Green Indian Financial System

Sector Spotlight

Financing India's Green Food Value Chain: Insights from the Fruits and Vegetables Value Chain

About the spotlight

This spotlight examines the financing needs and opportunities across India's green food value chain, with a focus on how financial institutions (FIs), investors, insurers, and development finance providers can support climate resilience across the value chain. It considers the range of actors involved beyond primary production, including aggregators, traders, storage and cold-chain operators, transporters, processors, retailers, and other service providers. The analysis looks at where climate-related risks and losses create financing needs, how existing financing mechanisms address these needs, and where different forms of finance, including debt, equity, insurance, guarantees, blended finance, and development finance, could be better aligned with underlying business models and risk profiles

Fruits and vegetables are selected as the focal value chain because they are among the most perishable and climate-sensitive types of agricultural produce in India. The value chain spans multiple nodes, from production and aggregation to storage, cooling, transportation, wholesale, and retail, creating distinct climate-related risks and financing needs at each stage. The analysis therefore considers not only financing for physical assets and working capital, but also the financing of intermediaries and service providers, including startups and businesses offering storage, cooling, logistics, and other post-harvest services. This helps assess whether existing financing approaches suit these business models and whether other forms of finance could address remaining needs.

Climate risk and credit exposure

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

The fruits and vegetables value chain spans five nodes: production, aggregation and first-mile handling, storage, transport, and wholesale and retail. Production is carried out predominantly by smallholder farmers and farmer collectives , while Micro, Small and Medium Enterprises (MSMEs) play an important role across the downstream handling and distribution nodes. This structure helps illustrate where a physical hazard can become a cash-flow shock, how that shock can affect repayment capacity, and whether existing credit, insurance, and capital subsidy mechanisms address the point where the risk is realized.

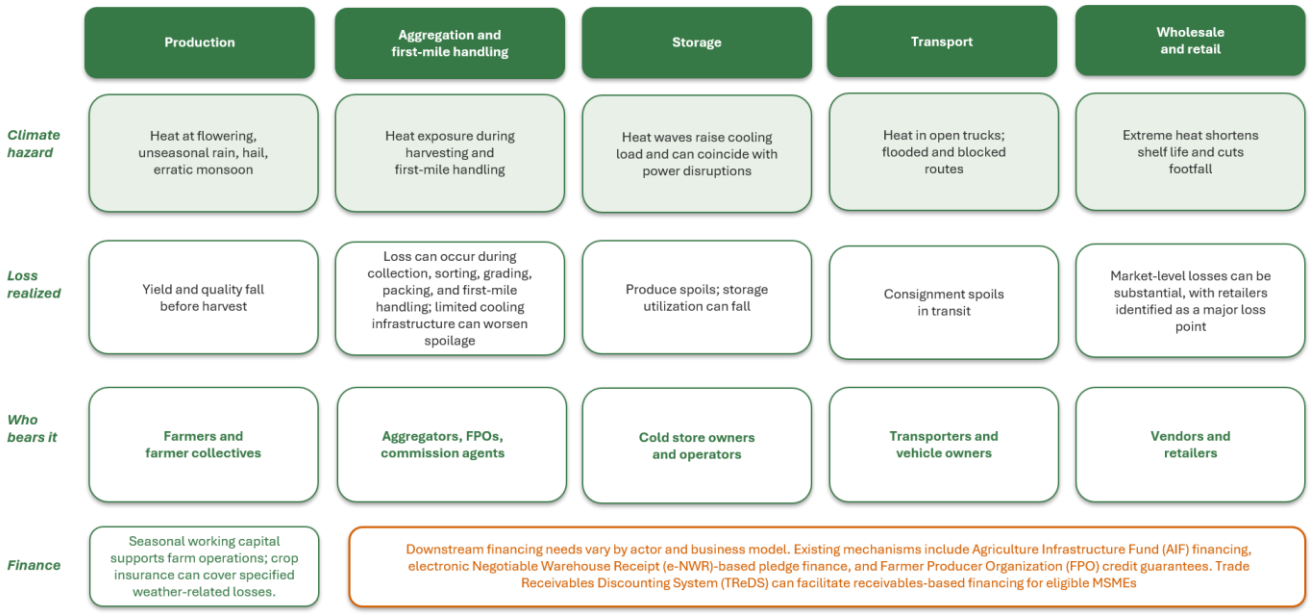
The fruits and vegetables value chain is largely informal. Published field research finds that produce moves through two types of value chains. Informal chains, running through village traders and commission agents, handle about 78% of the volume; formal chains handle about 20%, and contract farming is rare. In both, the grower's share of the final consumer price is small, ranging from 14% to 43% (Wageningen 2021).

Climate-related losses can reach a lender's portfolio through two broad pathways. The first occurs during production, while the second emerges during harvesting, handling, storage, and movement of produce. The financing implications differ because the actors exposed to the loss, the nature of the cash-flow impact, and the available financial and risk-management mechanisms vary across these stages.

- **The first pathway occurs on the farm, before harvest.** Heat at flowering, unseasonal rain, hail, and an erratic monsoon can reduce yield and quality. The counterparty is the farmer, and the loss is a reduction in crop output or quality, and crop loans and crop insurance are among the existing financing and risk-management mechanisms relevant to this exposure.
- **The second pathway occurs at and after harvest, during handling and movement.** Heat can accelerate deterioration, while delays, inadequate pre-cooling, and rough handling can increase spoilage and reduce the quality and value of produce. The counterparties can include aggregators, transporters, storage operators, and vendors; the resulting loss can take the form of spoiled inventory and reduced cash flow. Fewer financial instruments are designed specifically to address this exposure.

