



## **Transforming Agricultural Value Chains in Northeast India: Evidence from Farmer Aggregation, Market Linkage and Logistics Interventions**

**<sup>1</sup>Vivek Jain, <sup>2</sup>Niraj Kumar, <sup>3</sup>Ankit Tirole, <sup>4</sup>Kavita Bisht**

**<sup>1</sup>Director Livelihood Care Foundation, <sup>2/4</sup>Livelihood Care foundation, <sup>3</sup>Senior Associate TNS  
India Foundation**

### **ABSTRACT**

Agricultural value chains in Northeast India face severe structural challenges arising from fragmented production, weak aggregation systems, limited local consumption, high transportation costs, and the deep geographical distance between production clusters and major consumption markets. This study examines the field-level implementation experience of the Livelihood Care Foundation (LCF) in facilitating farmer aggregation and market linkages across major high-value agricultural commodities, including ginger, turmeric, banana, and pineapple. Based on field-level interventions involving more than 1,000 smallholder farmers and over 500 metric tons (MT) of aggregated produce, the study analyses the key constraints affecting market participation and farm-gate price realization. The field intervention demonstrates that sustainable market access is not determined solely by local production capacity. Effective village-level aggregation, the selection of reliable local aggregators, transport logistics availability, stringent quality management, buyer coordination, and market intelligence flow emerge as co-equal components of a functional agricultural value chain. Farmers in remote areas frequently depend on constrained local markets despite the existence of larger, high-value demand centres located more than 2,000 km away. This creates a severe structural mismatch between production locations and consumption markets. The study argues for an integrated Farmer–Aggregator–Transporter–Buyer (FATB) model, supported by digital market information, institutional aggregation, logistics planning, and demand-based production. Such an approach can significantly reduce transaction costs, minimize post-harvest value decay, improve market access, and strengthen the participation of smallholder and women farmers in formal agricultural value chains.

**Keywords:** Northeast India, agricultural value chain, farmer aggregation, market linkage, logistics, FPO, ginger, turmeric, pineapple, banana, rural livelihoods

### **1. Introduction**

Agriculture remains the primary source of livelihood and economic activity in Northeast India; however, smallholder agricultural producers face significant, systemic barriers in accessing remunerative, organized markets. The region possesses substantial, agro-climatically unique production potential in high-value commodities such as ginger, turmeric, pineapple, and banana. However, the economic benefits of this production are heavily constrained by fragmented smallholder supply, inadequate localized aggregation



infrastructure, and high downstream logistics costs (Roy & Hazari, 2023; Boro & Deb Barman, 2022).

The geographical structure of Northeast India creates an acute logistical challenge. Major consumption, processing, and terminal trading centres are concentrated heavily outside the region, while production remains highly dispersed across remote, smallholder farming communities. In many instances, the physical distance between these production clusters and major national markets exceeds 2,000 km. Consequently, smallholders frequently sell their produce through nearby village markets or to local intermediaries, even when higher-value markets exist elsewhere. This localized dependence often results in localized supply gluts and depressed farm-gate prices (Roy & Hazari, 2023; Sah et al., 2011).

The core systemic problem, therefore, is not simply a lack of production capacity at the farm level. It is a market-connectivity problem involving four interconnected nodes: aggregation, logistics, real-time market information, and buyer coordination (Chengappa, 2018; Das et al., 2015; Gardas et al., 2018).

To address these constraints, the Livelihood Care Foundation (LCF) has undertaken extensive field-level interventions focused on direct farmer aggregation and structured B2B buyer-market linkages. LCF's operational experience spans an outreach of more than 1,000 farmers and the mobilization of over 500 MT of multiple agricultural commodities. This provides a robust, empirical case-study baseline to examine the practical challenges of building resilient agricultural value chains in geographically difficult and remote regions.

