Supporting Agri-Entrepreneurship through Agri-Business Incubation in Kerala: A Critical Narrative Review of Institutional Models, Venture Support and Evidence Gaps

Abstract

Agri-business incubators have become prominent instruments for converting agricultural research, processing technologies and entrepreneurial ideas into commercial ventures, yet the effectiveness of incubation depends on more than the existence of facilities or training programmes. Kerala provides an analytically useful setting because its support architecture is distributed across Kerala Agricultural University and commodity-specialised Indian Council of Agricultural Research institutes serving food processing, spices, plantation crops, fisheries and tropical tuber crops. This critical narrative review examines how these incubators support agri-entrepreneurship, the pathways through which support may affect venture development, the quality of available outcome evidence and the priorities for more defensible evaluation. Literature and institutional evidence published from 2003 to 21 June 2026 were identified through open scholarly indexes, regional repositories, citation searching and official institutional sources, with earlier foundational incubation research retained where conceptually necessary. The synthesis indicates that Kerala's incubators offer a progressively broader bundle of physical infrastructure, technology transfer, product development, training, mentoring, grant or credit facilitation, intellectual-property support and market linkage. Their commodity specialisation creates strong potential for matching scientific capabilities to value-chain constraints, while stage-differentiated programmes and satellite incubation extend support beyond conventional facility-based models. Direct Kerala evidence, however, remains narrow. Existing peer-reviewed studies are small, retrospective or cross-sectional, focus mainly on surviving or graduated enterprises, and generally lack credible non-incubated comparison groups. Consequently, observed commercialisation, technology adoption or profitability among supported firms cannot be attributed confidently to incubation itself. Wider incubation research supports a small positive average association with venture performance but also shows substantial heterogeneity by programme design, specialisation, sponsorship, service utilisation, venture stage and regional context. Kerala's policy challenge is therefore not simply to expand incubation activity, but to demonstrate additionality. Longitudinal cohort tracking, matched counterfactual evaluation, service-use measurement, post-graduation follow-up and outcome frameworks linking venture performance with farmer, value-chain and inclusion effects are required to establish which forms of agri-business incubation create durable public value.

Keywords: Agripreneurship; agri-business incubation; Kerala; technology commercialisation; agri-startups; entrepreneurial ecosystem; venture support; rural innovation.

1. Introduction

1.1 Agri-business Incubation in Kerala: Context and Conceptual Framing

Agri-entrepreneurship occupies an unusual position between conventional small-business development and agricultural innovation policy. New ventures operating in food processing, crop inputs, farm technologies, fisheries, plantation crops or value-chain services must manage

ordinary liabilities of newness while also confronting sector-specific constraints: biological production cycles, variable raw-material quality, fragmented supply, food-safety and quality requirements, seasonality, thin rural markets, and the need to translate technical knowledge into repeatable commercial processes. Incubation is attractive in this setting because it can bundle resources that an early venture cannot economically acquire on its own. The business-incubation literature has consequently moved from a narrow emphasis on subsidised workspace towards a process view in which selection, business development, access to knowledge, networks and graduation are central design choices (Aernoudt, 2004; Bergek & Norrman, 2008; Bruneel et al., 2012; Hackett & Dilts, 2004; Mian et al., 2016). For agri-enterprises, the relevance of this process logic depends on whether the incubator can connect entrepreneurial capability with domain-specific scientific infrastructure and value-chain relationships rather than merely replicate generic start-up support.