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

Figure 1: Climate hazards, points of loss, and actors exposed by node of the fruits and vegetables value chain



Source: Authors' analysis drawing on NABCONS 2022, Wageningen 2021, and NCCD 2015

The scale of harvest and post-harvest losses is documented. The study by National Bank for Agriculture and Rural Development (NABARD) Consultancy Services (NABCONS) for the Ministry of Food Processing Industries, with reference years 2020-22, reports the following:

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

- Across all 54 commodities studied, harvest and post-harvest losses are valued at INR 1.53 trillion (USD 18.3 billion), equivalent to 2.35% of Gross Domestic Product (GDP) at current prices for the first quarter of 2022-23[1]
- Fruits and vegetables alone account for 19.3 million tons and INR 570 billion (USD 6.8 billion) of that total
- Measured as a share of output, losses run from 6.02% to 15.05% for fruits and from 4.87% to 11.61% for vegetables
- For every fruit and vegetable studied, most of the loss occurs at what the study defines as farm-level operations, including harvesting, collection, sorting and grading, packaging, and farm storage and transport, rather than in cultivation
- Guava and tomato record the highest losses. Guava's total loss of 15.05% splits into 11.59% in farm operations and 3.46% at market level, a farm-level share of 77%; the equivalent share for tomato is 72%. Harvesting and sorting and grading account for the largest shares of these losses
- Within the market chain, the retailer is the largest single point of loss for almost every crop (NABCONS 2022), a finding also reflected in focus groups across six states (Wageningen 2021)

From a financing perspective, these losses affect the working-capital cycle of aggregators, transporters, and vendors. These businesses often purchase produce with cash or short-term financing and expect to sell it within a short period. When a consignment spoils, the inventory loss reduces the cash available for subsequent purchases while existing payment obligations remain. For businesses operating on short cash cycles, this can create a liquidity constraint that carries into subsequent trading cycles.

Financing gaps across the value chainInstitutional credit relies on established mechanisms for assessing repayment capacity, documenting borrowers and assets, and managing credit risk. These mechanisms apply across sectors, but can be harder to

[1] INR figures are converted at INR 83.7 per USD using the World Bank official exchange rate (period average) for 2024. This conversion is for presentation only. The NABCONS study covers 54 commodities across 292 districts, with reference years 2020-22; its monetary estimate is based on 2020-21 production and average wholesale prices for 2019-20 to 2021-22. These estimates should not be interpreted as current values.

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

apply in agriculture because holdings are often small and fragmented, land records may be unavailable or outdated, tenants and sharecroppers may not own the land they cultivate, and agricultural income is often seasonal. These factors can make conventional collateral, documentation, and repayment-assessment requirements more difficult for some borrowers to meet.

The consequences are visible in the composition of agricultural credit. The Reserve Bank of India's (RBI) Internal Working Group on Agricultural Credit found that the share of short-term crop loans in crop-related credit increased from 51% to 75% between 2000 and 2018. The group also raised concerns about the relative availability of investment credit, meaning longer-tenor lending used to finance assets such as pack houses, cold rooms, irrigation, and machinery rather than a single crop cycle (RBI 2019). The same group noted that banks find secured lending easier to sanction and that tenants, sharecroppers, and landless cultivators remain less well served by formal credit. Approximately 77.2 million Kisan Credit Card (KCC) accounts were operative in March 2025 (PIB 2026a). However, KCC primarily supports agricultural production and associated working-capital needs and does not, by itself, address financing requirements further along the value chain.

Financing needs also differ across the value chain:

- **Production:** seasonal working capital and investment in irrigation equipment, farm equipment, and climate-resilient practices
- **Aggregation and post-harvest handling:** working capital and investment in collection, sorting, grading, and pack houses
- **Storage, cooling, and logistics:** longer-tenor financing for infrastructure and equipment, as well as working capital linked to seasonal utilization.
- **Processing, wholesale, and retail:** working capital and investment in processing, distribution, and other value-adding activities.
- **Service providers and startups:** financing for business models based on service fees, pay-per-use arrangements, or contracts rather than ownership of the underlying agricultural assets

Post-harvest infrastructure faces related financing constraints. Under the Agriculture Infrastructure Fund (AIF), lenders had sanctioned INR 802 billion (USD 9.6 billion) for

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

150,431 projects by January 2026, with a 3% interest subvention and guarantee coverage for eligible loans up to INR 20 million per project (PIB 2026b). The fund covers a range of eligible borrowers, including farmers, farmer producer organizations (FPOs), cooperatives, self-help groups, agri-entrepreneurs, and startups. However, asset-based finance does not necessarily address the needs of those who use infrastructure without owning it, such as farmers paying for storage, traders renting cold-storage space, or vendors purchasing cooling services.

This is particularly relevant for intermediaries and service providers offering aggregation, storage, cooling, logistics, and other post-harvest services. Their revenues may depend on seasonal utilization, service fees, or contracts rather than direct ownership of agricultural assets. For some businesses, particularly startups and early-stage enterprises, financing may need to extend beyond conventional debt to include equity investments, guarantee-backed support, concessional capital, or blended and development finance.

The policy framework for public finance support for fruit and vegetable cold chains has also changed. Effective June 8, 2022, the Integrated Cold Chain and Value Addition Infrastructure scheme under Pradhan Mantri Kisan Sampada Yojana discontinued support for cold-chain projects in the fruit and vegetable sector, with the segment moving to Operation Greens (PIB 2025c). This is a policy-design change rather than a climate-finance gap in itself. For lenders, however, it reinforces the need to understand which public financing or subsidy window applies to a particular post-harvest investment.

