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**INDIA-OMAN STRATEGIC PARTNERSHIP IN  
AGRICULTURE AND FOOD SECURITY**

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# INDIA-OMAN STRATEGIC PARTNERSHIP IN AGRICULTURE AND FOOD SECURITY

## Executive Summary

India and Oman share centuries old maritime trade linkages that have evolved into a robust strategic partnership. With bilateral trade reaching USD 10.61 billion in FY 2024 - 25, both nations are poised to deepen cooperation in agriculture and food security, a critical pillar for economic diversification and national resilience.

This white paper examines the complementary strengths of India as a global agricultural powerhouse and Oman's progressive vision toward food self-sufficiency. It presents 10 actionable recommendations to enhance bilateral cooperation, with particular emphasis on innovative cluster development models, technology transfer, and sustainable value chains.

## 1. Introduction: The Strategic Context

The India - Oman relationship is anchored in more than 5,000 years of civilizational and commercial interaction, making it one of the oldest continuous cross cultural exchanges in the Indian Ocean region. Ancient maritime routes connecting Gujarat, Kerala, and Maharashtra with Oman's ports at Sohar and Sur facilitated the exchange of frankincense, spices, cotton, metals, pearls, and knowledge systems. These exchanges created early economic interdependence and sociocultural familiarity, long before modern diplomacy was institutionalized.

Formal diplomatic relations were established in **1955**, followed by the opening of resident embassies in Muscat and New Delhi. The relationship deepened significantly in the late 20th century and was elevated to a **Strategic Partnership in 2008**, marking Oman as one of India's closest allies in the Gulf. Defense cooperation, maritime security, energy partnership, and people-to-people ties have since grown rapidly.

Today, the presence of **over 620,000 Indians**, constituting the largest expatriate community in Oman, forms a living bridge that enhances cultural affinity, economic collaboration, and societal integration. Indian professionals play vital roles in **healthcare, construction,**

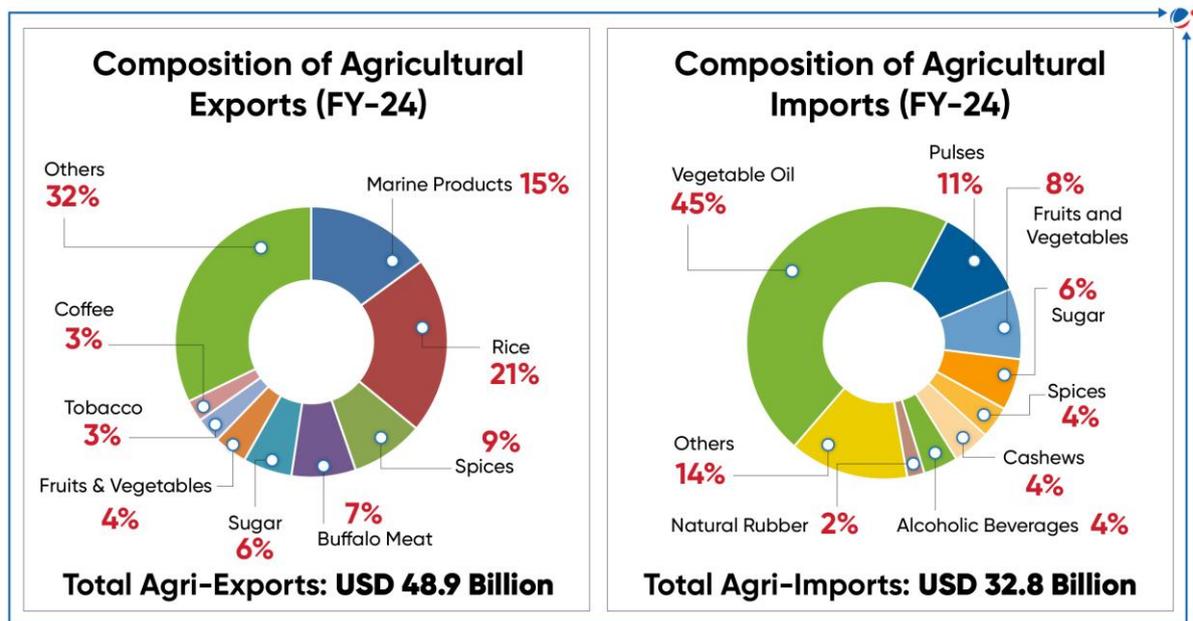
education, MSME development, retail, and emerging technology sectors, reinforcing mutual trust and making the partnership uniquely stable, resilient, and future-oriented.