Kerala offers a distinctive institutional configuration for examining that proposition. Kerala Agricultural University (KAU) reports a university agri-business incubator at Tavanur, launched in 2012 with a strong post-harvest and food-processing orientation, alongside a Technology Hub and a Techno Incubation Centre supporting technology transfer, value addition and enterprise development (Kerala Agricultural University, n.d.-a, n.d.-b, n.d.-e). The state also hosts commodity-oriented incubation within Indian Council of Agricultural Research (ICAR) institutes: the Indian Institute of Spices Research (IISR) in Kozhikode, the Central Plantation Crops Research Institute (CPCRI) in Kasaragod, the Central Institute of Fisheries Technology (CIFT) in Kochi, and the Central Tuber Crops Research Institute (CTCRI) in Thiruvananthapuram. Their mandates bring laboratory knowledge, processing facilities and sectoral networks into close proximity with potential entrepreneurs (ICAR-Central Institute of Fisheries Technology, n.d.; ICAR-Indian Institute of Spices Research, n.d.; ICAR-Central Tuber Crops Research Institute, n.d.; Muralidharan & Jayasekhar, 2020). This distributed architecture is important because it means that "incubation in Kerala" is not a single treatment. It is a family of institutional arrangements with different commodities, technologies, entry criteria, service portfolios and policy objectives.

The national policy environment has widened this architecture. The Innovation and Agri-Entrepreneurship Development component of Rashtriya Krishi Vikas Yojana, subsequently implemented through the RKVY-RAFTAAR and PM-RKVY framework, uses Knowledge Partners and RKVY Agribusiness Incubators to combine incubation with staged financial support. A 2024 Government of India statement reported 24 RKVY Agribusiness Incubators and specified support ceilings of Rs 5 lakh at the idea or pre-seed stage and Rs 25 lakh at the seed stage (Government of India, Ministry of Agriculture & Farmers Welfare, 2024). KAU's 2026 cohort announcement shows this policy translated locally through RAISE, an agripreneurship-orientation route, and PACE, a start-up incubation route, with selected participants eligible for grant support and structured development (Kerala Agricultural University, 2026). The corresponding programme descriptions distinguish idea-to-prototype assistance from product validation, commercial launch and continuing mentoring, suggesting a shift from facility-centred incubation towards stage-differentiated venture development (Kerala Agricultural University, n.d.-c, n.d.-d).

The theoretical case for these interventions is plausible but cannot substitute for evidence of additionality. Incubators can reduce resource constraints by providing shared equipment, technical expertise and legitimacy; they can accelerate learning through mentoring; and they can broker ties to universities, investors, regulators and markets. University linkages can affect venture survival and graduation, while network-based incubation can generate knowledge, capabilities and social capital (Eveleens et al., 2017; Rothaermel & Thursby, 2005; Scillitoe & Chakrabarti, 2010). Yet several studies show that outcomes are conditional rather than automatic. Incubator type affects performance (Barbero et al., 2012), resource abundance can

help or hinder depending on founding conditions (Amezcua et al., 2013), and entrepreneurs may underuse intangible services when they do not recognise capability gaps (van Weele et al., 2017). A 2026 meta-analysis synthesising 22 primary studies and 65 effect sizes estimated a statistically significant but small overall association between incubation and new-venture performance, with substantial variation by programme and context (Seitz et al., 2026). Thus, a credible assessment of Kerala's incubators must examine mechanisms, service fit and evaluation design rather than infer success from participation alone.

A recent meta-analysis of 39 empirical studies encompassing 55,219 firms found that business-incubation effects differed across performance dimensions and were moderated by support mechanisms and incubator ownership, with stronger evidence for innovation and growth than for survival, profitability or employment (Murillo-Rojas et al., 2026). Recent evidence also cautions that specialisation is not uniformly advantageous: a three-year study of incubated start-ups in China found that greater incubator specialisation was associated with lower R&D efficiency and, indirectly, lower venture-capital financing, with the relationship contingent on specialised technical knowledge (Cao et al., 2024). Research on incubator positioning further indicates that the performance implications of generic market-infrastructure services and customised business-capability development depend on their configuration and context rather than on a single universally superior service model (Li et al., 2024). An ethnographic study of a technology business incubator in India similarly showed that incubation relationships can involve conflicts over institutional norms, roles and practices during venture creation, underscoring the importance of entrepreneur-incubator alignment in the delivery of support (Mohan et al., 2025).