The RBI's Internal Working Group recommended financing models that cover FPOs across the supply and value chain and a credit guarantee fund for agriculture modeled on MSME schemes (RBI 2019). FPO-centered financing can be relevant for aggregation, first-mile handling, and collectively owned storage, but may not be a solution for every value-chain actor. Traders, transporters, vendors, and other service providers may require different financing approaches based on their business models.

The financing challenge is therefore not simply about increasing agricultural credit. It is about better aligning existing and additional forms of finance with the actors, assets, and business models across the value chain.

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

Informal finance and access gaps

In parts of the value chain, handling and trading activities are supported by informal supply-chain finance arrangements. Commission agents provide credit to farmers at sowing and to pre-harvest contractors, act as farmers' selling agents, and charge a commission of 6% to 8% on the sale, borne by the farmer, in return for carrying the financial risk (Wageningen 2021). Their role combines financing with control over the marketing and sale of produce, including price-setting and management of the transaction (Wageningen 2021; TCI 2026). Field visits in early 2026 recorded commissions of 6% to 8% in private eggplant markets in Nadia, West Bengal, and 7% to 8% at the Kalamna orange market in Nagpur (TCI 2026).

Access to finance and the time required to secure it are also important. Informal finance can be physically accessible, involve limited documentation, and provide financing decisions within the selling season. Institutional finance may involve more documentation and longer processing times, which can be difficult where transactions involve highly perishable produce. A weather shock can further widen this gap: following crop losses after a storm in Purnia, Bihar, in early 2026, maize farmers with previous loan defaults reportedly turned to village traders and moneylenders after facing constraints in accessing subsidized credit and crop insurance (TCI 2026). **The financing gap is therefore shaped not only by product availability, but also by access, documentation, turnaround time, and the ability to accommodate seasonal and climate-related cash-flow risks.**

Several existing financing mechanisms and support measures address parts of this challenge, although their applicability varies by borrower, transaction, and commodity:

- **Pledge finance against electronic negotiable warehouse receipts (e-NWRs):** The Credit Guarantee Scheme for e-NWR-based Pledge Financing supports pledge loans against e-NWRs issued by registered warehouses. Eligible borrowers include FPOs, traders, MSMEs, and farmer cooperatives for agricultural and horticultural commodities (WDRA 2026).
- **Credit Guarantee Fund for FPOs:** Under the 10,000 FPO scheme, credit guarantees of up to INR 20 million per FPO are available through NABSanrakshan.

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

- **Agriculture Infrastructure Fund (AIF):** AIF provides interest subvention and credit-guarantee support for eligible post-harvest management infrastructure and community farming assets, including for eligible agri-entrepreneurs and startups.

  These mechanisms do not address the same counterparties or commodities. Warehouse-receipt finance depends on storable commodities and registered warehouses; FPO guarantees depend on an organized collective; and receivables finance requires an eligible MSME transaction.**The practical question is therefore not necessarily which new product is required, but where existing financing mechanisms and support measures can be extended or adapted within their eligibility and risk parameters**

A financing gap also remains for intermediaries and service providers such as aggregators, storage and cooling operators, logistics providers, and pack house and grading businesses. Their revenues may depend on seasonal utilization, service fees, pay-per-use arrangements, or contracts rather than ownership of the underlying agricultural assets. Depending on the business model and stage of development, relevant financing may therefore include **working capital, equipment finance or leasing, guarantees, concessional or blended finance, development finance, and equity.**

This is important because the actor managing a climate-related loss may not own the physical asset. A farmer may pay for storage without owning the cold room, while a trader or vendor may rent storage or purchase cooling and transport services. Financing therefore needs to consider the **counterparty, cash-flow model, asset ownership, and location of climate-related risk.**

The remaining challenge is therefore not simply a shortage of capital, but a mismatch between the **timing and location of climate-related losses and the structure through which finance is delivered**. Table 1 sets the informal and institutional financing mechanisms side by side, linking each value-chain node to its financing requirement and distinguishing existing **mechanisms** from areas where further adaptation or new structures may be needed.

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

Green Indian Financial System

Table 1: Climate loss, financing requirement, current finance, and Financing Approaches Across the Fruits and Vegetables Value Chain

Node	How climate loss is realized	Financing requirement it creates	Current source of finance	Existing financing mechanism	Potential financing or risk-management approach
Production	Heat at flowering and unseasonal rain cut yield and quality; losses correlate across a growing belt	Seasonal working capital that can accommodate a poor production year; term finance for on-farm adaptation	Crop loans and Kisan Credit Card; limited weather-index cover	Crop insurance and available weather-index products; term loans for eligible adaptation investments such as drip irrigation and shade nets	Portfolio limits based on district hazard and commodity concentration
Aggregation and first-mile handling	Heat exposure during harvesting and first-mile handling can accelerate spoilage; post-harvest losses occur across harvesting, sorting, grading, packing, and farm-level storage and transport	Short-tenor working capital against produce in transit; term finance for crates, pre-cooling, and pack houses	Informal credit from commission agents; commissions of 6% to 8% on sales	MSME term loans; Agriculture Infrastructure Fund subvention and guarantee; FPO credit guarantee; e-NWR pledge finance where the commodity is storable	Working capital against documented purchase orders or verified transaction records, where eligibility requirements are met
Storage	Heat waves raise cooling load and coincide with grid outages; single-commodity stores lose a	Capital for cooling assets; cover for revenue lost to outages and underutilization	Credit-linked capital subsidies of 35% to 50% under applicable schemes;	Collectively owned solar cold rooms with subsidy	Debt for pay-per-use operators supported by metered revenue; financing for solar