## 2. India's Agricultural Profile and Export Potential

### 2.1 Production Capacity

India stands as an agricultural powerhouse with one of the most diverse and expansive production systems in the world. With **195.7 million hectares of cultivated land**, India is the **second largest agricultural producer globally**, benefiting from a vast array of **15 agro climatic zones** that support year round farming cycles. This climatic diversity enables India to produce everything from tropical fruits to temperate cereals, making it a reliable supplier across multiple food categories.

India leads globally as the **largest producer of milk, pulses, and spices**, and ranks as the **second largest producer of rice, wheat, fruits, and vegetables**. This scale gives India not only surplus capacity for exports but also the strategic resilience to withstand global supply shocks an asset highly relevant for food insecure regions like the Gulf.



### 2.2 Export Performance

India's agricultural export ecosystem has become increasingly outward-looking, with agri exports reaching **USD 49.29 billion in FY 2024 - 25**. This export basket reflects both diversity

specialization.

Key export categories include:

- **Rice (USD 12.47B):** India supplies over 40% of global rice trade, dominating both basmati and non basmati segments.
- **Marine Products (USD 7.40B):** Particularly shrimp and high value fish species.
- **Spices:** India supplies nearly 75% of the world's spice varieties.
- **Fresh Fruits & Vegetables:** Mangoes, pomegranates, grapes, onions, and more.
- **Dairy, Meat & Poultry:** Buffalo meat and processed dairy products form a strong segment.
- **Plantation Products:** Tea, coffee, cashew, and processed foods.

#### **Top Strategic Strengths:**

- Global reputation for **Basmati rice**, medicinal spices, and high value horticulture.
- Strong cold chain networks supporting fresh produce exports.
- Ability to meet diverse market demands from bulk staples to premium niche foods.

For Oman, which imports more than 60% of its food needs, India offers a stable, scalable, and geographically proximate supply partner.

### **2.3 Technological Capabilities**

India's agricultural sector has undergone rapid modernization, strengthening its role as a global agri - tech leader. Key capabilities include:

- **Water - efficient irrigation** (drip & sprinkler systems pioneered by India's micro - irrigation revolution) critical for arid regions like Oman.
- **Protected cultivation** (polyhouses, hydroponics, shade net farming) enabling climate - resilient food production.
- **Cold - chain & logistics infrastructure**, including pack houses, controlled atmosphere storage, and reefer transport.
- **Advanced food processing technologies** improving shelf life, quality, and exportability.

- **Organic and natural farming systems**, including Sikkim's fully organic model.
- **Digital agriculture platforms** for precision farming, crop monitoring, market linkages, and satellite based advisories.

These capabilities position India as not just a supplier but also a **technology partner** in enabling Oman to strengthen domestic food production under Vision 2040.

### **3. Oman's Food Security Landscape**

#### **1.1 Historical Foundations**

India and Oman share a civilizational relationship that dates back more than 5,000 years, shaped by maritime trade routes across the Arabian Sea and long standing cultural exchange between coastal communities. These early linkages fostered the exchange of commodities such as spices, pearls, textiles, and frankincense, laying the foundation for diplomatic ties that were formally established in 1955. The partnership was elevated to a **Strategic Partnership in 2008**, reflecting deep political trust and expanding cooperation in trade, defence, energy, and human development. Today, the Indian diaspora in Oman estimated at **over 620,000 people** is one of the largest and most influential expatriate communities in the Sultanate. Indian professionals and workers play a significant role across sectors such as construction, healthcare, finance, retail, education, and traditional medicine, serving as a human bridge that reinforces bilateral goodwill, economic integration, and cultural familiarity.

#### **1.2 Contemporary Relevance**

Food security has emerged as a strategic priority for both India and Oman in the 21st century. As climate change accelerates, both countries face rising temperatures, groundwater depletion, and extreme weather disruptions threatening agricultural stability. At the same time, **growing populations, shifting dietary preferences, and global supply chain vulnerabilities** exacerbated by pandemics, geopolitical tensions, and price volatility have amplified the urgency to diversify and secure food supplies. India seeks to modernize agriculture and expand exports, while Oman aims to reduce dependence on food imports and strengthen domestic production as outlined in its **Vision 2040**. The **India - Oman Joint Vision Partnership for the Future (2023)** specifically highlights agriculture and food security as priority areas,

signalling a shared commitment to co - develop resilient supply chains, invest in joint agricultural projects, and leverage complementary strengths. This convergence of strategic need, political alignment, and economic opportunity creates a compelling foundation for deep, future-ready cooperation in food security.