The Kerala-specific peer-reviewed evidence is considerably thinner than the institutional footprint. Thomas et al. (2021) examined enterprises facilitated by KAU incubators and reported support for training, technology transfer, legitimisation, upgrading and ecosystem linkages. Ashwini et al. (2020) studied 30 coconut enterprises that had graduated from agribusiness incubators in Kerala and described their enterprise profiles and selected break-even performance. A related study of 30 spice enterprises associated with the IISR incubator described technology use, enterprise stage and commercial characteristics (Ashwini et al., 2021). These studies are valuable because they document actual incubatees in local commodity systems, but their designs do not establish a counterfactual trajectory for comparable non-incubated ventures. Small samples, retrospective measurement, purposive elements and concentration on operating or graduated firms make selection and survivorship especially difficult to rule out. The central empirical question is therefore not whether supported entrepreneurs can be found operating businesses, but how much of their performance is attributable to incubation, which components matter, for whom, and over what period.

This distinction is consequential for public policy. Incubator managers commonly report inputs and activities such as applicants, trainees, technologies transferred, facilities used, grants distributed or ventures graduated. Such indicators are necessary for programme administration but can conflate throughput with economic or social impact. Classical incubation research has repeatedly criticised ambiguous performance definitions and weak comparators (Hackett & Dilts, 2004; Phan et al., 2005). More recent work similarly shows that start-up growth, survival and innovation effects can diverge. For example, Lukeš et al. (2019) found little evidence of employment gains and an adverse short-term sales association for incubated innovative Italian start-ups, while Sedita et al. (2019) found positive relationships with innovation performance in a different setting. Schwartz (2011) reported that post-graduation growth was not uniformly strong. These contradictions do not imply that incubation is ineffective; they indicate that programme goals, venture selection, service exposure, comparison groups and follow-up horizons must be made explicit before effectiveness can be judged.

1.2 Scope, Research Gap and Objectives

This review critically examines institutional support for agri-entrepreneurship delivered by agri-business incubators located in Kerala. It covers university- and research-institute-based incubators serving agricultural production, food processing, spices, plantation crops, fisheries and tropical tuber-crop value chains, together with the national innovation programmes that shape their financing and service models. The review focuses on incubation mechanisms, venture-development pathways, accessibility, ecosystem functions and performance evaluation. It does not treat all Kerala start-up policy, conventional agricultural extension, stand-alone credit schemes or generic technology incubators as agri-business incubation unless they are directly connected to agricultural venture development. The principal gap is the absence of an integrated critical assessment that connects Kerala's distributed institutional architecture with the small body of local outcome research and with the wider evidence on incubator effectiveness. The objectives are to map the principal support models, explain the mechanisms through which they may influence venture development, assess the strength and limitations of the available Kerala evidence, interpret local arrangements against broader incubation research, and identify research and governance priorities capable of demonstrating programme additionality and durable public value.

2. Methods for Literature Selection

2.1 Review Design and Rationale

A critical narrative review design was used because the question combines several evidence types that cannot be reduced sensibly to a single pooled intervention estimate: small Kerala enterprise studies, national agri-start-up research, heterogeneous international incubation studies, and institutional documentation describing programmes and facilities. The purpose was therefore explanatory and evaluative rather than exhaustive enumeration. Narrative synthesis is appropriate when evidence differs substantially in design, unit of analysis and outcome definition, provided that search, selection and appraisal decisions remain transparent and the narrative does not become a substitute for methodological scrutiny. The review was guided by principles for rigorous narrative review conduct, including explicit search logic, relevance-based selection, critical comparison and evidence-calibrated conclusions (Baethge et al., 2019; Green et al., 2006). No formal risk-of-bias score was assigned because the included studies span qualitative research, cross-sectional surveys, reviews, longitudinal analyses and meta-analysis; instead, design-specific threats to inference were evaluated within the synthesis.

