

Reimagining Arunachal Pradesh Tea Economy: Digital Transformation, Sustainable Value-Chain Development, Women's Empowerment through Self-Help Groups, and Gen Z Engagement in Northeast India

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Abstract

The tea economy of Arunachal Pradesh represents an emerging opportunity for rural livelihood generation, entrepreneurship, women's economic participation, sustainable agriculture, and regional branding in Northeast India. However, tea growers—particularly small and marginal producers—face challenges related to fragmented production, limited processing infrastructure, dependence on intermediaries, price volatility, weak market access, inadequate branding, and limited participation in value-added activities. At the same time, rapid digitalization, social-media-based marketing, electronic commerce, consumer interest in sustainable products, women's Self-Help Groups (SHGs), and the growing purchasing influence of Generation Z (Gen Z) create new possibilities for restructuring the tea value chain.

This research paper proposes an integrated framework for reimagining Arunachal Pradesh's tea economy through four mutually reinforcing dimensions: digital transformation, sustainable value-chain development, women's empowerment through SHGs, and Gen Z engagement. The study adopts a mixed-method research design incorporating secondary literature, stakeholder analysis, structured questionnaires, interviews, and value-chain assessment. The proposed analytical framework examines relationships among digital adoption, sustainable production, SHG participation, perceived product authenticity, Gen Z engagement, and market performance. Evidence from the broader Northeast Indian tea sector indicates that collective organization can improve growers' access to markets, information and fairer returns, while sustainable production and value addition can enable smallholders to move beyond the role of raw-material suppliers.

The paper argues that Arunachal Pradesh can develop a distinctive “green, digital and community-owned tea economy” by integrating traceability, e-commerce, social-media storytelling, sustainable cultivation, women-led enterprises, collective processing, and youth-oriented branding. The study concludes that digital transformation should not be viewed merely as a marketing intervention but as an enabling mechanism connecting producers, SHGs, processors, consumers and institutions across the entire value chain....

Keywords : Arunachal Pradesh, tea economy, digital transformation, sustainable value chain, Self-Help Groups, women empowerment, Generation Z, social media marketing, e-commerce, Northeast India..

INTRODUCTION

Tea is one of the world's most important agricultural commodities and provides livelihoods to millions of people across producing regions [6][9]. In India, the tea sector has historically been concentrated in states such as Assam, West Bengal, Tamil Nadu and Kerala, but the Northeast is increasingly recognized for opportunities involving small tea growers, specialty teas, organic cultivation and geographically distinctive products.

Arunachal Pradesh possesses considerable potential for developing a differentiated tea economy based on its agro-climatic diversity, relatively low industrial concentration, biodiversity, indigenous knowledge and opportunities for sustainable agricultural production [5][7]. The state's tea sector, however, faces structural challenges. Small

growers often have limited bargaining power, inadequate access to processing facilities and restricted direct access to consumers [10]. Similar problems have been documented among small tea growers elsewhere in Northeast India, where price volatility, weather uncertainty, middlemen dependence and inefficient marketing channels constrain profitability [8].

Research on Assam demonstrates that small tea growers can improve their position by participating in processing and marketing rather than remaining confined to primary production [11]. Organic cultivation, for example, has created opportunities for some smallholders to process and market tea themselves, thereby enabling alternative value chains and greater value capture [13].

Collective organization is another important pathway. Research on producer collectives shows that Self-Help Groups can help small tea growers obtain information, improve market access and strengthen their bargaining position [12]. The Government of India has also emphasized SHGs/FPOs, mini tea factories and capacity building as mechanisms for moving small growers up the tea value chain [14].

Digital technology adds another dimension to this transformation. Social media, e-commerce, digital payments, QR-based traceability, online storytelling and direct-to-consumer marketing can reduce informational and geographical barriers between Arunachal's producers and national or international consumers [2][16]. Importantly, the state's tea stakeholders have themselves been encouraged to combine traditional and digital marketing, develop distinctive brands, use social media storytelling and establish e-commerce channels [3][15].

At the consumer end, Generation Z represents an increasingly important market segment. Gen Z consumers tend to interact heavily with digital media and can be responsive to sustainability, authenticity, ethical production, environmental responsibility and social narratives [7][11]. Recent research on sustainable food purchasing demonstrates the relevance of attitudes, perceived behavioural control, product availability and social media to sustainable consumption intentions.