## **2.1 Production Capacity**

India is one of the world's agricultural powerhouses, ranking as the **second largest producer of food** globally. Its vast **195.7 million hectares of cultivated land**, combined with **15 major agro climatic zones**, enable year round cultivation of diverse crops from cereals to horticulture and plantation crops. India leads the world in milk, pulses, spices, and jute production, and ranks second in rice, wheat, fruits, and vegetables, making it a critical global supplier. This production diversity allows India to sustain domestic needs while ensuring a steady export surplus across multiple categories. The country's ability to maintain stable output even during global disruptions underscores its resilience and agricultural depth.

## **2.2 Export Performance**

India's agricultural export sector has shown strong momentum, reaching **USD 49.29 billion in FY 2024-25**, positioning the country among the world's top agricultural exporters. Key export pillars include rice (USD 12.47 billion), marine products (USD 7.40 billion), fresh fruits, vegetables, spices, meat, dairy, tea, and processed foods. India's basmati and non basmati rice dominate Middle Eastern markets, while spices such as pepper, chilli, turmeric, cumin, and cardamom enjoy premium demand internationally. High value marine products, especially shrimp, have secured strong positions in GCC and East Asian markets. This robust export basket ranging from raw agricultural commodities to value added processed foods provides Oman with reliable sourcing options and opportunities for downstream processing, joint ventures, and long term supply agreements.

## **2.3 Technological Capabilities**

India has rapidly advanced its agricultural technology ecosystem, becoming a global leader in **water efficient irrigation**, protected cultivation, and digital agriculture. Techniques such as

**drip and sprinkler irrigation**, initially pioneered in Indian drylands, have enhanced water productivity offering significant relevance for arid regions like Oman. Large-scale adoption of **greenhouses, polyhouses, and hydroponics** has expanded year round production of high-value horticulture. India's growing cold chain networks, packhouses, food processing facilities, and export oriented agro industries support both domestic consumption and global supply chains. Additionally, India's emerging digital agriculture stack spanning soil sensors, farm apps, satellite-based advisories, and traceability platforms creates scalable models that Oman can adopt for precision agriculture, water management, and smart farming.

### 3.1 Current Status

Oman has achieved notable progress in food security through targeted policies, investments, and diversification initiatives. By 2024, the country reached **65.8% food self sufficiency**, reflecting improvements in domestic agriculture, fisheries, and livestock. Oman's ranking of **35th in the Global Food Security Index (2022)** highlights its strong governance, affordability, and quality standards. The agriculture, fisheries, and forestry sector although contributing a modest **2.4% to GDP** plays a crucial role in national resilience. Oman has achieved remarkable self-sufficiency in key commodities: **162% in fish, 97% in fresh milk, 92% in table eggs**, and over **100% in dates**, positioning it as a competitive regional supplier. These gains reflect Oman's strategic push to build a diversified and sustainable food ecosystem.

### 3.2 Challenges

Despite its progress, Oman faces structural constraints that limit agricultural expansion. **Water scarcity** remains the most significant challenge; per capita water availability has plunged from 2,000 m<sup>3</sup> in 1990 to under 1,000 m<sup>3</sup> in 2024, placing Oman among the world's water stressed nations. With only **0.4% of land arable**, and 90% categorized as arid or semi-arid, large scale crop cultivation is inherently constrained. Oman continues to rely heavily on **imports for grains, vegetables, and red meat**, making it vulnerable to global supply shocks. Extreme summer temperatures exceeding 45°C further reduce growing seasons and strain livestock systems. Additionally, Oman's agricultural sector faces a **shortage of skilled labor**, necessitating workforce development, mechanization, and technology-driven solutions.