2.2 Information Sources

Literature discovery used AGRIS, EconBiz, OpenAlex, the Directory of Open Access Journals, Semantic Scholar and Google Scholar as the principal multidisciplinary and agriculture/business search sources. Regional and country-specific searching was supplemented through Krishikosh and ICAR ePubs to identify Indian agricultural scholarship that may be poorly represented in international indexes. Backward and forward citation searching from major incubation reviews and empirical papers was used to identify foundational and methodologically influential studies. Official institutional evidence was searched on the websites of Kerala Agricultural University, ICAR-IISR, ICAR-CIFT, ICAR-CTCRI, ICAR-CPCRI and the Government of India's Press Information Bureau. These institutional sources were used to establish programme design, facilities, eligibility, policy instruments and dated initiatives; they were not treated as independent evidence that incubation caused venture outcomes. Journal references and Digital Object Identifiers (DOIs) were cross-checked against journal or DOI-linked bibliographic records before inclusion.

2.3 Search Strategy and Search Period

The main search period was January 2003 to 21 June 2026. The starting point captures the period in which contemporary incubation research increasingly shifted from descriptions of physical facilities towards process, service configuration, university linkage, selection and performance, while also preceding the establishment of the principal Kerala agri-business incubators identified in this review. Earlier publications were retained only when conceptually foundational, most notably evidence on the value-added role of university technology incubators. Searches combined the principal concepts "agri-business incubator", "agribusiness incubation", "agri-entrepreneurship", "agripreneurship", "agri-startup" or "agritech startup" with "Kerala", "India", "incubator performance", "technology transfer", "commercialisation", "mentoring", "finance", "network", "survival", "growth", "innovation", "graduation", "food processing", "spices", "coconut", "plantation crops", "fisheries" and "tuber crops". Representative Boolean logic included ("agribusiness incubat*" OR "agri-business incubat*" OR "agri startup*") AND (Kerala OR India) AND (entrepreneur* OR commerciali* OR performance OR support), and ("business incubat*" OR "startup incubat*") AND (performance OR survival OR growth OR innovation OR network* OR mentor*) for comparative evidence.

2.4 Eligibility Criteria

Eligible peer-reviewed publications had to contribute directly to at least one of four questions: the operation or outcomes of agri-business incubators in Kerala; the design or evaluation of agri-incubation and acceleration in India or other relevant emerging-economy settings; the mechanisms through which incubation services affect venture capability; or the methodological problem of evaluating incubator performance. Empirical studies, high-quality reviews and meta-analyses were prioritised. Authoritative institutional documents were included when they were necessary to verify Kerala programme characteristics or national policy arrangements. English-language sources were used because complete bibliographic and claim-level verification was feasible for them in the accessible evidence. Sources were excluded when they were promotional without verifiable programme information, bibliographically incomplete, unrelated to venture incubation, duplicated, published after the final search date, or unable to support the claim for which they were being considered. Theses and repository records were useful for discovery but were not used as core evidence when peer-reviewed or official sources could support the same point.

2.5 Screening, Duplicate Handling and Study Selection

Search results were screened iteratively at title, abstract or summary, and full-record level. Records were retained when they added Kerala-specific evidence, clarified a support mechanism, offered a credible comparative evaluation, or materially changed interpretation of effectiveness. Duplicate records found across indexes were reconciled using author names, title, year and DOI rather than counted as separate evidence. Where an article appeared in several repositories, the journal record or another authoritative bibliographic source was preferred for citation. Full text or sufficiently detailed article records were examined when sample, methods or outcome interpretation were important to the synthesis. Sources whose identity, publication status or metadata could not be verified were excluded. No screening counts are reported because the search was designed as an iterative critical narrative search rather than a prospectively registered systematic review with a fixed deduplicated corpus.