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

Node	How climate loss is realized	Financing requirement it creates	Current source of finance	Existing financing mechanism	Potential financing or risk-management approach
	season's throughput when one crop fails		mortgage-backed loans		backup systems; and insurance coverage for defined losses arising from qualifying power outage.
Transport	Heat in open trucks and flooded routes can spoil produce in transit	Asset finance for insulated and refrigerated last-mile vehicles; cover for consignment spoilage	Standard vehicle loans and other eligible vehicle finance	Eligible clean-transport finance; standard vehicle loans	Insulated or refrigerated vehicle finance combined with consignment-level spoilage cover
Wholesale and retail	Extreme heat shortens shelf life at open stalls and cuts footfall; the retailer is the largest single loss point for almost every crop, and vendors lose 40% to 50% of income on hot days	Liquidity to bridge income lost on heat days without a distress sale or a fresh loan application	Microfinance and street-vendor micro-loans	Heat-index insurance, piloted and redesigned	A pre-approved credit line attached to the existing vendor loan, drawing on the same weather trigger as the insurance; market cooling and shaded vending infrastructure

Source: Authors' analysis drawing on NABCONS 2022, Wageningen 2021, TCI 2026, NCCD 2015, IIR 2026, CGAP 2026, WDRA 2026, and RBI 2025

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

Insurance can play different roles across the value chain. At production, it can complement crop finance by covering specified weather-related losses. In transport, consignment-level spoilage cover can protect inventory against defined risks. At the retail level, parametric income insurance can provide liquidity following a defined climate trigger. These structures can complement credit by reducing the severity of climate-related cash-flow shocks. Table 2 gives working examples from India across these parts of the value chain.

Table 2: Examples from India of Financing and Risk-Management Approaches in Table 1

Node	Example	What it demonstrates
Aggregation and first-mile handling	Post-harvest infrastructure financed under the Agriculture Infrastructure Fund, assessed by the Indian Institute of Management Ahmedabad in November 2025	Post-harvest losses fell by 5% to 15% and farmer incomes rose by 11% to 15% where first-mile infrastructure was financed (Deccan Chronicle 2026)
Aggregation and first-mile handling	Pledge finance against e-NWRs, with guarantee cover under the Credit Guarantee Scheme for e-NWR based Pledge Financing	A collateral-free post-harvest loan for FPOs, traders, and cooperatives already exists; the binding constraint is registered storage and shelf life, not the credit structure (WDRA 2026)
Storage	Solar cold rooms owned by FPOs and women-led self-help groups in Odisha, run on a per-crate fee	A collective with metered revenue can be the borrower; a pilot at Rourkela reports spoilage falling from 17% to 4% (BASE Foundation 2026)
Storage	Pay-per-use cooling offered by a technology company that owns the unit	The asset owner and the asset user are different parties, and the subsidy follows the purchaser rather than the user, which changes who the lender underwrites (Ashden 2022)

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

Node	Example	What it demonstrates
Wholesale and retail	Self-Employed Women's Association (SEWA) Extreme Heat Income Insurance in Gujarat, Rajasthan, and Maharashtra	The 2023 pilot did not trigger payouts because the specified temperature threshold was not reached. A 2024 redesign using local historical temperature data and a two-day trigger resulted in payouts to more than 46,000 women. (Mongabay India 2024; CGAP 2026; QCF 2024)
Across nodes	SEWA Climate Welfare Facility	Savings, credit, and insurance combined so that a payout can offset a loan rather than closing the borrower's credit line (CGAP 2026)

Source: Authors' compilation from the cited sources

Equity and development finance

Debt is not the only form of capital required across the value chain. For some midstream counterparties, including cold-chain operators, aggregation platforms, logistics providers, and service companies providing cooling, grading, or storage, equity or other risk-bearing capital may be important before conventional debt can be accessed at scale. These businesses can be asset-intensive and seasonal, with revenues generated through service fees, contracts, or utilization rather than the sale of agricultural produce. Their financing needs may therefore not align well with conventional collateral-based lending.

Equity funding for Indian agritech has also come under pressure. Agritech startups raised USD 202 million across 36 deals in 2025, around 25% below the USD 269 million raised in 2024, with investor caution particularly affecting capital-intensive and logistics-led models (Inc42 2026). This matters for the green food value chain because some of the infrastructure and service businesses needed to strengthen climate resilience depend on patient, risk-bearing capital during their early stages.

Public and development finance can help address part of this gap. AgriSURE, a Category II Alternative Investment Fund with a corpus of INR 7.5 billion (USD 90 million), managed by NABVENTURES, provides equity and debt-oriented investment to startups and rural enterprises, including businesses across the agricultural value chain. The National Bank for Agriculture and Rural Development (NABARD) has also announced thematic funds,

Funded by
France AFD · sidbi · SHAKTI SUSTAINABLE ENERGY FOUNDATION · Global Gateway · EUROPEAN UNION

such as the NABARD Carbon Fund (NCF), focused on green and climate-related investments, creating additional potential channels for risk-bearing and catalytic capital (FAO, 2025).

For lenders, the implication is not that these businesses require entirely new financing products. Rather, debt can complement equity and development finance as businesses develop sufficient operating history and predictable cash flows. Relevant structures may include equipment finance or leasing, working-capital facilities, co-lending, guarantees, or other risk-sharing arrangements. The appropriate structure will depend on the counterparty, asset, revenue model, and repayment source.