### 3.3 Strategic Initiatives

To address these challenges, Oman has launched a series of ambitious national strategies. **Oman Vision 2040** places food security and economic diversification at the center of national development. The **Food Security Strategy 2010 - 2030** emphasizes expanding domestic production, strengthening strategic reserves, and improving supply chain infrastructure. The **Food Security Lab 2024** acts as a policy accelerator attracting investments, modern technologies, and private sector partnerships. The establishment of the **Oman Food Capital**, a consolidated state backed enterprise with investments exceeding RO 1 billion, highlights the Sultanate's commitment to agro industrial transformation. In 2024 alone, Oman announced **89 new agriculture and fisheries projects**, covering over 9 million m<sup>2</sup>, focusing on aquaculture, greenhouse farming, desert agriculture, livestock development, and cold chain expansion. These initiatives create fertile ground for India - Oman collaboration in agricultural technology, joint production, food processing, and resilient supply chains.

## 4. India - Oman Agricultural Trade: Current State

### 4.1 Bilateral Trade Overview

India-Oman bilateral trade has grown substantially:

- **FY 2024-25:** USD 10.61 billion
- **FY 2023-24:** USD 8.95 billion
- **FY 2022-23:** USD 12.39 billion (peak)

India exports to Oman include:

- Rice, cereals, and processed foods
- Fresh fruits and vegetables
- Spices and condiments
- Tea and coffee
- Dairy products
- Sugar and confectionery

## **4.2 Existing Cooperation Framework**

### **Key Bilateral Agreements:**

- MoU on Agricultural Cooperation
- Joint Investment Fund (OIJIF) - USD 100 million
- Comprehensive Economic Partnership Agreement (CEPA) - under negotiation

### **Institutional Mechanisms:**

- India-Oman Joint Commission Meeting (JCM)
- Joint Business Council (JBC)
- Investment promotion through Invest India and Invest Oman

## **4.3 Untapped Potential**

Despite strong foundations, agricultural trade remains underutilized:

- Agricultural exports to Oman constitute less than 2% of India's total agri-exports
- Limited collaboration in agricultural technology transfer
- Underdeveloped joint ventures in food processing
- Minimal integration of supply chains

## **5. Ten Strategic Recommendations for Enhanced Cooperation**

### **Recommendation 1: Establishment of the Kazain Agri - Food Processing Cluster**

**Concept:** Develop a world-class integrated agri - food processing cluster in Oman's Kazain region, leveraging both countries' strengths and creating a regional hub for food security.

#### **Components:**

##### **A. Industrial Infrastructure**

- **Food Processing Units:** Establish facilities for processing dates, fruits, vegetables, grains, and dairy
- **Cold Storage Network:**

- Temperature controlled warehouses (50,000+ MT capacity)
- Blast freezing units
- Ripening chambers for fruits
- Multi temperature zones (-25°C to +15°C)
- **Packaging and Labeling Facilities:** Modern packaging lines with nitrogen flushing, modified atmosphere packaging
- **Quality Testing Laboratories:** NABL/ISO accredited labs for food safety and quality

## **B. Specialized Zones**

- **Dates Processing Zone:** Sorting, grading, pitting, paste production, value-added products
- **Marine Products Zone:** Fish processing, quick freezing, IQF technology
- **Grain Processing Zone:** Milling, fortification, packaging
- **Vegetable Processing Zone:** IQF vegetables, dehydration, canning

## **C. Supporting Infrastructure**

- **Common Effluent Treatment Plant:** Zero liquid discharge facility
- **Renewable Energy Integration:** Solar power (5-10 MW) for energy security
- **Water Management:** Wastewater recycling, RO plants
- **Logistics Hub:** Integrated cold chain connectivity to Duqm and Sohar ports

**Indian Contribution:** Technology, equipment, operational expertise, and anchor investors

**Omani Contribution:** Land, regulatory support, local partnerships, and market access

## **Recommendation 2: India-Oman Agricultural Technology Transfer Program**

**Objective:** Facilitate systematic transfer of Indian agricultural technologies to enhance Oman's productivity.

**Key Focus Areas:**

### **A. Water-Efficient Technologies**

- Drip and micro-irrigation systems (Israeli + Indian hybrid models)
- Sensor-based precision irrigation
- Rainwater harvesting structures adapted to Oman's terrain
- Hydroponic and aeroponic systems for leafy vegetables

### **B. Protected Cultivation**

- Climate controlled greenhouses with evaporative cooling
- Polyhouses suitable for Oman's extreme temperatures
- Shade net houses for vegetable production
- Vertical farming modules for urban areas

### **C. Post-Harvest Technologies**

- Solar powered cold storage units (off-grid capable)
- Portable cooling solutions for farm-level intervention
- Value addition equipment (drying, grading, processing)
- Mobile cold storage units

### **Implementation Mechanism:**

- **Technology Centers:** Establish 3 centers in Batinah, Dhofar, and Dhank
- **Training Programs:** 500 Omani farmers and technicians trained annually
- **Demonstration Farms:** 10 model farms showcasing Indian technologies
- **Equipment Leasing:** Subsidized leasing program for small farmers

### **Recommendation 3: India - Oman Organic and Specialty Products Corridor**

**Rationale:** Growing global demand for organic, GI tagged, and specialty products offers high value export opportunities.