## **2. Objectives of the Study**

1. Examine the major structural and infrastructural constraints affecting agricultural market access in Northeast India.
2. Analyse the role of village-level aggregation mechanisms in effectively connecting smallholder farmers with larger institutional markets.
3. Examine transportation and logistics infrastructure as core determinants of agricultural market competitiveness.
4. Identify the operational challenges associated with local aggregator selection and value chain supply coordination.
5. Assess the potential of direct business-to-business (B2B) market linkage models for improving smallholder market participation.
6. Develop an integrated, scalable framework for strengthening farmer-centric agricultural value chains in geographically remote clusters.

## **3. Methodology**

This study adopts a field-based, empirical case-study approach based on the direct implementation data and operational observations of the Livelihood Care Foundation (LCF) in Northeast India.

The analysis draws upon qualitative and quantitative observations recorded during field procurement, village aggregation, and long-distance transport coordination.



**Table 1: Scope of LCF field intervention**

| Indicator              | Field Experience Scope / Parameters                                                                         |
|------------------------|-------------------------------------------------------------------------------------------------------------|
| Farmers Reached        | 1,000+ smallholder farmers                                                                                  |
| Produce Aggregated     | 500+ Metric Tons (MT)                                                                                       |
| Major Commodities      | Ginger, turmeric, banana, pineapple                                                                         |
| Market Channels        | Terminal mandis, regional processors, organic businesses, institutional/industrial buyers                   |
| Key Intervention Areas | Input/output aggregation, direct buyer linkage, long-distance logistics, and multi-stakeholder coordination |

The study uses quantitative field observation supported by operational data generated during procurement, aggregation, transportation and buyer coordination.

#### **4. Field Observation & Experience**

##### **4.1 Market Linkage Is Not Just About Finding a Buyer**

*(Reported by Vivek Jain, Marketing Expert, Meghalaya, Northeast India)*

Many people think market linkage means connecting farmers with a buyer. In the field, we quickly realize that this is only a small part of the job. A successful market linkage starts long before the produce is harvested and continues even after it reaches the consumer.

The first question is not, “Who will buy?” The real question is, “What does the market want?”

A buyer may ask for pineapples weighing 1.8–2.2 kg, cardamom bananas of a specific length, ginger with bold rhizomes and low fibre, or fruits harvested at the right maturity for a seven-day journey. If farmers do not understand these requirements, the produce may be rejected or sold at a lower price.

Market linkage begins with understanding consumer demand and buyer specifications. It requires continuous communication with wholesalers, retailers, processors, exporters, and institutional buyers. Every market has different expectations regarding size, colour, maturity, taste, cleanliness, packaging, and delivery schedule.

Harvesting is equally important. Produce harvested too early lacks taste, while overripe produce may not survive transportation. The correct harvesting stage depends on the destination market, transport time, and expected shelf life. A pineapple going to a nearby city and one travelling over 2,000 kilometres cannot be harvested in the same way.

After harvesting comes sorting, grading, and quality control. Mixing different sizes and qualities in one consignment reduces buyer confidence. Standardization builds trust and helps farmers receive repeat orders and better prices.

Logistics is where many market linkages fail. Good produce can lose its value because of poor packaging, delayed loading, rough handling, or inefficient transportation. Planning



vehicles, air cargo, rail, road transport, loading schedules, packaging materials, and delivery timelines is as important as production itself.

Shelf life determines marketing strategy. Every commodity has a biological clock. The time available to sell fresh produce is limited. Understanding shelf life helps decide when to harvest, how to pack, where to send the produce, and which market offers the best return.

Market information must flow continuously. Prices, demand, arrivals, seasonal trends, weather conditions, festivals, and competitor supply influence buying decisions every day. A market linkage professional must monitor these changes and guide farmers accordingly.

Trust is the foundation of sustainable market linkage. Buyers expect consistent quality and timely deliveries. Farmers expect transparent pricing and assured payments. Building this trust requires regular communication, honesty, and long-term relationships—not just one-time transactions. Therefore, market linkage is not a single activity. It is a complete value-chain management process.

