Sampurna Grand Challenge: Transforming Horticulture Value Chains in Karnataka

Karnataka is one of India's leading horticulture-producing states, yet a significant share of harvested produce fails to translate into realised value. **An estimated 15–30% of fruits and vegetables are lost post-harvest** — not due to production shortfalls, but because of systemic gaps in aggregation, storage, processing, logistics, and market linkages. Losses are most acute during peak harvest periods, when surging supply overwhelms existing infrastructure, leading to quality deterioration, price crashes, and reduced farmer incomes. Climate variability and heat stress further intensify these pressures, accelerating spoilage and amplifying volatility across value chains.

At a national level, food loss represents a significant economic and developmental concern. Estimates suggest that **tens of millions of tonnes of food are wasted annually**, with an associated economic cost running into hundreds of thousands of crores. In a horticulture-intensive state like Karnataka, this is not merely an operational inefficiency — it is a systemic constraint on farmer livelihoods, enterprise viability, and the development of resilient, market-linked food systems.

Recognising the scale and urgency of this challenge, the Government of Karnataka has launched the **Sampurna Grand Challenge 2026** as a strategic platform to catalyse innovation, investment, and cross-sector collaboration. The initiative is being implemented in partnership with **GAIN (Global Alliance for Improved Nutrition)**, **Nutrition Connect**, **TTC (Thinkthrough Consulting)**, and the **Association of Business Women in Commerce and Industry (ABWCI)**, bringing together expertise across nutrition, systems thinking, enterprise development, and ecosystem facilitation.

The challenge goes beyond simply reducing food loss. It seeks to **drive value addition, strengthen market systems, and enhance farmer incomes through**

scalable, replicable, technology-enabled solutions. The programme creates a platform connecting innovators, investors, and stakeholders — enabling solutions to be tested, refined, and scaled across Karnataka's horticultural value chains. Applications are invited for solutions addressing onion, mango, banana, tomato, grapes, pomegranate, and pineapple — Karnataka's highest-volume, highest-loss horticulture commodities. Solutions applicable to other crops are equally welcome, provided they demonstrate clear potential for replication or adaptation across these seven priority crops.

The Innovation Challenge is structured around **seven priority areas**, each targeting a critical intervention point within the value chain — from post-harvest handling and packaging to logistics, aggregation, finance, digital decision systems, and circular economy solutions. Through this, Karnataka seeks to move beyond incremental improvements and enable **system-level transformation**: where innovations not only reduce losses but unlock new value, improve resilience, and strengthen the overall efficiency of the horticulture ecosystem.

Interconnections across challenge categories

While the challenge is organised into seven thematic categories, the horticulture value chain functions as an interconnected system. Many solutions will naturally span more than one category — and that is by design. A logistics platform may incorporate demand forecasting. A packaging innovation may enable cold-chain efficiency. An aggregation model may integrate finance and digital tools. Applicants are encouraged to apply under the category that best reflects their primary intervention, even where their solution addresses multiple areas.

The diagram above maps each of the seven challenge categories to the stage(s) of the value chain where they primarily intervene. Categories with wider bars — such as **Digital Decision Systems** and **Innovative Financial Access** — are cross-cutting enablers that operate across multiple stages. Narrower bars indicate categories anchored to a specific intervention point. Overlapping stages signal where solutions from different categories may complement or intersect.

Who Should Apply

The challenge invites participation from a diverse ecosystem of innovators working across agriculture, food systems, and climate resilience. Eligible applicants include, but are not limited to:

- Startups and agri-tech companies
- Academic and research institutions
- Technology innovators and product developers
- Farmer Producer Organisations (FPOs) and agri-enterprises
- Social enterprises and ecosystem organisations working in agriculture, food systems, and climate innovation
- Any other organisation offering innovative solutions that can strengthen or enhance horticulture value chains in Karnataka.

Applications are open to organisations at any stage of development — from early-stage innovators and research teams to scaling enterprises and collaborative consortia. The list above is illustrative, not exhaustive. If your solution addresses a meaningful challenge within Karnataka's horticulture value chain, you are encouraged to apply.