Against this background, the present study integrates four dimensions that are usually investigated separately:

Digital transformation of the tea value chain

Sustainable production and value addition

Women's empowerment through SHGs

Gen Z engagement and sustainable consumption

The central proposition is that these dimensions can collectively transform Arunachal Pradesh's tea sector from a predominantly production-oriented model into a digitally connected, sustainable, inclusive and consumer-oriented value system.

OBJECTIVES OF THE STUDY

The study has the following objectives:

To examine the existing structure and challenges of the tea economy in Arunachal Pradesh.

To investigate the potential of digital technologies for improving tea production, marketing and distribution.

To examine opportunities for sustainable value-chain development.

To assess the potential role of women's SHGs in tea processing, packaging, branding and marketing.

To examine Gen Z's attitudes toward sustainable and regionally authentic tea products.

To develop an integrated conceptual model linking digitalization, sustainability, SHG participation and Gen Z engagement.

To suggest policy and managerial strategies for building a competitive Arunachal Pradesh tea brand.

RESEARCH QUESTIONS

The research is guided by the following questions:

RQ1: How can digital technologies improve market access and value capture for tea growers in Arunachal Pradesh?

RQ2: What sustainable value-chain practices can improve the economic, environmental and social performance of the tea sector?

RQ3: How can women-led SHGs contribute to tea processing, entrepreneurship, branding and value addition?

RQ4: What factors influence Gen Z's intention to purchase Arunachal Pradesh tea?

RQ5: Can digital storytelling and sustainability communication strengthen Gen Z engagement with Arunachal Pradesh tea?

RQ6: How can digital transformation, sustainability, SHGs and Gen Z engagement be integrated into a unified tea-economy development model?

THEORETICAL BACKGROUND

Value Chain Theory

Porter's value-chain perspective conceptualizes competitive advantage as emerging from interconnected activities involved in creating, marketing, delivering and supporting a product [2]. Information technology can transform these activities and their linkages.

For Arunachal Pradesh tea, the value chain can be represented as:

Input suppliers → Tea growers → SHGs/FPOs → Collection → Processing → Quality certification → Packaging → Branding → Digital marketing → E-commerce → Consumers

The proposed transformation is therefore not limited to online promotion. Digital technology can potentially influence production records, procurement, inventory, quality control, traceability, logistics, customer relationships and payments.

Sustainable Value-Chain Theory

Sustainable value-chain development extends conventional value-chain analysis by incorporating:

Economic sustainability,

Environmental sustainability, and

Social sustainability.

Research among Assam's small tea growers suggests that sustainable/organic production can promote learning, environmental awareness, new networks and entrepreneurship while creating opportunities for greater participation in processing and marketing.

For Arunachal Pradesh, sustainable tea development can include:

reduced chemical inputs,

soil and water conservation,

biodiversity protection,

climate-resilient cultivation,

organic/low-input production where appropriate,

sustainable packaging,

waste reduction,

energy-efficient processing,

Traceability and responsible sourcing.

Social Capital and Collective Action Theory

SHGs can be interpreted through the concept of collective action and social capital. Individual small growers may have limited bargaining power, while collective organizations can aggregate production, information, finance and marketing capabilities.

Evidence from Indian SHGs indicates positive effects on women's empowerment, particularly through greater control over income, credit-related decision-making and group participation.

Thus, SHGs could become more than savings-and-credit institutions. In the tea economy they can potentially function as:

Producer → Processor → Brand owner → Digital seller → Entrepreneur

Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) proposes that behavioural intention is influenced by:

attitude,

subjective norms, and

perceived behavioral control.

The framework is particularly relevant for understanding Gen Z's intention to purchase sustainable tea.

A proposed model is:

Sustainability attitude + Social influence + Perceived product availability + Perceived authenticity → Purchase intention

Recent research on green food purchasing in India found that attitude and perceived behavioural control influenced purchase intention, while social media positively affected key TPB constructs.

Technology Acceptance Perspective

Digital transformation among growers and SHGs depends not merely on availability of technology but also on perceived usefulness, ease of use, trust, digital skills, infrastructure and expected economic benefits.