Key portfolio exposures

The first exposure is **correlated default risk**. Tomato, onion, and potato production is concentrated in a relatively small number of states, with onion grown largely in Maharashtra, Madhya Pradesh, and Gujarat (PIB 2026a). A weather shock affecting a major production belt can therefore affect both output and prices across a wider market. A Climate Trends analysis of RBI data attributes 1.24 percentage points of vegetable inflation to changes in rainfall and 1.30 percentage points to changes in temperature (Deccan Herald 2025). The RBI Working Group on Agricultural Credit also found that agricultural loan performance moves with rainfall deficiency at the national level (RBI 2019). This geographic and commodity concentration creates the potential for correlated deterioration across exposures within the same production belt.

The aggregate picture supports the concern, although it does not establish the magnitude of correlation at the crop or district level. As of March 2026, agriculture carried a gross non-performing asset ratio of 5.1% and accounted for 37.2% of scheduled commercial banks' gross non-performing assets, while the systemwide ratio had fallen to 1.8% (RBI 2026a). The same report noted that a weak monsoon, alongside supply shocks, could push headline inflation toward the upper end of the tolerance band. An analyst from the Investment Information and Credit Rating Agency (ICRA) also warned in July 2026 that a weak monsoon could place rural borrowers under near-term cash-flow stress, with agriculture-linked borrowers accounting for a substantial share of microfinance exposure and farm-linked vehicle loans also potentially affected (Business Standard 2026). District-level default data by crop are not publicly available, so the extent of correlation within specific horticulture belts cannot be verified from public sources.

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

For lenders, the implication is that borrower-level credit assessment alone may not capture common exposure to physical climate risks. Geographic and commodity concentration can be considered alongside individual borrower risk when assessing portfolio exposure. The RBI's November 2025 Master Directions on Climate Finance and Management of Climate Change Risks provide a framework for the management of climate-related risks and the raising, allocation, verification, and disclosure of green deposits. However, they do not prescribe how physical climate risks in a horticulture portfolio should be mapped or integrated into credit risk assessment (RBI 2025). Illustrative considerations for assessing portfolio exposure may include mapping exposure by district, hazard, and commodity belt; assessing concentration across these dimensions; and considering the role of existing insurance or other risk-sharing arrangements.

The second exposure is an **unclassified green and adaptation asset base**. When the RBI surveyed 34 scheduled commercial banks in January 2022, only about one in three had analyzed the effect of climate change on their loan portfolios, and in roughly a third, no responsibility for climate initiatives had been assigned (RBI 2022). Where climate-related risks and opportunities have not been assessed systematically, banks may also have limited visibility into adaptation-related assets already present in their portfolios. The RBI's green-deposit framework includes climate-change adaptation, energy efficiency, renewable energy, clean transportation, water-efficient irrigation, and environmentally sustainable management of agriculture among the eligible uses for green-deposit proceeds (RBI 2025). The draft Climate Finance Taxonomy also places adaptation and resilience within its proposed framework (DEA 2025).

In this value chain, **many potentially bankable investments are primarily adaptation-oriented, although some also deliver mitigation co-benefits**. A lender that considers only assets with clear mitigation benefits may therefore have limited visibility into the climate-related investments already supported through its lending portfolio. The practical opportunity is not necessarily to create new green products, but to **identify and appropriately classify adaptation-related investments within existing lending pipelines and portfolios**, subject to applicable regulatory and taxonomy requirements. This makes early identification of eligible investments relevant for future alignment with India's evolving climate-finance framework.

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

Implementation barriers across financing mechanisms

Each financing mechanism in Table 1 faces implementation barriers related to data, transaction structure, or product design.

At the production level, weather-index insurance and belt-level portfolio assessment depend on sufficiently granular weather and location data. Differences between conditions at the insured location and the weather station used for an index can create basis risk and reduce the effectiveness of payouts (Leblois et al. 2014). The Reserve Bank Climate Risk Information System (RB-CRIS), announced in October 2024, is being released in phases, with the physical-risk module expected to be operationalized first and transition-risk data to follow (Business Standard 2024; ETBFSI 2026). Until the relevant datasets are available, lenders may need to combine portfolio-location data with information from the India Meteorological Department and other sources.

At the **aggregation and first-mile level**, financing needs differ by counterparty. Individual smallholder farmers are not eligible users of TReDS. **TReDS is a digital platform that facilitates the financing of eligible MSME receivables through financiers where there is an identifiable buyer and documented receivable. It may therefore be relevant to certain traders, aggregators, or other eligible agri-MSMEs, but not as a general source of farmer or FPO finance.** FPOs have a separate financing channel through the FPO credit guarantee mechanism; by December 2025, 2,583 of the 10,000 FPOs registered under the central scheme had secured a collateral-free loan (Agro Spectrum India 2025). The two mechanisms address different financing needs.

At the **storage and cooling level**, the relevant borrower and revenue model need to be established before selecting a financing structure. Cold rooms may be owned and operated by FPOs or other collectives and generate revenues through per-use fees, while technology companies may own the equipment and provide cooling through lease or pay-per-use models (BASE Foundation 2026; Ashden 2022). The Council on Energy, Environment and Water (CEEW) identified inadequate financing, seasonal utilization, users' limited paying capacity, and the cost of capital as key constraints for cooling enterprises (CEEW 2023). Financing therefore needs to reflect the borrower's ownership structure, utilization, and cash-flow model.

At the retail level, climate-linked insurance also presents product-design challenges. The 2023 Self-Employed Women's Association (SEWA) Extreme Heat Income Insurance pilot

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

did not trigger payouts because the specified temperature threshold was not reached, while a 2024 redesign using local historical temperature data and a two-day trigger resulted in payouts in 17 of 22 districts (Mongabay India 2024; CETEx 2026). These experiences highlight the importance of appropriate triggers and sufficiently localized data. The Self-Employed Women's Association's (SEWA) Climate Welfare Facility provides an example of linking savings, credit, and insurance to support borrowers facing climate-related shocks (CGAP 2026). Such contingent finance structures could be considered more broadly where a clear climate trigger, financing mechanism, and repayment structure can be established.