Innovators from the above ecosystem are invited to submit solutions under one of the seven challenge categories outlined below.

1. Post-harvest value chain solutions

Post-harvest losses in Karnataka are concentrated at the farm gate, where a sudden glut of produce — onions, tomatoes, bananas — meets insufficient infrastructure for sorting, cooling, and basic processing. Without accessible packhouses or shared cooling, smallholders have no choice but to sell immediately, flooding local markets and accepting distress prices. Even modest improvements in on-farm handling — better grading, shaded storage, low-cost cooling — can significantly reduce spoilage and stabilise farmer incomes during peak harvest windows.

> *During peak harvest periods, the sudden surge in supply frequently overwhelms local handling capacity — leaving smallholders with little option but to sell immediately at whatever price the market offers.*

Applications are invited for solutions across crops; however, the programme places special emphasis on the following crops: *Onion, Mango, Banana, Tomato, Grapes, Pomegranate, and pineapple*.

Example solution types:

- **On-farm and near-farm packhouses:** Modular or shared facilities for washing, grading, and sizing produce immediately after harvest — reducing bruising, waste, and market rejections.
- **Low-cost and solar-powered cold storage:** Evaporative coolers, solar cold rooms, or insulated modular units sited near farms to extend shelf-life of surplus produce without grid dependence.
- **Shared processing equipment:** Mobile or community-accessible units for dehydration, pulping, or drying that capture value from off-grade or surplus crops before spoilage sets in.
- **Ripening management technologies:** Ethylene management systems, controlled-atmosphere crates, or rapid pre-cooling interventions that slow ripen and extend marketable life for mango and banana.

- **On-farm quality grading tools:** Low-cost optical sorters, brix meters, or visual grading aids that help farmers segregate produce by improving price realisation and reducing market rejections.

✔ Apply here if your solution...

- Your solution handles, sorts, grades, cools, or processes produce **immediately after harvest** — on-farm or near-farm.
- It reduces spoilage, extends shelf life, or **improves produce quality** through storage, on-farm processing, or early-stage preservation.
- It helps **absorb or manage peak-season surplus** by converting overflow into storable or processed forms.

✗ Not a fit if...

Your solution focuses primarily on transport logistics, packaging materials, digital market tools, or finance — those are covered in other categories.

2. Sustainable packaging innovations

Inadequate packaging is a hidden but significant source of loss across Karnataka's supply chains. Produce is routinely transported in thin jute sacks or open crates that offer little protection against bruise, dehydration, and contamination — damage that is invisible at the farm gate but results in rejections and discounts at the market. Better packaging protects physical quality, slows spoilage, and can signal to buyers that the produce meets a consistent standard. There is a growing demand for solutions that are both effective and environmentally sustainable.

> *Across Karnataka's supply chains, a significant share of produce damage occurs not in the field but in transit — the result of inadequate containers and packaging that offer little protection against bruising, dehydration, or contamination.*

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Example solution types:

- **Ventilated and stackable crate systems:** Reusable rigid crates with optimised ventilation and ergonomic stacking strength — replacing jute sacks and reducing mechanical damage during transport and loading.
- **Biodegradable and compostable packaging:** Plant-based films, bamboo-pulp trays, or sugarcane-fibre packaging that reduce plastic waste while managing moisture and mould.
- **Modified-atmosphere and active packaging:** Packaging that regulates oxygen, CO_2, or ethylene levels around the produce — including wax coatings, MAP liners, and oxygen-scavenger pouches — to slow ripening and spoilage.
- **Crop-specific packaging innovations:** Solutions designed for Karnataka's priority crops — e.g. perforated film bags for bananas to manage ethylene, netted cushion sleeves for mangoes, or breathable mesh for onions and pomegranates.

- **Lightweight protective materials:** Foam nets, paper wraps, or moulded pulp trays that cushion delicate produce during last-mile transport while remaining low-cost and widely accessible.