Potential technologies include:

smartphones,

WhatsApp Business,

social-media platforms,

digital payments,

e-commerce,

QR codes,

cloud-based records,

GIS/GPS,

digital traceability,
AI-assisted demand forecasting,
Digital customer analytics.

LITERATURE SURVEY

Small Tea Growers and Value-Chain Participation

Das and Mishra (2019) examined the tea value chain and constraints faced by small tea growers in Assam. Their study identified substantial value addition at processing and downstream stages, while growers and collectors received comparatively limited returns. Price fluctuations, labour shortages and other structural constraints were important problems [1].

Deka et al. examined sustainable value-chain development among small tea growers in Assam and found that organic cultivation could facilitate greater participation in processing and marketing. The study emphasized collective organization, producer organizations, trust and strategic collaboration as mechanisms for developing inclusive value chains [2].

Sharma et al. (2025) identified price volatility, weather variability, forced sales and middlemen dependence among major challenges affecting small tea growers in Assam [6].

These findings are relevant to Arunachal Pradesh because a fragmented producer base can remain vulnerable when producers have little control over processing, branding and market access.

Collective Organization and SHGs

Saha (2020) found that self-help and collective action among small tea growers can support access to markets, fairer prices and information [3].

Research on SHGs more broadly indicates that collective participation can contribute to financial inclusion, entrepreneurship, confidence, skills and market access.

A systematic review of SHG research found substantial evidence connecting SHG participation with multidimensional women's empowerment.

The implication for Arunachal Pradesh is that women-led SHGs could potentially become decentralized tea enterprises undertaking:

leaf collection,
artisanal processing,
packaging,
branding,
online selling,
tourism-linked tea experiences,
handicraft-tea product combinations, and
Direct consumer engagement.

Women and Tea Economy

Women have historically played important roles in India's tea sector, especially in plantation and processing activities. However, participation in labour does not automatically translate into ownership, decision-making power or control over value creation [7].

SHG-based entrepreneurship provides an opportunity to shift women's participation from labour-intensive activities toward **enterprise ownership and value capture**.

Ghosh et al. found that SHG intervention and entrepreneurial characteristics are relevant to economic and socio-cultural empowerment of rural women [8].

Therefore, the present study emphasizes **women as value-chain entrepreneurs rather than merely workers**.

Digital Transformation

Digital transformation can alter the relationship between producers and consumers by reducing information asymmetry and transaction costs. Porter and Millar argued that information technology can transform activities throughout the value chain and strengthen competitive advantage [4][5].

For Arunachal tea, digitalization could support:

Value-chain stage	Digital intervention
Production	Mobile farm records
Extension	Digital training/videos
Procurement	Digital collection records
Processing	Batch tracking

Quality	Digital quality documentation
Branding	Social media
Marketing	Influencer/content marketing
Sales	E-commerce
Payments	Digital payments
Traceability	QR code
Customer feedback	Online reviews
Market intelligence	Analytics

Table 1. Digitalization with value chain stage

Gen Z and Sustainable Consumption

Gen Z represents an important consumer segment for digitally marketed sustainable products. Research on sustainable food purchasing among Gen Z emphasizes sustainability-related attitudes and behavioural intentions. For Arunachal tea, Gen Z engagement could be built around:

origin stories,
indigenous cultural narratives,
sustainability,
organic/low-chemical cultivation,
women entrepreneurship,
farmer stories,
biodiversity,
visually appealing packaging,
short-form video,
influencer collaborations,
QR-enabled farm-to-cup stories.

The product therefore becomes more than tea; it becomes a cultural and sustainability experience.

RESEARCH GAP

Existing studies have generated valuable insights into individual dimensions of the tea economy, including:

smallholder constraints,
sustainable cultivation,
value-chain participation,
SHGs,
women empowerment, and
digital marketing.

However, there is comparatively limited integrated research connecting all four dimensions—digital transformation, sustainable value-chain development, women's SHGs and Gen Z consumer engagement—within the specific context of Arunachal Pradesh.

The research gap can therefore be expressed as:

Existing research generally examines production, sustainability, women's empowerment, digitalization and consumer behaviour as separate domains. A comprehensive model explaining how these factors jointly transform Arunachal Pradesh's tea economy remains underdeveloped.