2.6 Critical Appraisal and Evidence Synthesis

Appraisal focused on whether each source could support the inference drawn from it. For Kerala outcome studies, particular attention was paid to sampling, sample size, venture stage, presence or absence of a comparison group, prospective versus retrospective measurement, reliance on self-report, survival conditioning, outcome breadth and the distinction between enterprise description and programme impact. Comparative incubator research was assessed for design strength, temporal follow-up, counterfactual construction, measurement of service exposure, heterogeneity by incubator type and regional context, and whether intermediate capabilities were confused with final venture performance. Evidence was then organised thematically around institutional architecture, support mechanisms, observed Kerala outcomes, ecosystem mediation, inclusion and accessibility, and performance governance. Greater weight was placed on findings replicated across designs or supported by stronger longitudinal or comparative evidence. Contradictory findings were retained and interpreted as information about contingent programme effects rather than averaged rhetorically into an artificial consensus.

3. Institutional Architecture of Agri-Business Incubation in Kerala

3.1 From Shared Processing Facilities to Staged Venture Support

The institutional history visible in Kerala suggests an evolution rather than a single design template. KAU's Tavanur incubator was established with a clear post-harvest and food-processing logic: entrepreneurs could access processing systems for agricultural commodities while receiving technical guidance around enterprise creation (Kerala Agricultural University, n.d.-a). The Vellayani Techno Incubation Centre similarly centres on fruit and vegetable value addition, with processing machinery, technology transfer, consultancy and product-quality analysis intended for prospective entrepreneurs and self-help groups (Kerala Agricultural University, n.d.-e). These models address a concrete barrier that is especially severe in food entrepreneurship: pilot-scale processing equipment and technical testing are lumpy assets. Shared facilities lower the cost of experimentation and enable entrepreneurs to learn whether a product and process can be stabilised before committing to dedicated plant. In resource-based terms, the incubator temporarily substitutes institutionally owned assets for venture-owned assets, while university credibility and staff expertise can supply forms of legitimacy and knowledge that are otherwise difficult for a new enterprise to purchase (Mian, 1996; Mian et al., 2016).

KAU's broader architecture extends beyond equipment access. The Technology Hub, initiated in 2014, is described as a platform for technology consolidation, incubation, consultancy, dissemination and handholding, with the explicit purpose of linking scientific and business domains (Kerala Agricultural University, n.d.-b). More recent RAISE and PACE programmes further separate support by venture maturity. RAISE is organised around proof of concept, prototype development, research facilities, technical experts, intellectual-property support and mentoring, whereas PACE is oriented towards product validation, commercial launch and market-oriented mentoring (Kerala Agricultural University, n.d.-c, n.d.-d). KAU's April 2026 cohort notification confirms continuing operation of these pathways under the national PM-RKVY framework and eligibility for grant support to selected start-ups (Kerala Agricultural University, 2026). This stage-gated design is theoretically stronger than a uniform service bundle because incubation needs change as a venture moves from idea validation to production, regulatory compliance, market entry and scale. Evidence from outside Kerala likewise indicates that the usefulness of incubator capabilities depends on technology and venture life-cycle stage (Fukugawa, 2018).

3.2 Commodity-specialised ICAR Incubators

The ICAR institutes add another layer: incubation embedded in specialised agricultural research organisations. IISR's Institute Technology Management unit was established in 2008 and upgraded to an agri-business incubation unit in 2013, with explicit emphasis on spices. Its published guidelines link admission to the fit between an applicant's needs and institute expertise and facilities, and its service description includes access to agro-technologies, processing infrastructure, capacity building, mentoring, technology transfer, product development, commercialisation and market linkages (ICAR-Indian Institute of Spices Research, n.d.). This "synergy" criterion is analytically important. Selection based on fit can raise the probability that an incubatee receives genuinely scarce technical inputs, but it also creates selection effects: ventures admitted because they already possess commercially feasible ideas or relevant backgrounds may outperform rejected firms even without incubation. Performance evaluation must therefore distinguish the value created by IISR from the quality of ventures selected into IISR.

