	World's #1 Milk Producer	239.30 MT (2023-24); AMUL cooperative model; Operation Flood/White Revolution; 8 crore dairy farmer families
2	World's #1 Spice Producer & Exporter	Largest production, consumption, export of spices; 75+ varieties; Spices Board quality standards
3	World's Largest Organic Producers	~4.7 million ha; Sikkim (100% organic state); NPOP certification; growing global organic market share
4	ICAR Research System (World's Largest)	113 institutes + 731 KVKs; 100+ new varieties/year; Green Revolution heritage; Pusa Basmati, wheat varieties (HD 3226)
5	RECORD Foodgrain Production	357.73 MT (2024-25); feeds 1.44 billion; rice + wheat self-sufficient + surplus for export
6	Digital Agriculture / AgriStack	Unique Farmer ID; e-NAM (1,389 mandis); Kisan Suvidha; 6 crore+ farmers on digital platforms; \$4B+ agritech startup ecosystem
7	PM-KISAN (World's Largest DBT)	Direct income support to 11 crore farmers; INR 6,000/year; >INR 3.04 lakh crore disbursed
8	Tractor Manufacturing Hub	World's largest tractor market (~1M units/year); Mahindra (#1 globally); affordable mechanisation for Global South

13.2 What India Can Learn from BRICS

#	Area	From	Opportunity
1	Hybrid Rice Scale-Up	China	China >50% hybrid rice adoption vs India ~6–8%; could boost yields by 15–20%
2	Large-Scale Grain Mechanisation	Brazil, Russia	Brazil's soybean mechanisation; Russia's autonomous combines; India's wheat belt could benefit
3	Palm Oil Production	Indonesia	Indonesia's 52.76 MT CPO vs India's ~0.3 MT; India is world's largest palm oil importer (\$10B+); domestic expansion in NE/AP/Telangana
4	Aquaculture Intensification	China, Indonesia	China 60.6 MT aquaculture; Indonesia eFishery IoT; India has 2nd largest but huge untapped potential
5	Saffron/Pistachio Dryland Horticulture	Iran	Iran's world #1 saffron + pistachio under extreme aridity; applicable to J&K, Rajasthan, Ladakh
6	Coffee Genetic Diversity	Ethiopia	Ethiopia's 6,000+ Arabica accessions; disease resistance for Indian coffee sector (Karnataka/Kerala)
7	Conservation Agriculture	Brazil, South Africa	Brazil's no-till soybean; SA's conservation farming; India's residue burning (Punjab) needs alternatives

SECTION 14: REFERENCES & DATA SOURCES

14.1 Primary Data Sources

MoAFW	Ministry of Agriculture & Farmers' Welfare – crop production (Advance Estimates), area/yield, policy. agriwelfare.gov.in
DES/DAC	Directorate of Economics & Statistics – Agricultural Statistics at a Glance. desagri.gov.in
DAHD	Department of Animal Husbandry & Dairying – 20th/21st Livestock Census, BAHS 2024, milk/egg/meat production. dahd.gov.in
DoF	Department of Fisheries – PMMSY, fish production statistics. dof.gov.in
ICAR	Indian Council of Agricultural Research – 113 institutes, crop/livestock R&D, variety release. icar.org.in
NSO/CSO	National Statistical Office – GDP, national accounts, employment surveys. mospi.gov.in
Economic Survey	Annual Economic Survey of India (Ministry of Finance) – agriculture chapter. indiabudget.gov.in
FAOSTAT	FAO – production, trade, land use. faostat.fao.org
USDA-FAS New Delhi	Grain & Feed, Oilseeds, Cotton, Rice, Sugar, Livestock GAIN reports. fas.usda.gov
World Bank	GDP, poverty, population. data.worldbank.org
IMF WEO	GDP, per capita (October 2025). imf.org/weo
UNDP HDR	HDI. hdr.undp.org
IBEF	India Brand Equity Foundation – agriculture sector overview. ibef.org
PIB	Press Information Bureau – government press releases. pib.gov.in

14.2 Glossary

Term	Definition
MoAFW	Ministry of Agriculture & Farmers' Welfare
DAHD	Department of Animal Husbandry & Dairying
ICAR	Indian Council of Agricultural Research – world's largest agricultural research system
KVK	Krishi Vigyan Kendra – Farm Science Centre (731 across India); frontline extension
MSP	Minimum Support Price – government-guaranteed price for 23 crops
FCI	Food Corporation of India – procures and distributes foodgrains
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana – irrigation scheme ('Per Drop More Crop')
e-NAM	Electronic National Agriculture Market – online trading platform for agricultural commodities
AMUL	Anand Milk Union Limited – India's largest dairy cooperative; model for world
LMT	Lakh Metric Tonnes (1 LMT = 100,000 MT; Indian statistical convention)
Kharif	Monsoon crop season (Jun–Oct): rice, maize, soybean, cotton, pulses
Rabi	Winter crop season (Oct–Mar): wheat, barley, mustard, chickpea, lentils