#### **4.2 Comparative Mandi Operational Experience Across Six Markets**

*(Field observations reported by Mr. Niraj Kumar, Program Manager, Livelihood Care Foundation)*

Across visits to Azadpur, Patna, Varanasi, Dhanbad, Meerut and Jaipur Muhana, one lesson kept returning: a fruit's price does not travel with it from the farm. It changes with the road, the season, the quantity available, the quality buyers want and the distance to the next market. Azadpur Mandi made that lesson visible at scale. Buyers and sellers bring produce from across India as different regions come into season. Based on my field experience, the market handles an estimated 5,000–7,000 metric tonnes of fruits and vegetables each day. In that volume, appearance alone is not enough. Buyers look at freshness, maturity, grading, packing, damage and how long produce is likely to last after arrival.

The journey matters just as much as the harvest. Highly ripe fruit may be difficult to sell when it must travel onward to another city. Produce needs careful handling from harvest through sorting, grading, packing and loading. In some arrangements, commission agents help connect buyers and sellers, with commission reported at around 5–7%. Smaller farmers can struggle to sell directly because transporting a small quantity costs more per kilogram and finding the right buyer takes time. Some aggregators address this by pooling produce from two or three farms into one vehicle. Larger vehicles, sometimes carrying around 22–28 tonnes, can also move produce from Azadpur to smaller markets. My field estimate was that about half the volume may be consumed in Delhi, with much of the rest redistributed elsewhere. These figures are approximate.

Leaving Delhi's large wholesale market and looking east, Patna showed how local production can change the calculation. Bihar produces fruits such as bananas and litchis, and the city's sizeable population creates steady demand. When local supply is strong, some fruits can be available at lower prices. Bananas from Meghalaya may also find buyers in Patna, depending on the purchase price, transport cost, quality and demand when they arrive. By contrast, products such as coconut and kiwi often travel farther because local production is limited, and the added journey can raise their price.



Varanasi offered another view of regional trade. Its position in eastern Uttar Pradesh and its road links allow it to serve nearby districts and markets. Prices there still shift with season, supply and transport costs. Coconut and kiwi, for example, may cost more because of where they are produced and how far they must travel. The mandi's connections help move produce, but distance and availability continue to shape what buyers pay.

In Dhanbad, the importance of incoming supply was especially clear. The market receives produce from neighbouring states, including West Bengal, Bihar, Odisha and Uttar Pradesh, and also serves nearby places such as Bokaro, Giridih and Deoghar. When a commodity has to travel farther, its price can rise. Bananas may therefore cost more than in a closer or more supply-rich market. Apples can also become more expensive in the off-season, when availability is limited and transport adds to the cost.

Meerut sits roughly 80 kilometres from Delhi, but proximity does not always mean a simple route. Some produce reaches Meerut through Azadpur before continuing to the city, adding another movement and another handling step. Pineapple may follow this route. Seasonal mangoes grown within Uttar Pradesh can be more competitive because they travel a shorter distance. Buyers serving smaller markets often arrive between 4:00 and 7:00 in the morning to select produce for onward sale. Commission was reported at around 5% in some arrangements, with labour and other charges counted separately.

At Jaipur Muhana Mandi, I saw how strongly supply from outside the city shapes the market. Apples can be competitively priced when arrivals from Himachal Pradesh and other producing areas are high. Pomegranates may also be available at good prices when supplies come from Rajasthan and Gujarat. Pineapple, by contrast, can cost more when it travels from distant regions such as Kerala. Regular relationships between buyers and sellers help transactions proceed and payments arrive on time.

Taken together, these markets showed me that there is no single price pattern for fruit and vegetables across India. Local production, distance, freight, seasonal supply, quality and consumer demand all work together. A fruit grown near a mandi may reach it at a competitive price; the same fruit can cost more elsewhere after a longer journey or a second round of handling.