The same logic appears in plantation crops and fisheries. The Kalpa Agri-Business Incubator at ICAR-CPCRI was developed for coconut, arecanut and cocoa value chains and combines in-house or virtual incubation with access to product-processing facilities, technology licensing, project preparation and credit linkages (Muralidharan & Jayasekhar, 2020). ICAR-CIFT's Zonal Technology Management - Agribusiness Incubation Centre is explicitly tailored to technology-based fisheries enterprises and offers technical consultancy, infrastructure, expert guidance and training in a location embedded in a major fisheries economy (ICAR-Central Institute of Fisheries Technology, n.d.). These are not merely different sector labels. Food, spice, coconut and fish ventures face different processing, perishability, quality-control, raw-material and market constraints. Specialised incubators can therefore create "problem-resource fit" by concentrating relevant equipment and expertise. The trade-off is institutional fragmentation: a venture spanning ingredients, packaging, digital traceability and export compliance may need support that crosses institute boundaries.

CTCRI illustrates an emerging attempt to carry specialised incubation closer to value-chain communities. Its core incubator provides technology, skill upgrading and incubation related to tropical tuber crops, including planting material, farming, smart technologies and nutrition-oriented products (ICAR-Central Tuber Crops Research Institute, n.d.). In September 2025 CTCRI inaugurated a satellite incubation centre at KAU's Regional Agricultural Research Station, Pattambi, designed to promote grassroots innovation and agripreneurship (ICAR-Central Tuber Crops Research Institute, 2025). A 2026 institutional description of the partnership emphasises value-chain technology development and refinement, business mentoring, credit and market facilitation, intellectual-property management, capacity building and networking, with a particular orientation towards tribal entrepreneurship and biofortified sweet-potato value chains (ICAR-Central Tuber Crops Research Institute, 2026). Satellite incubation is therefore more than geographical extension: it can reconfigure where entrepreneurial support is delivered and which actors, including self-help groups, farmer producer organisations and rural innovators, are treated as potential venture builders.

3.3 Institutional Complementarity and Coordination Risk

Taken together, Kerala's institutional architecture offers broad coverage of the agri-food innovation process: general processing and commercialisation support within KAU; commodity science and licensing within ICAR institutes; staged idea-to-market programmes under national financing; and distributed access through satellite incubation. This diversity is potentially advantageous because incubation research warns against universal "best practice" models that ignore mission and context (Bergek & Norrman, 2008; Grimaldi & Grandi, 2005).

A public university incubator trying to diffuse locally relevant processing technology should not necessarily be judged by the same exit or investment metrics as a private accelerator pursuing high-growth digital firms. Yet diversity creates governance demands. Entrepreneurs can face duplicated training, inconsistent eligibility rules, repeated documentation and unclear referral pathways if institutions function as separate programmes rather than a connected support system. The theoretical value of an entrepreneurial ecosystem lies partly in the ability of intermediaries to connect resources across organisational boundaries, not merely to accumulate services within their own walls (Eveleens et al., 2017; Fernández Fernández et al., 2015).

Table 1 summarises the principal incubator nodes identified in Kerala and shows why any assessment should retain their institutional differences. The dominant pattern is commodity or technology specialisation combined with increasing emphasis on mentoring, commercialisation and market connection. The table also makes a key evidence limitation visible: most institutional sources establish that support exists, not whether that support produces additional venture outcomes relative to a credible counterfactual. The few Kerala outcome studies are concentrated in KAU, coconut and spice contexts, leaving fisheries, tuber crops and newer stage-gated or satellite models comparatively unevaluated.