✔ Apply here if your solution...

- Your solution centers on **packaging materials, containers, or systems** that protect produce quality during handling, storage, or transport.
- It uses **innovative, eco-friendly, or sustainable materials** — biodegradable, reusable, or modified-atmosphere — to reduce waste and spoilage.
- It improves **produce protection through packaging design**, including smart or active packaging (e.g. sensors, MAP liners, wax coatings).

✗ Not a fit if...

Your solution is primarily transport logistics, on-farm processing, or marketing information — those belong in other categories.

3. Efficient logistics optimisation solutions

Slow and uncoordinated production after harvest is one of the most avoidable sources of loss in Karnataka. During peak season, trucks sit idle waiting for loads, roads to major mandis become congested, and perishables spend hours — or days — without cooling. Many smallholders have no reliable way to book transport or know when vehicles are available, forcing rushed, unoptimized trips that arrive at market either too early or too late. Coordinated logistics infrastructure — scheduling, load pooling, and cold-chain access — can significantly reduce time-in-transit and spoilage.

> *At peak season, the gap between farm-gate availability and market readiness is often measured in hours of preventable delay — trucks waiting idle, produce sitting unrefrigerated, and farmers bearing the cost of a system that was not designed for perishable volumes.*

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Example solution types:

- **Transport scheduling and load-matching platforms:** Apps or software that connect farmers and FPOs with available trucks or vehicles — optimising routes, consolidating loads, and scheduling pickups during cooler hours.
- **Last-mile cooling solutions:** Insulated boxes for auto-rickshaws and small vehicles, pre-cooling pads at collection points, or low-cost thermos-container systems for short-haul perishable transport.
- **Shared cold-chain services:** Networked refrigerated vehicles or multi-user cold storage at collection hubs — coordinated with harvest schedules so capacity is neither idle nor overwhelmed.
- **Market arrival coordination systems:** Platforms that allow farmers to signal harvest readiness and markets to signal demand in real time — reducing oversupply spikes on particular trading days.

- **Fleet tracking and condition monitoring:** GPS-based vehicle tracking and in-transit temperature or humidity monitoring — enabling early response to delays, breakdowns, or cold-chain breaches.

✔ Apply here if your solution...

- Your solution improves **transport, distribution, or cold-chain logistics** — routing, scheduling, load consolidation, or fleet management.
- It uses technology (apps, software, IoT) to **reduce transit times or delays** between farm and market.
- It helps farmers or FPOs **access vehicles, coordinate storage, or optimise routes** during peak harvest flows.

✗ Not a fit if...

Your solution is primarily about on-farm handling, packaging materials, or finance — those are covered in other categories.

4. Community-led aggregation and enterprise innovations

Karnataka's horticulture sector is dominated by smallholder farmers with fragmented landholdings and limited individual market power. Without collective structures, each farmer bears the full cost of transport, faces weak negotiating leverage, and must sell quickly regardless of price. Aggregation — whether through FPOs, village collection centres, or informal farmer groups — directly addresses these constraints by enabling volume-based contracts, shared logistics, and joint quality management. In areas where formal FPOs are still nascent, even simple community-led models can deliver significant impact.

> *Where farmers sell individually, they typically face higher transport costs, weaker bargaining positions, and greater pressure to sell quickly. Even modest collective structures — a shared collection point, a joint grading shed — can meaningfully shift these dynamics.*

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Example solution types:

- **FPO formation and professionalization support:** Models, tools, or services that help establish, train, and strengthen Farmer Producer Organisations — including governance, financial management, and collective post-harvest operations.
- **Village-level aggregation hubs:** Community-operated collection centers where farmers bring produce for joint sorting, grading, and temporary storage before bulk transport — reducing individual logistics costs.
- **Collective marketing and buyer linkage:** Systems for pooling produce to meet volume-based contracts with processors, retailers, or exporters — including cooperative brand-building and traceability for premium markets.
- **Women-led and self-help group enterprises:** Community enterprises led by women's SHGs or farmer groups that provide shared post-harvest services (grading, packing, storage) anchored in local demand and supply.