CONCEPTUAL FRAMEWORK

The proposed framework is:

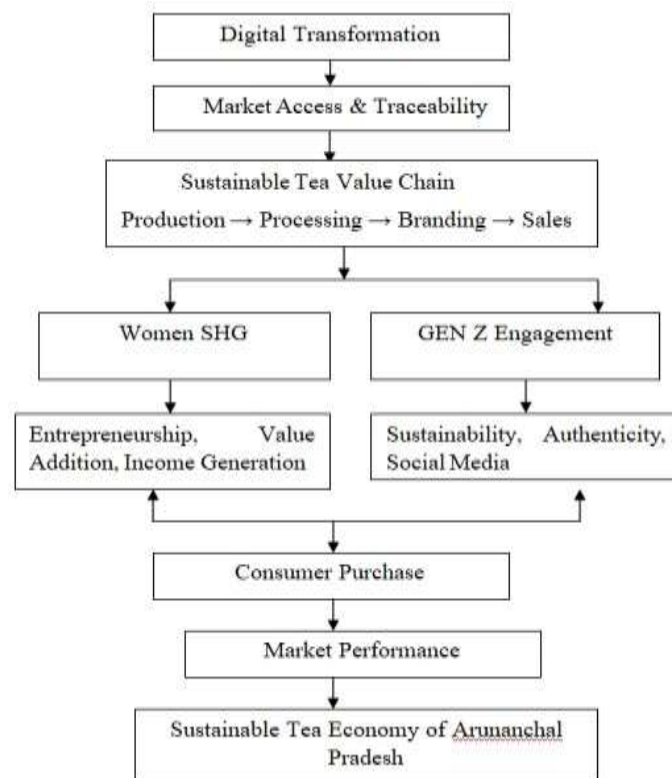


Figure 1. Conceptual framework of research

RESEARCH METHODOLOGY

Research Design

The study proposes a **mixed-method research design**, combining quantitative and qualitative approaches.

Phase I: Secondary research

Secondary information may be collected from:

Tea Board of India,
Government of Arunachal Pradesh,
Ministry of Commerce and Industry,
NABARD,
NITI Aayog,
academic journals,
Reports and policy documents.

Phase II: Primary research

Primary data may be collected from four stakeholder categories:

Small tea growers
Women SHG members
Tea processors/entrepreneurs
Gen Z consumers

Proposed Sample

A suitable sample design for an empirical version of this paper could be:

Respondent group	Proposed sample
Small tea growers	150
Women SHG members	100
Tea entrepreneurs/processors	50
Gen Z consumers	200
Total	500

Table 2. Sample of respondent group

The actual sample should be determined after identifying tea-producing clusters and completing a sampling-frame assessment.

Sampling Technique

A multistage sampling technique is proposed:

Stage 1: Identification of important tea-producing areas.

Stage 2: Selection of growers/SHGs/processors.

Stage 3: Selection of Gen Z consumers using purposive/stratified sampling.

Data Collection Instrument

A structured questionnaire can use a five-point Likert scale:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

Major constructs

Digital Transformation (DT)

DT1: Digital tools improve access to tea markets.

DT2: Social media can improve tea brand visibility.

DT3: E-commerce can reduce dependence on intermediaries.

DT4: Digital traceability can improve consumer trust.

Sustainable Value Chain (SVC)

SVC1: Sustainable cultivation improves product value.

SVC2: Eco-friendly packaging enhances competitiveness.

SVC3: Sustainable processing should be encouraged.

SVC4: Sustainable practices can improve long-term farmer income.

SHG Empowerment (SHE)

SHE1: SHGs improve women's financial independence.

SHE2: SHGs improve access to markets.

SHE3: SHGs encourage entrepreneurship.

SHE4: SHGs increase participation in decision-making.

Gen Z Engagement (GZE)

GZE1: Sustainability influences tea purchasing.

GZE2: Social media influences tea-brand awareness.

GZE3: Product origin influences purchase intention.

GZE4: Authentic stories increase interest in regional tea.

Purchase Intention (PI)

PI1: I would purchase Arunachal Pradesh tea.

PI2: I would recommend it to others.