The route from farm to consumer is not always a straight line. Produce may pass from farmer to aggregator, transporter, mandi agent, wholesaler and smaller market before reaching a retailer. Large aggregators may also sell directly to wholesalers, retailers or institutional buyers. Smaller farmers often rely more on aggregators or commission agents to reach those buyers.

These visits changed how I think about market access. Producing good fruit is only the beginning. It must reach the right market, at the right time, in the right quantity and in saleable condition. Better aggregation, careful post-harvest handling, suitable transport, timely market information and reliable buyer relationships can help connect farmers to markets where their produce has the best chance of earning a fair return.

## **5. Major Findings**

### **5.1 Production is Not the Primary Constraint**

The field implementation experience clearly indicates that smallholder farmers in Northeast India are highly capable of producing commercially significant quantities of crops. The primary bottleneck preventing market entry is instead the highly fragmented nature of this production.

A typical buyer requires a predefined minimum volume, consistent quality grades, uniform packaging specifications, and adherence to rigid delivery schedules. Individual smallholder farmers cannot meet these commercial requirements independently due to limited farm size and lack of direct market access. Therefore, institutionalized aggregation acts as the mandatory bridge required to connect fragmented smallholder farm production with organized, large-scale market demand (Chengappa, 2018; Das et al., 2015).

### **5.2 Dependence on Local Markets and Value Decay**

A significant proportion of smallholders continue to depend entirely on nearby village markets or traditional local traders. Local markets provide immediate cash liquidity and require very limited logistical coordination or grading effort from the individual farmer (Roy & Hazari, 2023; Sah et al., 2011).

However, local markets have highly constrained consumption capacity for high-yielding agricultural commodities produced at scale. This capacity constraint becomes highly problematic for perishable or semi-perishable crops such as pineapple, banana, ginger, and turmeric, where synchronized seasonal harvesting creates substantial temporary surpluses (Roy & Hazari, 2023; Boro & Deb Barman, 2022).

In the absence of external market channels, this dynamic creates a destructive economic cycle:

**High Seasonal Supply → Limited Local Demand → Severe Price Pressure →  
Distress Sale**

This demonstrates the critical need to structurally connect production clusters with larger consumption and processing centres outside the region well before the peak harvesting period begins (Chengappa, 2018; Roy & Hazari, 2023).

### **5.3 Aggregator Selection as a Critical Bottleneck**

One of the most important operational lessons emerged from the field implementation: identifying, training, and retaining an appropriate village-level aggregator is just as critical as securing the final institutional buyer. The aggregator serves as the essential operational link between the farm-gate and the logistics network (Das et al., 2015; North Eastern Regional Agricultural Marketing Corporation Limited [NERAMAC], 2022).

The field data indicates that a successful local aggregator must possess a specific suite of capabilities: high levels of farmer-level institutional trust and a permanent local community presence; proven operational ability to effectively mobilize small volumes of produce from multiple households; basic quality-control capacity to enforce sorting and grading standards at the point of collection; transparent payment practices and reliable bookkeeping; and

operational capacity to coordinate physical vehicle loading schedules and communicate fluidly with both truck operators and corporate buyers.

The LCF experience shows that weak or poorly vetted aggregator selection results directly in inconsistent supply volumes, severe quality variation within single batches, delayed collections, increased spoilage, and escalated transaction costs.

#### **5.4 Logistics as a Structural Constraint**

For the landlocked and topographically challenging region of Northeast India, transportation logistics cannot be treated merely as a secondary supporting service. Logistics acts as a primary, structural determinant of agricultural competitiveness and market access (Roy & Hazari, 2023; Shukla & Jharkharia, 2013).