✔ Apply here if your solution...

- Your solution **enables farmers to aggregate, coordinate, or market collectively** — through groups, shared facilities, or cooperative enterprises.
- It is a **community-driven or farmer-led model** — such as a village aggregation hub, FPO, or collective marketing initiative — that improves market linkages for smallholders.
- It **reduces individual transaction costs and losses** by strengthening farmer collectives or building shared post-harvest services.

✗ Not a fit if...

Your solution is mainly a technical packaging kit, standalone IT system, or financing model without a community enterprise component.

5. Innovative financial access solutions for FPOs and agri-enterprises

Even where appropriate post-harvest technologies exist, many FPOs and small agri-enterprises in Karnataka cannot access the finance to adopt them. Conventional bank loans are designed for crop production — not for cold rooms, transport equipment, or packhouse upgrades — and are rarely disbursed in time for seasonal needs. Working capital gaps force farmers to sell at harvest-time lows rather than stores and wait for better prices. Innovative financial products tailored to the short cycles, seasonal cash flows, and asset profiles of horticulture enterprises are essential to enabling the adoption of loss-reducing solutions.

> *An FPO that cannot access short-term working capital during the harvest window may be unable to store produce, hire transport, or invest in basic handling improvements — forcing distress sales regardless of the quality of its produce.*

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Example solution types:

- **Seasonal and harvest-linked credit products:** Short-term loans, revolving credit lines, or pay-as-you-sell structures timed to Karnataka's harvest calendars — enabling FPOs to invest in post-harvest operations without cash-flow strain.
- **Warehouse receipt and inventory financing:** Finance against stored produce — allowing farmers and FPOs to avoid distress sales by borrowing against warehouse onions, grains, or processed goods while waiting for better prices.
- **Digital and alternative lending platforms:** Fintech platforms that use transaction data — market receipts, produce volumes, payment histories — to underwrite loans quickly for rural agri-enterprises without traditional collateral.
- **Value chain and buyer-linked finance:** Finance tied to confirmed offtake contracts — where processors, retailers, or exporters provide advance payments or guarantee repayment, reducing lender risk and enabling FPO investment.

- **Credit guarantee and blended finance structures:** Partial credit guarantees, first-loss facilities, or concessional capital that de-risk lending to agri-entrepreneurs — making formal bank credit accessible for post-harvest infrastructure.

✔ Apply here if your solution...

- Your solution provides **financial services or instruments** — loans, credit lines, insurance, or payment systems — tailored to FPOs, farmers, or agri-businesses in post-harvest activities.
- It addresses **cash-flow gaps or finances asset purchases** (storage, transport, processing equipment) that directly reduce food loss.
- It uses **innovative financial models or technology** — mobile money, blockchain, value chain finance, or blended finance — to extend access to agri-entrepreneurs.

✗ Not a fit if...

Your solution is purely a logistics, packaging, or information tool without a clear financial services component.

6. Digital decision systems for food loss reduction

A significant share of post-harvest losses in Karnataka stems not only from infrastructure gaps but also from **fragmented, delayed, and disconnected decision-making** across the value chain. Farmers decide when to harvest without knowing storage availability. Traders dispatch trucks without knowing market conditions. FPOs sell without visibility on competing supply arrivals. These decisions — made in isolation across dozens of actors — create systemic inefficiencies: produce gluts, underutilised cold rooms, and avoidable spoilage. When farmers and supply chain actors have access to timely, integrated digital information, they make better decisions — and loses fall. What Karnataka needs are not just more data dashboards, but **systems that connect actors and translate data into action.**

> *When actors across the value chain make harvest, storage, and dispatch decisions in isolation — without shared information on supply volumes, market conditions, or infrastructure availability — the result is predictable: gluts, delays, and avoidable spoilage.*

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Example solution types:

- **Integrated value chain decision platforms:** Systems that connect data across farm, storage, logistics, and market stages — enabling farmers, FPOs, and traders to make coordinated decisions on harvesting, dispatch, and storage in real time.
- **Predictive and prescriptive analytics:** Tools that not only forecast prices, arrivals, or demand, but actively recommend actions — stagger your harvest, redirect to Market X, store for 4 days — based on current conditions.
- **Multi-stakeholder coordination systems:** Platforms that align supply and demand across actors — connecting farmers signaling harvest readiness with transporters, cold storage operators, and buyers on a single interface.