PI3: I would purchase it online.

PI4: I would pay a premium for genuinely sustainable tea.

HYPOTHESES

The following hypotheses can be empirically tested:

H1: Digital transformation has a significant positive effect on tea market access.

H2: Digital transformation positively influences consumer trust.

H3: Sustainable value-chain practices positively influence perceived product value.

H4: SHG participation positively influences women's entrepreneurial empowerment.

H5: Women's empowerment positively influences participation in tea value addition.

H6: Sustainability consciousness positively influences Gen Z purchase intention.

H7: Social-media engagement positively influences Gen Z purchase intention.

H8: Perceived authenticity positively influences Gen Z purchase intention.

H9: Digital engagement moderates the relationship between sustainability perception and Gen Z purchase intention.

H10: Integrated digital, sustainable and inclusive value-chain practices positively influence the overall performance of the Arunachal Pradesh tea economy.

DATA ANALYSIS TECHNIQUES

The proposed empirical study can employ:

Descriptive statistics

Frequency

Percentage

Mean



Standard deviation
Reliability analysis
Cronbach's alpha can be used to assess internal consistency.
Inferential analysis
Pearson correlation
Multiple regression
t-test

ANOVA

Chi-square test
Advanced analysis
If the final sample and measurement model are adequate:
Exploratory Factor Analysis (EFA)
Confirmatory Factor Analysis (CFA)
Structural Equation Modelling (SEM)
Partial Least Squares SEM (PLS-SEM)

ANALYSIS AND RESULTS

Expected Digital Transformation Findings
The study is expected to find that digital adoption can improve:
market visibility,
direct customer interaction,
price information,
product promotion,
online sales,
payment efficiency,
Traceability.

The evidence from the tea sector supports the relevance of collective organizations and alternative value chains, while recent policy initiatives explicitly promote SHGs/FPOs, mini tea factories and capacity building.

Expected Sustainable Value-Chain Findings

The study is expected to demonstrate that sustainability is not merely an environmental issue but a source of economic differentiation.

A potential sustainable value chain is:

Sustainable cultivation → Quality leaf → Local processing → Quality certification → Sustainable packaging → Digital branding → Direct sales → Higher value capture

Evidence from Assam indicates that sustainable/organic production can encourage small growers to participate in processing and marketing, thereby creating alternative value chains.

Expected SHG Findings

SHG participation is expected to have positive relationships with:

financial inclusion,
entrepreneurial confidence,
collective bargaining,
access to information,
processing activities,
market participation,
Household decision-making.

Existing Indian evidence reports significant positive impacts of SHG participation on aggregate women's empowerment, particularly income control, credit-related decision-making and group participation.

Expected Gen Z Findings

The proposed research expects Gen Z respondents to respond particularly positively to tea brands demonstrating:
authentic regional origin;
sustainable production;
environmental responsibility;
attractive digital storytelling;
women-led/community-based production;
transparent supply chains;
Convenient online purchasing.

This expectation is consistent with recent sustainable-food research showing relationships between sustainability-related attitudes, perceived behavioral control, social media and purchase intention.

PROPOSED VALUE-CREATION MODEL FOR ARUNACHAL TEA

The transformation can be represented as:

Traditional model

Grower → Middleman → Processor → Wholesaler → Retailer → Consumer

Problems:

low producer bargaining power,

information asymmetry,

limited branding,

low value capture,

Weak consumer connection.

Proposed model

Grower + SHG → Local Processing → Sustainable Certification → Digital Brand → E-commerce → Gen Z/Urban Consumer

Benefits:

higher producer participation,

local value addition,

women entrepreneurship,

digital market access,

direct consumer relationships,

better storytelling,

improved traceability,

Stronger regional identity.

DISCUSSION

The proposed framework suggests that the future of Arunachal Pradesh's tea economy should not depend exclusively on increasing production. Rather, the strategic objective should be increasing the value captured per unit of tea.

This requires moving from:

“Sell tea leaves”

Toward:

“Create, certify, brand, tell and digitally sell a sustainable Arunachal Pradesh tea experience.”

The distinction is economically important. Small growers frequently receive limited value when they participate only in primary production. Studies in Assam have demonstrated that greater participation in processing and marketing can create opportunities for value-chain upgrading.