**Strategic Elements:**

## **A. Organic Certification Hub**

- Establish India Oman joint organic certification body
- Harmonize standards with international requirements (EU, USDA, NPOP)
- Train and certify 1,000+ farmers in organic farming
- Create traceability systems using blockchain technology

## **B. Product Portfolio**

- **Indian Products:** Organic pulses, spices, tea, coffee, basmati rice, millets
- **Omani Products:** Organic dates, frankincense, limes, rose water
- **Joint Products:** Co branded organic processed foods

## **C. Market Development**

- Target high value markets: UAE, EU, USA, Japan
- Participate in international organic fairs
- Develop "India Oman Organic" brand
- E - commerce platforms for direct B2C sales

## **Recommendation 4: Joint Aquaculture and Marine Products Development**

**Context:** Both nations have strong marine sectors with potential for technology sharing and market integration.

### **Initiatives:**

#### **A. Integrated Aquaculture Projects**

- **Shrimp Farming:** Transfer Indian shrimp farming technology
- **Fish Farming:** Cage culture systems for sea bass, sea bream
- **Integrated Multi-Trophic Aquaculture (IMTA):** Combine fish, seaweed, and shellfish farming

#### **B. Value Addition and Processing**

- Upgrade Omani fish processing with Indian IQF technology
- Joint ventures in ready to eat seafood products
- Dried fish and fish meal production
- Fish by products utilization (collagen, fish oil)

### **C. Market Access**

- Leverage India's preferential market access to EU, USA
- Position Oman as India's seafood processing hub for GCC markets
- Joint participation in international seafood exhibitions

## **Recommendation 5: Establishment of India Oman Food Security Research Institute**

**Vision:** Create a world class research institution focused on arid agriculture and food security solutions.

### **Research Priorities:**

#### **A. Climate Resilient Agriculture**

- Drought tolerant crop varieties
- Heat stress management techniques
- Saline agriculture development
- Desert farming innovations

#### **B. Water Management**

- Efficient irrigation scheduling
- Desalinated water usage in agriculture
- Wastewater treatment and reuse
- Soil moisture conservation

#### **C. Alternative Proteins**

- Insect farming for animal feed

- Lab-grown meat feasibility
- Plant-based protein development
- Microalgae cultivation

#### **D. Food Preservation**

- Extended shelf life technologies
- Natural preservatives
- Active and intelligent packaging
- Minimal processing techniques

#### **Structure:**

- **Location:** Oman with satellite centers in India
- **Staffing:** 50 scientists (25 Indian, 25 Omani)
- **Partnerships:** Indian Agricultural Research Institute (IARI), ICAR institutes, Sultan Qaboos University

#### **Deliverables:**

- 10+ research papers annually
- 5+ new technologies/varieties per year
- Training programs for 500+ students annually

### **Recommendation 6: Digital Agriculture and Precision Farming Initiative**

**Objective:** Deploy digital solutions to optimize resource use and improve agricultural productivity.

#### **Technology Components:**

##### **A. Precision Agriculture Platform**

- **Satellite Based Monitoring:** Crop health assessment, yield prediction
- **Drone Technology:** Spraying, surveillance, mapping

- **IoT Sensors:** Soil moisture, temperature, humidity monitoring
- **Weather Forecasting:** Hyperlocal weather predictions

### **B. Digital Extension Services**

- Mobile app in Arabic and English
- Video tutorials on best practices
- Expert consultation via chatbot (AI powered)
- Pest and disease diagnosis using image recognition

### **C. Market Linkage Platform**

- Connect farmers directly with buyers
- Price discovery and transparency
- Digital payment integration
- Logistics coordination

### **Implementation:**

- Partner with Indian agritech startups (CropIn, AgroStar, Ninjacart equivalents)
- Customize solutions for Omani context
- Provide subsidized devices and internet connectivity
- Train 5,000+ farmers in digital tools

### **Recommendation 7: Joint Date Palm Development Program**

**Context:** Oman produces 400,000 MT of dates annually; India has large date consumption. Both can benefit from joint R&D and processing.