Gender considerations in financing

The Wageningen study finds that women's participation in fruit and vegetable value chains varies significantly by crop, ranging from 30% to 40% in orange and less than 40% in mango to more than 70% in tomato and onion, 70% to 80% in fresh peas, and more than 80% in eggplant. Women's roles are concentrated in activities such as weeding, picking, assembling, grading, and marketing, with limited participation in decision-making (Wageningen 2021). Women account for about 48% of the agricultural workforce but hold 13.96% of operational landholdings, while half of women working in agriculture are recorded as unpaid family workers (Frontline 2026).

These patterns matter for financial product design. **This does not imply that individual or micro borrowers cannot be financed against owned assets.** Rather, where women participate primarily as workers, informal businesses, or members of collective enterprises, ownership-based lending alone may not address their financing needs. Depending on the borrower and activity, cash-flow-based lending, working-capital finance, collective financing, or insurance may provide more appropriate financing or risk-management options.

Two examples illustrate this. In Odisha, solar-powered cold rooms operated by farmer producer organizations (FPOs) and women-led self-help groups demonstrate how financing shared post-harvest infrastructure can support women's participation while addressing storage and spoilage risks. At a pilot cold room in Rourkela, the promoter reported preliminary results showing a reduction in spoilage from 17% to 4% and an increase in farmer incomes of nearly 30%, although loan performance data have not been published (BASE Foundation 2026). Separately, the Self-Employed Women's Association's heat-index insurance covered 50,000 women in 2024 and triggered

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

payouts to more than 46,000, demonstrating how parametric insurance can provide protection against climate-related income losses (CGAP 2026; QCF 2024).

The financing approach should therefore reflect the borrower's role, asset ownership, cash-flow profile, and climate exposure, rather than assume that one financing model will apply across the value chain.

Implications for lenders and policymakers

The financing gaps identified above point to opportunities to strengthen existing financing mechanisms and consider where policy or regulatory clarity may be relevant..

For lenders

- **Improve portfolio visibility:** Lenders could record the location of financed cold rooms, pack houses, and produce vehicles and assess exposure against relevant climate hazards. Lenders can use available India Meteorological Department data until standardized datasets through RB-CRIS become available.
- **Strengthen midstream finance:** For eligible FPOs, traders, and agri-MSMEs, consider working capital against documented purchase orders or receivables, including leveraging the TReDS platform, where eligibility requirements are met. This can be complemented by term finance for first-mile assets such as crates, collection centers, pre-cooling, and grading facilities, alongside appropriate insurance or other risk-sharing mechanisms.
- **Test financing models for service providers:** Pilot financing for selected cooling and other service providers based on utilization, service revenues, contracts, and operating costs. The financing structure would need to identify the borrower, repayment source, asset ownership, and relevant climate-related risks at the outset.

For policymakers and development-finance institutions

- **Strengthen the fit of existing infrastructure finance:** Review whether existing capital subsidy and financing windows, including the Agriculture Infrastructure Fund, adequately support shared infrastructure operated by FPOs, collectives, and eligible service providers, within the Fund's existing eligibility and financing framework.

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

- **Provide greater taxonomy clarity:** Further development of the agriculture and MSME components of India's draft Climate Finance Taxonomy could provide greater clarity on eligible climate-finance activities and investments (DEA 2025).
- **Improve access to and robustness of climate-risk data:** More robust and accessible district-level weather, hazard, and loss data could support more granular credit assessment, portfolio monitoring, insurance design, and climate-risk analysis.

The RBI Working Group on Agricultural Credit highlighted the potential for FPO-based financing across the agricultural value chain and recommended an agricultural credit guarantee mechanism drawing on the experience of MSME credit guarantees (RBI 2019). For the green food value chain, this points to the need for financing approaches that consider not only farm-level borrowers, but also the intermediaries and service providers through which climate risks and financing needs extend across the value chain.

Conclusion

India's fruits and vegetables value chain does not face a single financing gap. Financing needs differ across farmers, aggregators, storage and cooling operators, transporters, processors, wholesalers, retailers, and service providers, and the appropriate response depends on the underlying cash-flow model, asset ownership, and location of climate-related risk. Existing financing mechanisms already address parts of these needs, but their applicability varies across value-chain actors and transactions.

For financial institutions, the opportunity is to improve how existing finance is assessed, structured, and combined across the value chain. This includes improving visibility of climate-related exposures, strengthening working-capital and asset finance for eligible midstream businesses, using insurance and guarantees where they can reduce specific risks, and considering equity, concessional, blended, or development finance where business models are not yet suited to conventional debt. A more granular understanding of the value chain can help financial institutions identify where existing products can be adapted and where additional risk-sharing or financing structures may be needed.