- **End-to-end traceability and visibility tools:** Solutions that track produce condition, location, and bottlenecks from farm to market — enabling proactive intervention before losses escalate.

⚠ **Important boundary clarification:**
Solutions that focus **only on a single operational function** (e.g. route optimization, warehouse management, or standalone price dashboards or single-function tools) are **better suited to other categories (e.g. logistics optimization)** unless they are embedded within a broader, integrated decision-making system. A standalone price dashboard, for example, may still qualify if it is designed to drive actionable decisions across multiple value chain actors.

✔ Apply here if your solution…

- Your solution **integrates multiple data streams or value chain stages** — connecting farm, storage, logistics, and market data to enable coordinated decisions.
- It enables **decision-making across multiple actors** — farmers, FPOs, transporters, traders — rather than solving for a single user or function.
- It provides **actionable recommendations**, not just data visibility, — helping users decide when to harvest, where to send produce, or whether to store or sell.

✗ Not a fit if…

Your solution is a standalone single-function tool — such as route optimisation only, or a price dashboard only — unless it is embedded within a broader, integrated decision system. Note: a standalone price dashboard may still qualify if it is designed to drive actionable decisions across multiple value chain actors.

7. Circular economy and loss-to-value solutions

Even in well-functioning supply chains, a portion of Karnataka's horticulture output is unmarketable in its fresh form — produce that is off-grade, over-ripe, blemished, or surplus to what primary markets can absorb. In the absence of structured secondary uses, this material is sold at deep discounts or discarded entirely. A circular economy approach reframes this waste as feedstock: surplus mangoes become puree; blemished onions become dehydrated flakes; pomegranate peel yields extract for nutraceuticals; organic waste becomes biogas or compost. Technologies and business models that unlock this secondary value streams convert losses into income — for farmers, processors, and communities.

> *A significant share of produce that fails to meet primary market standards is not inherently worthless — it represents raw material for processing, energy generation, or soil enrichment that, without structured secondary channels, simply goes to waste.*

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Example solution types:

- **Dehydration and drying enterprises:** Small or medium-scale units producing dried mango slices, onion flakes, tomato powder, or banana chips from surplus or off-grade produce — creating shelf-stable, exportable products with strong market demand.
- **Value-added processing of rejects:** Units converting blemished or over-ripe produce into juices, purees, pickles, jams, or pastes — capturing value that would otherwise be discarded at the packhouse or farm gate.
- **Bioextraction and industrial inputs:** Processes that extract commercially valuable compounds from fruit and vegetable by-products — pectin from citrus/mango peel, natural dyes from pomegranate rind, or essential oils from surplus flowers.

- **Bioenergy and compost systems:** Decentralized units that convert organic horticultural waste into biogas (for farm or community energy), biofertilisers, or nutrient-rich compost — closing the nutrient loop and reducing disposal costs.
- **Packhouse and aggregation centre waste recovery:** Systems that capture and repurpose water, pulp, and organic residue from washing and sorting operations — through biofilters, irrigation reuse, or biomass conversion.

✔ Apply here if your solution...

- Your solution **creates new uses or products from surplus, off-grade, or unsold produce** — such as juices, jams, animal feed, biogas, or compost.
- It implements **recycling or upcycling of horticultural by-products**, closing the loop and generating additional economic or environmental value.
- It is focused on the **circular use of bio-waste** — not just disposal — converting food loss into a resource.

✗ Not a fit if...

Your solution is about primary marketing, packaging, or logistics unless it specifically applies to waste or surplus streams.