### **Program Elements:**

#### **A. Varietal Improvement**

- Exchange of superior date palm varieties
- Tissue culture laboratory for mass propagation

- Research on pest and disease management
- Development of climate-resilient varieties

### **B. Value Addition**

- Date paste and syrup production
- Date based confectionery
- Date powder (natural sweetener)
- Date seed coffee and cosmetics
- Functional foods with dates

### **C. Market Development**

- Position Omani dates in Indian market (2 million MT import opportunity)
- Leverage Indian processing capabilities for Omani date export
- Co branding initiatives
- Health and nutrition campaigns

### **Implementation:**

- Establish Date Processing Excellence Center in Oman
- Indian companies invest in processing technology
- Joint marketing campaigns in Asia and Africa
- Target export growth of USD 100 million

**Beneficiaries:** 50,000+ date farmers in both countries

### **Recommendation 8: Bilateral Agri - Startup Accelerator Program**

**Vision:** Foster innovation in food and agriculture through joint startup incubation.

### **Program Structure:**

#### **A. Accelerator Setup**

- Physical hub in Muscat with virtual connect to Indian agri hubs
- Focus sectors: AgriTech, FoodTech, Supply chain, Sustainability
- 6 month acceleration program with mentorship

#### **B. Innovation Themes**

- **Circular Economy:** Waste to value (date pits, fish waste, agricultural residues)
- **Alternative Foods:** Plant based proteins, fermentation technologies
- **Smart Farming:** AI/ML applications, robotics, automation
- **Sustainable Packaging:** Biodegradable, edible packaging
- **Food Safety:** Rapid testing kits, traceability solutions

#### **C. Support Ecosystem**

- Connect with investors from both countries
- Market access facilitation in India and GCC
- Regulatory sandbox for testing innovations
- IP protection and commercialization support

**Target:** Support 100 startups over 5 years

**Expected Outcomes:** 30 % success rate, creating 2,000+ jobs

### **Recommendation 9: Bilateral Food Safety and Quality Standards Harmonization**

**Rationale:** Streamlined standards will facilitate trade, reduce costs, and enhance consumer confidence.

#### **Key Actions:**

##### **A. Standards Alignment**

- Harmonize maximum residue limits (MRLs) for pesticides
- Align food additive regulations
- Mutual recognition of testing laboratories

- Standardize labeling requirements

## **B. Joint Certification Programs**

- Develop India - Oman GMP/HACCP certification
- Train food safety auditors (50 per year)
- Accredite laboratories in both countries
- Digital certification and traceability

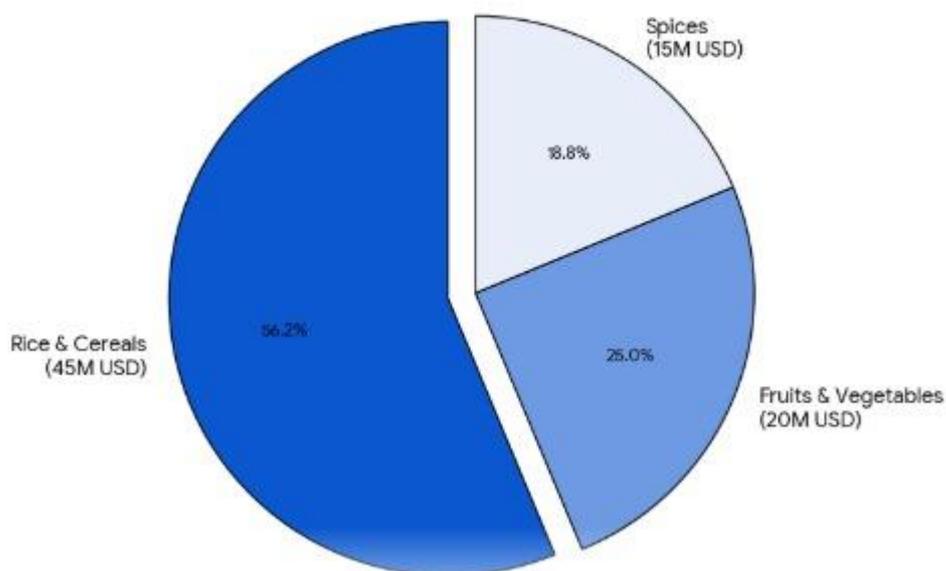
## **C. Capacity Building**

- Exchange of food safety officials
- Joint training programs (500+ participants annually)
- Workshops on international standards (Codex, EU, FDA)
- Emergency response protocols for food incidents