Funded by
France AFD
sidbi
SHAKTI SUSTAINABLE ENERGY FOUNDATION
Global Gateway
EUROPEAN UNION

References

Agro Spectrum India. 2025. India's FPO push gains momentum as 10,000 collectives go national with credit, digital and market linkages. 9 December 2025. [accessed 2026 Sep 21]. https://agrospectrumindia.com/2025/12/09/indias-fpo-push-gains-momentum-as-10000-collectives-go-national-with-credit-digital-and-market-linkages.html

Ashden. 2022. Ecozen Solutions: Ashden Award winner profile. [accessed 2026 Sep 21]. https://ashden.org/awards/winners/ecozen-solutions/

BASE Foundation. 2026. Leveraging digitalisation to manage cold rooms at scale in India: project description. [accessed 2026 Sep 21]. https://energy-base.org/projects/leveraging-digitalisation-to-manage-cold-rooms-at-scale-in-india/

Business Standard. 2024. RBI announces creation of Climate Risk Information System. 9 October 2024. [accessed 2026 Sep 21]. https://www.business-standard.com/markets/capital-market-news/rbi-announces-creation-of-climate-risk-information-system-124100900398_1.html

Business Standard. 2026. Weak monsoon raises rural credit risks; cash flow stress likely: ICRA. 16 July 2026. [accessed 2026 Sep 21]. https://www.business-standard.com/markets/news/weak-monsoon-raises-rural-credit-risks-cash-flow-stress-likely-icra-126071600141_1.html

[CETEx] Centre for Economic Transition Expertise. 2026. Leveraging parametric insurance for climate adaptation: parametric insurance in India. [accessed 2026 Sep 21]. https://cetex.org/wp-content/uploads/2026/06/Parametric-Insurance-in-India.pdf

[CGAP] Consultative Group to Assist the Poor. 2026. Confronting the climate and health nexus: lessons from Self-Employed Women's Association (SEWA). [accessed 2026 Sep

Funded by

France AFD · sidbi · SHAKTI SUSTAINABLE ENERGY FOUNDATION · Global Gateway · EUROPEAN UNION

21]. https://www.cgap.org/research/publication/confronting-climate-and-health-nexus-lessons-self-employed-womens-association

[CEEW] Council on Energy, Environment and Water. 2023. Making sustainable cooling in India affordable: a study of financing and cooperation models. [accessed 2026 Sep 21]. https://www.ceew.in/publications/making-sustainable-green-cooling-sector-affordable-india

Deccan Chronicle. 2026. AP sanctioned Rs 3,635 crore under Agriculture Infrastructure Fund. 4 August 2026. [accessed 2026 Sep 21]. https://www.deccanchronicle.com/southern-states/andhra-pradesh/ap-sanctioned-rs-3635-crore-under-agriculture-infrastructure-fund-1976568

Deccan Herald. 2025. Climate change impacts tomato, onion and potato production. 2 September 2025. [accessed 2026 Sep 21]. https://www.deccanherald.com/india/climate-change-impacts-tomato-onion-and-potato-production-3707696

[DA&FW] Department of Agriculture and Farmers Welfare. 2026. Second Advance Estimates of area and production of horticultural crops, 2025-26. Press Information Bureau. 12 June 2026. [accessed 2026 Sep 21]. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2271770

[DEA] Department of Economic Affairs, Ministry of Finance. 2025. Draft framework of India's climate finance taxonomy. [accessed 2026 Sep 21]. https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/may/doc2025575 51101.pdf

ETBFSI. 2026. RBI's climate risk repository RB-CRIS in final stages; physical risk module expected in coming months. 10 August 2026. [accessed 2026 Sep 21]. https://bfsi.economictimes.indiatimes.com/amp/articles/rbis-climate-risk-repository-rb-cris-in-final-stages-physical-risk-module-expected-in-coming-months/133069119

[FAO] Food and Agriculture Organization of the United Nations. 2025. FAO and NABARD collaborate to advance climate-resilient agriculture through innovative finance and carbon markets. 16 June 2025. [accessed 2026 Sep 21].

Funded by

France AFD · sidbi · SHAKTI SUSTAINABLE ENERGY FOUNDATION · Global Gateway · EUROPEAN UNION

https://www.fao.org/india/news/detail/fao-and-nabard-collaborate-to-advance-climate-resilient-agriculture-through-innovative-finance-and-carbon-markets/en

Frontline. 2026. Far from the madding fields. 5 September 2026. [accessed 2026 Sep 21]. https://frontline.thehindu.com/the-nation/agriculture/indian-farmers-leaving-farms-for-cities/article71428026.ece

Gaurav S. 2020. Do farmers care about basis risk? Evidence from a field experiment in India. Climate Risk Management. [accessed 2026 Sep 21]. https://www.sciencedirect.com/science/article/pii/S2212096319302128

[IMPRI] Impact and Policy Research Institute. 2026. Trade Receivables Discounting System (TReDS) (2014): assessing digital invoice financing for MSMEs. [accessed 2026 Sep 21]. https://www.impriindia.com/insights/policy-update/trade-receivables-discounting-system-treds-2014-assessing-digital-invoice-financing-for-msmes/

Inc42. 2026. Funding winter continues for Indian agritech startups. 22 January 2026. [accessed 2026 Sep 21]. https://inc42.com/buzz/funding-winter-continues-for-indian-agritech-startups/

[IIR] International Institute of Refrigeration. 2026. India: NCCD reports a 2.2% compound annual growth rate in cold storage capacity. 24 February 2026. [accessed 2026 Sep 21]. https://iifiir.org/en/news/india-nccd-reports-a-2-2-compound-annual-growth-rate-in-cold-storage-capacity

Leblois A, et al. 2014. Agricultural insurances based on meteorological indices: realizations, methods and research challenges. Meteorological Applications. 21(1). [accessed 2026 Sep 21]. https://rmets.onlinelibrary.wiley.com/doi/10.1002/met.303

Mongabay India. 2024. India experiments with parametric insurance to mitigate costs of disasters. June 2024. [accessed 2026 Sep 21]. https://india.mongabay.com/2024/06/india-experiments-with-parametric-insurance-to-mitigate-costs-of-disasters/