The long-distance movement of agricultural commodities from the Northeast to terminal national markets creates severe operational challenges: escalated freight costs that directly compress farm-gate profit margins; prolonged transit times over difficult terrain, accelerating product deterioration and transit weight loss; suboptimal post-harvest handling, rough loading, and lack of specialized packaging materials; high volatility in vehicle availability and an acute lack of reliable return-load options, which inflates one-way transport pricing; and communication and scheduling mismatches between village aggregators, transport providers, and terminal buyers (Gardas et al., 2018; Shukla & Jharkharia, 2013).

Consequently, attempting to execute market linkage contracts without logistics and supply chain planning fails to generate sustainable financial benefits for the farmers.

#### **6. Proposed Farmer–Aggregator–Transporter–Buyer (FATB) Model**

To resolve the structural value chain frictions identified in the field, this study proposes an integrated Farmer–Aggregator–Transporter–Buyer (FATB) model. This framework transitions the chain from a traditional, high-risk ‘produce-then-sell’ approach to a more efficient, demand-driven architecture.

The physical flow of commodities under the FATB model follows a structured progression:

**Farmer → Village Aggregator → FPO / Collection Centre → Transporter →  
Buyer / Processor / Mandi**

This physical movement is optimized and synchronized by a continuous, digital information layer that flows in reverse to de-risk the chain:

**Demand Information → Aggregation Planning → Logistics Planning →  
Synchronized Dispatch → Delivery → Payment Feedback**

(Ministry of Development of North Eastern Region, 2024; Ministry of Development of North-East Region, 2026)

By implementing this dual-layer framework, explicit terminal market requirements (regarding volumes, grades, and timing) are communicated backwards through the supply chain. This ensures that production and aggregation are directly aligned with pre-secured buyer demand before the crop leaves the field (Chengappa, 2018; Shruti et al., 2019).



## **7. Implications for Small and Women Farmers**

Smallholder and women farmers face disproportionately high barriers when attempting to access distant, institutional markets independently. Because their individual transaction volumes are small, they cannot absorb high transport costs, nor do they possess the bargaining power to negotiate directly with large corporate buyers (Chengappa, 2018; North Eastern Regional Agricultural Marketing Corporation Limited [NERAMAC], 2022).

Institutionalized collective aggregation serves as an equalizer. By pooling fragmented smallholder yields into centralized collection points, the FATB framework allows multiple vulnerable producers to participate safely in a single, high-volume commercial transaction.

The economic equation underlying this mechanism is straightforward:

$$\text{Individual Farmer Production} + \text{Collective Institutional Aggregation} = \text{Commercially Viable Marketable Volume}$$

This structural aggregation approach is highly relevant for Farmer Producer Organisations (FPOs), women-led self-help groups (SHGs), and village-level enterprises (Chengappa, 2018; North Eastern Regional Agricultural Marketing Corporation Limited [NERAMAC], 2022).

## **8. Conclusion**

The operational experience of the Livelihood Care Foundation (LCF) demonstrates that transforming agricultural value chains in Northeast India requires interventions that go far beyond simply increasing farm production. The central developmental challenge is to establish a highly efficient, logistically sound connection between distributed, smallholder production clusters and geographically distant, high-value consumption markets.

The field implementation data involving 1,000+ farmers and 500+ MT of aggregated crops confirms that long-term value chain success depends entirely on the synchronized efficiency of four core, interconnected pillars:

$$\text{Aggregation} + \text{Market Linkage} + \text{Logistics} + \text{Coordination}$$

Based on these findings, this study recommends that policy measures and rural development programs prioritize the strengthening of village-level collection infrastructure, the institutional formalization of aggregator-selection and training mechanisms, the optimization of multimodal transport coordination, and the scaling of demand-linked digital procurement systems (Chengappa, 2018; Gardas et al., 2018; Ministry of Agriculture & Farmers' Welfare, Government of India, 2018).

Transitioning the regional agricultural economy from a reactive 'produce-and-sell' model to a structured 'demand-aggregate-transport-sell' model is essential to build inclusive, resilient, and highly profitable value chains for the smallholder and women farmers of Northeast India.

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