## **Implementation:**

- Establish India Oman Food Safety Council
- Create technical working groups
- Annual food safety summit
- Publish joint guidelines and handbooks

Distribution of Current Trade (USD million)



Product Category	Current Trade (USD million)	Potential (USD million)	Growth Factor
Rice & Cereals	45	150	3.3x
Fruits & Vegetables	20	80	4.0x
Spices	15	50	3.3x

## **6. Enabling Framework for Implementation**

### **6.1 Institutional Architecture**

A robust institutional framework is essential for driving India - Oman cooperation in agriculture and food security. At the apex, the **India Oman Agriculture and Food Security Commission (IOAFSC)** co chaired by the Agriculture Ministers of both countries and meeting annually will oversee policy implementation, resolve bottlenecks, and allocate resources. Supporting this is a network of **Joint Working Groups** dedicated to technology transfer, trade facilitation, investment promotion, research collaboration, standards and quality, and capacity building, ensuring specialized and continuous engagement. A **Project**

**Management Office (PMO)** based in Muscat with a liaison office in India, staffed by full time officials from both sides, will coordinate daily operations, monitor project progress, troubleshoot implementation challenges, and facilitate partnerships between government and private entities.

## **6.2 Financial Mechanisms**

To sustain long term cooperation, a multi-tier financing system is proposed. The **India - Oman Agriculture Development Fund** will provide grants, soft loans, and equity support for infrastructure, technology, startup incubation, and agricultural R&D. Private sector participation will be incentivized through **tax benefits**, concessional land allocation, fast-track approvals, and visa facilitation for investors and technical experts. Additionally, collaboration with **FAO, the World Bank, and the Islamic Development Bank** will enable access to multilateral financing, climate funds, and advanced technology transfer programs, further strengthening resource mobilization.

## **6.3 Policy and Regulatory Framework**

A strengthened bilateral policy ecosystem will support commercial and technological integration. Enhancing the **Bilateral Investment Treaty** with agriculture specific provisions will ensure investment protection and efficient dispute resolution. Trade facilitation reforms such as preferential tariffs under CEPA, simplified phytosanitary protocols, dedicated green channels for certified products, and paperless trade will accelerate agricultural flows. Mobility frameworks will include **multi year visas** for agricultural experts, simplified business visas, student exchange schemes, and at least **50 farmer exchange visits annually**, ensuring continuous knowledge exchange.

# **7. Expected Outcomes and Impact**

## **7.1 Food Security Impact**

The India- Oman agricultural cooperation framework is expected to substantially strengthen Oman's food security while creating new strategic advantages for India. Through joint production systems, technology adoption, and improved supply chain integration, Oman's overall food self sufficiency is projected to increase from the current 66% to nearly 80%, with significant gains in key sectors such as vegetables (from 60% to 85%) and processed foods (from 30% to 60%). Enhanced strategic reserves will allow Oman to maintain a six

month buffer stock for critical commodities, improving resilience against global disruptions. India stands to benefit through a stable, long term export market within the GCC, validation of its agricultural technologies in arid and high temperature environments, expanded access to Middle Eastern markets, and deeper integration with Oman, which also contributes to India's broader energy and geopolitical security.

### **8.3 Social Impact**

The partnership is poised to generate substantial social value across both countries. More than **15,000 direct jobs** (10,000 in Oman and 5,000 in India) and **over 30,000 indirect jobs** will emerge from joint farming projects, food processing units, logistics networks, and technology driven agricultural enterprises. Skill development initiatives will train more than **5,000 agricultural professionals**, while rural development programs are expected to benefit over **20,000 farming families** across both nations. Capacity building efforts will further empower communities, with over **10,000 farmers** trained in modern and climate smart agriculture, **500 agro entrepreneurs** supported through financial and technical assistance, and more than **2,000 students** engaged in specialized agriculture programs. These interventions will accelerate technology adoption among Omani farmers, with projected uptake reaching **50% of the farming population**, thereby strengthening national capabilities and human capital.