Funded by

France AFD · sidbi · SHAKTI SUSTAINABLE ENERGY FOUNDATION · Global Gateway · EUROPEAN UNION

[NABARD] National Bank for Agriculture and Rural Development. 2026. AgriSURE: Agri Fund for Start-ups and Rural Enterprises. [accessed 2026 Sep 21]. https://www.nabard.org/agrisure.aspx

[NABCONS] NABARD Consultancy Services. 2022. Study to determine post-harvest losses of agri produces in India. Ministry of Food Processing Industries. [accessed 2026 Sep 21]. https://www.mofpi.gov.in/sites/default/files/study_report_of_post_harvest_losses.pdf

[NCCD] National Centre for Cold-chain Development. 2015. All India cold-chain infrastructure capacity: assessment of status and gap. Ministry of Agriculture and Farmers Welfare. [accessed 2026 Sep 21]. https://nccd.gov.in/uploads/All_India_Cold_Chain_Infrastructure_2015_5da1279baa.pdf

Outlook Business. 2025. NABARD to launch INR 1,300 crore funds for agritech and climate start-ups in 2026. 16 December 2025. [accessed 2026 Sep 21]. https://www.outlookbusiness.com/news/nabard-to-launch-1300-cr-funds-for-agritech-climate-start-ups-in-2026

PolicyEdge. 2026. India's FPO push needs a centralised data spine. 5 February 2026. [accessed 2026 Sep 21]. https://www.policyedge.in/p/indias-fpo-push-needs-a-centralised

[PIB] Press Information Bureau. 2025c. Integrated Cold Chain and Value Addition Infrastructure (ICCVAI): India's post-harvest supply chain from farm gate to consumer. 29 October 2025. [accessed 2026 Sep 21]. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2183607

[PIB] Press Information Bureau. 2026a. India's resilient production systems in agriculture: from fields to market. 26 March 2026. [accessed 2026 Sep 21]. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2245639

[PIB] Press Information Bureau. 2026b. Agriculture Infrastructure Fund strengthens post-harvest infrastructure through interest-subvented loans. 3 February 2026. [accessed 2026 Sep 21]. https://pib.gov.in/PressReleasePage.aspx?PRID=2222807

Funded by

France AFD · sidbi · SHAKTI SUSTAINABLE ENERGY FOUNDATION · Global Gateway · EUROPEAN UNION

[QCF] Quadrature Climate Foundation. 2024. Protecting women and vulnerable communities from extreme heat: Climate Resilience for All. [accessed 2026 Sep 21]. https://www.qc.foundation/news-and-research/protecting-women-and-vulnerable-communities-from-extreme-heat/

[RBI] Reserve Bank of India. 2019. Report of the Internal Working Group to Review Agricultural Credit. 13 September 2019. [accessed 2026 Sep 21]. https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=942

[RBI] Reserve Bank of India. 2022. Report of the Survey on Climate Risk and Sustainable Finance. Sustainable Finance Group, Department of Regulation. [accessed 2026 Sep 21]. https://rbidocs.rbi.org.in/rdocs/PressRelease/PDFs/PR599214E4135AF0F4BB5A7E715BF0760568C.PDF

[RBI] Reserve Bank of India. 2025. Reserve Bank of India (Commercial Banks to Climate Finance and Management of Climate Change Risks) Directions, 2025. 28 November 2025. [accessed 2026 Sep 21]. https://rbi.org.in/Scripts/BS_ViewMasDirections.aspx?id=13138

[RBI] Reserve Bank of India. 2026a. Financial Stability Report, June 2026. [accessed 2026 Sep 21]. https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx

[RBI] Reserve Bank of India. 2026b. Reserve Bank of India (Trade Receivables Discounting System) Directions, 2026. 23 June 2026. [accessed 2026 Sep 21]. https://www.rbi.org.in/Scripts/BS_ViewMasDirections.aspx

[TCI] Tata-Cornell Institute for Agriculture and Nutrition. 2026. Farm to fork: exploring food value chains in India. Puri R, Kottayil NS. 20 May 2026. [accessed 2026 Sep 21]. https://tci.cornell.edu/?blog=farm-to-fork-exploring-food-value-chains-in-india

[Wageningen] Wageningen University & Research. 2021. Scoping study on fruits and vegetables: results from India. Report 2021-104. Wageningen Economic Research. [accessed 2026 Sep 21]. https://edepot.wur.nl/552208

Funded by

France AFD · sidbi · SHAKTI SUSTAINABLE ENERGY FOUNDATION · Global Gateway · EUROPEAN UNION

[WDRA] Warehousing Development and Regulatory Authority. 2026. Frequently asked questions: Credit Guarantee Scheme for e-NWR based pledge financing (CGS-NPF). Department of Food and Public Distribution. [accessed 2026 Sep 21]. https://website.wdra.gov.in/web/wdra/faq-cgs

About the Initiative

The Green Indian Financial System (GIFS)

The Green Indian Financial System (GIFS) Initiative is an Indo-European platform established in 2021 to support the greening of India's financial system and accelerate the country's low-carbon transition. GIFS Initiative is co-created by the Small Industries Development Bank of India (SIDBI), the Shakti Sustainable Energy Foundation (SSEF), and Agence Française de Développement (AFD), and is funded by the European Union (EU). The initiative brings together financial institutions, policymakers, industry leaders, researchers, and practitioners to advance sustainable finance through knowledge exchange, capacity building, and technical dialogue.

For more information, visit GIFS Initiative.

Funded by

France AFD | sidbi | SHAKTI SUSTAINABLE ENERGY FOUNDATION | Global Gateway | EUROPEAN UNION