Women SHGs can provide the organizational infrastructure for decentralized value addition. Rather than treating SHGs exclusively as microfinance institutions, the proposed model positions them as community-based tea enterprises.

Digital technology then becomes the connecting infrastructure between producers and consumers.

STRATEGIC MODEL: “ARUNACHAL TEA 4.0”

The paper proposes a four-pillar strategy called **Arunachal Tea 4.0**:

Pillar 1 – Digital Tea

QR traceability

e-commerce

social media

digital payments

farmer databases

digital quality records

Pillar 2 – Green Tea

sustainable cultivation

organic/low-input alternatives

biodiversity conservation

eco-friendly packaging

climate-resilient practices

Pillar 3 – Women-Led Tea

SHG-based processing

women-owned brands

financial inclusion

entrepreneurship training

digital marketing training

Pillar 4 – Gen Z Tea

Instagram/Reels/short-video campaigns
storytelling
influencer marketing
sustainability campaigns
interactive packaging
QR-based farm stories
online tea communities

POLICY RECOMMENDATIONS**For Government**

Establish district-level tea digitalization programmes.
Provide digital marketing training to growers and SHGs.
Encourage formation and strengthening of tea SHGs/FPOs.
Support mini tea-processing units.
Promote sustainable cultivation and certification.
Develop common branding guidelines for Arunachal tea.
Support participation in national and international tea exhibitions.
Government policy is already moving toward collective organization, mini tea factories and capacity building for small tea growers, providing a useful policy foundation for this approach.

For SHGs

SHGs should diversify from savings and credit toward:

processing,
packaging,
branding,
online selling,
tourism,
tea tasting,
gift boxes,
subscription models.

For Tea Entrepreneurs

Entrepreneurs should emphasize:

Origin + Sustainability + Women + Community + Digital Storytelling

rather than competing solely on price.

For Educational Institutions

Universities and colleges can support:

digital entrepreneurship,
tea supply-chain research,
AI-based market analytics,
packaging innovation,
consumer research,
Startup incubation.

CONCLUSION

Arunachal Pradesh's tea economy stands at an important transition point. Its future competitiveness is unlikely to depend only on expanding cultivated area or increasing production. The more strategic opportunity lies in developing a high-value, sustainable, digitally connected and socially inclusive tea ecosystem.

The study proposes that four forces can work together:

Digital transformation can connect producers with markets.

Sustainable value-chain development can improve environmental performance and product differentiation.

Women's SHGs can create collective entrepreneurship and strengthen women's participation in value addition.

Gen Z engagement can create new demand for authentic, sustainable and digitally discoverable regional tea.

The experience of Assam demonstrates that small tea growers can move toward greater value-chain participation through sustainable production, processing, collective organization and market development. Arunachal Pradesh can adapt these lessons while developing its own distinctive regional identity.

The proposed transformation is therefore:

From Grower → to Entrepreneur;

From Commodity → to Brand;

From Local Market → to Digital Market;

From Individual Producer → to Collective Enterprise;

From Conventional Production → to Sustainable Value Creation.

Such an approach can potentially position Arunachal Pradesh not simply as another tea-producing region but as a source of **premium, sustainable, community-centred and digitally branded Northeast Indian tea**.

FUTURE SCOPE

Future research can extend this study in several directions:

Conduct district-level empirical research among Arunachal Pradesh tea growers.

Compare Arunachal Pradesh with Assam, Darjeeling and other Northeast tea regions.

Develop a **Tea Digital Readiness Index** for small growers.

Develop a **Women Tea Entrepreneurship Index** for SHGs.

Measure Gen Z willingness to pay for sustainable Arunachal tea.

Examine the effectiveness of influencer and social-media marketing.

Study QR-based farm-to-cup traceability.

Explore AI-based tea demand forecasting.

Develop blockchain-based tea supply-chain traceability.

Examine the potential of tea tourism and experiential marketing.

Investigate climate-change impacts on Arunachal's tea production.

Examine how indigenous knowledge and cultural heritage can be integrated into tea branding.

Develop a geographical-indication/collective-branding strategy where legally and institutionally appropriate.

Conduct longitudinal research to measure whether digitalization actually increases growers' income and value capture..

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