### **8.4 Environmental Impact**

The collaboration will advance sustainable and climate resilient agriculture across Oman through significant improvements in water management, resource efficiency, and renewable energy integration. Water use efficiency is expected to rise by **40%** through precision irrigation, hydroponics, and optimized desalinated water allocation, while nearly **50 million m<sup>3</sup>** of wastewater will be recycled annually for agricultural use. Sustainable practices will expand with **100,000 hectares** of organic farming, deployment of **50 MW** of solar energy in agri-infrastructure, and valorisation of **80% of agricultural waste** through circular economy solutions such as composting, biofertilizers, and biomass energy. Overall, the project aims to reduce the carbon footprint of agricultural production by **30% per unit output**, making Oman a regional model for low carbon food systems. Additionally, more than **20 climate smart crop varieties** suited for arid conditions will be developed and deployed, **5,000 hectares** will be dedicated to protected cultivation, and climate early warning systems will cover **80% of agricultural areas**, significantly boosting Oman's resilience to climate shocks and environmental stresses.

## **8. Success Factors and Recommendations for Success**

The success of the India - Oman agricultural cooperation framework will depend on several critical factors that ensure continuity, scalability, and long-term impact. Strong leadership commitment is essential, with sustained political will at the highest levels, regular ministerial engagement, and fast track decision making mechanisms to insulate food security initiatives from policy uncertainties. Equally vital is active private sector participation supported by an attractive investment climate, clear return on investment pathways, risk sharing models, and assured market linkages. The technological dimension must emphasize appropriateness and adaptation, prioritizing solutions proven in similar climates, scalable systems, cost effective models, and structured programs for developing Omani workforce capabilities. Inclusive stakeholder engagement will further strengthen outcomes by involving farmer organizations, promoting women's participation in agriculture, encouraging youth entrepreneurship, and implementing consumer awareness initiatives that build trust in India - Oman agri value chains.

Global best practices offer valuable guidance for implementation. The Israel - India model demonstrates the effectiveness of government-facilitated but private - sector driven excellence centres that emphasise water efficiency, protected cultivation, and farmer-facing training. Partnerships between the Netherlands and Middle Eastern countries highlight the benefits of high-tech greenhouse systems, integrated supply chains, and strict quality and sustainability standards. Similarly, China - Africa FOCAC agriculture programs showcase the importance of technology demonstration centres, comprehensive capacity building, and concessional financing for scaling proven models.

To avoid common pitfalls that weaken cross country agricultural cooperation, both nations must guard against over ambition by beginning with well designed pilot projects, validating outcomes before scaling, learning quickly from failures, and maintaining realistic timelines. Technology mismatch should be avoided by steering clear of overly complex, high cost solutions that are difficult to maintain; instead, emphasis must be placed on technologies with clear ROI, manageable maintenance requirements, and strong local capacity building components. Policy inconsistency must also be minimized through a stable long term policy framework, predictable export rules, fulfilment of bilateral commitments, and transparent government to industry communication. These measures together create an enabling

environment for durable, high impact India - Oman collaboration in agriculture and food security.

## **9. Conclusion: A Shared Vision for Food Security**

The India-Oman strategic partnership in agriculture and food security represents more than bilateral cooperation it embodies a vision of resilience, innovation, and sustainable development. Both nations bring complementary strengths: India's agricultural prowess, technological capabilities, and vast market; Oman's strategic location, investment capacity, and commitment to diversification.

The ten recommendations outlined in this white paper provide a pragmatic, executable roadmap that balances ambition with realism. The Kazain cluster exemplifies transformative thinking creating integrated infrastructure that addresses multiple challenges simultaneously. From cold storage to food processing, from renewable energy to digital platforms, this cluster can serve as a model not just for India - Oman cooperation but for the entire Middle East region.

Success will require sustained commitment, flexible adaptation, and inclusive participation. The framework presented here provides the structure; the partnership's strength will determine the outcome. As both nations navigate global uncertainties, climate challenges, and changing food systems, this collaboration can serve as an anchor of stability and prosperity.

The time for action is now. With demographic pressures mounting, climate change accelerating, and geopolitical tensions persisting, food security cannot be left to chance. India and Oman, bound by history and united by vision, have the opportunity to demonstrate that strategic partnerships grounded in mutual benefit, technological innovation, and sustainable practices can build a food - secure future.