Table 1. Principal agri-business incubation nodes and support orientations identified in Kerala

Institution / model	Primary sector or value-chain focus	Core support orientation	Distinctive design feature	Evidence constraint	Supporting references
KAU Agri Business Incubator, Tavanur	Post-harvest processing; fruits, vegetables, spices, coconut, rice	Shared processing, technology support, enterprise development	University-based processing infrastructure; launched 2012	Direct KAU enterprise study exists, but no non-incubated control	Kerala Agricultural University (n.d.-a); Thomas et al. (2021)
KAU RAISE / PACE, Thrissur	Agriculture and allied start-ups	Idea-to-prototype support; product validation; mentoring; grant-linked incubation	Stage-differentiated pathways under PM-RKVY	Current programme design is clearer than independent outcome evidence	Kerala Agricultural University (n.d.-c, n.d.-d, 2026); Government of India, Ministry of Agriculture & Farmers Welfare (2024)
KAU Technology Hub, Mannuthy	Cross-commodity KAU technologies	Technology consolidation, consultancy, incubation, handholding	Bridges university technology portfolio with potential investors and entrepreneurs	Institutional description; no comparative outcome evaluation identified	Kerala Agricultural University (n.d.-b)
KAU Techno Incubation Centre, Vellayani	Fruit and vegetable value addition	Processing equipment, technology transfer, consultancy, quality analysis	Explicit outreach to micro-entrepreneurs and self-help groups	Institutional description; venture outcomes not independently evaluated	Kerala Agricultural University (n.d.-e)
ICAR-IISR ITM-ABI, Kozhikode	Spices and allied processing	Technology transfer, facilities, product development, mentoring,	Admission criterion stresses fit with IISR expertise and facilities	Small local study of 30 spice enterprises; selection and counterfactual	ICAR-Indian Institute of Spices Research (n.d.); Ashwini et al.

Institution / model	Primary sector or value-chain focus	Core support orientation	Distinctive design feature	Evidence constraint	Supporting references
		commercialisation, market linkage		limitations	(2021)
ICAR-CPCRI Kalpa ABI, Kasaragod	Coconut, arecanut and cocoa	In-house/virtual incubation, product processing, licensing, project/credit linkage	Commodity-specific processing infrastructure for small-holder plantation crops	Local coconut study describes graduates but does not identify causal impact	Muralidharan & Jayasekhar (2020); Ashwini et al. (2020)
ICAR-CIFT ZTM-ABI, Kochi	Fisheries technology and processing	Technical consultancy, infrastructure, expert guidance, training	Industry-specific incubation near fisheries production and knowledge networks	Institutional evidence predominates; comparative venture outcome evidence is scarce	ICAR-Central Institute of Fisheries Technology (n.d.)
ICAR-CTCRI ABI and Pattambi satellite model	Tropical tuber crops; value-chain and grassroots entrepreneurship	Technology, skill upgrading, mentoring, credit/market facilitation, IP, networking	Satellite incubation extends support into a regional value-chain setting, including tribal entrepreneurship	Recent model; outcome additionality has not yet been established	ICAR-Central Tuber Crops Research Institute (n.d., 2025, 2026)

Note. ABI = agri-business incubator; ICAR = Indian Council of Agricultural Research; IISR = Indian Institute of Spices Research; CPCRI = Central Plantation Crops Research Institute; CIFT = Central Institute of Fisheries Technology; CTCRI = Central Tuber Crops Research Institute; IP = intellectual property; KAU = Kerala Agricultural University; PM-RKVY = Pradhan Mantri Rashtriya Krishi Vikas Yojana. Institutional sources document programme design and should not be interpreted as independent evidence of impact

4. Support Mechanisms and Their Plausible Pathways to Venture Development

4.1 Infrastructure and Technology Access as De-risking Mechanisms

The most immediately observable contribution of Kerala's agri-business incubators is access to assets that are expensive, specialised or difficult to procure before a venture has stable demand. Pilot processing lines, laboratories, testing facilities and research expertise can reduce the fixed cost of product experimentation and allow entrepreneurs to learn whether technical assumptions survive contact with actual raw materials and production conditions. This role is especially salient in food and agricultural processing, where commercial feasibility depends on yield, shelf life, process consistency, hygiene, packaging and product quality. KAU's processing-oriented facilities, IISR's spice technologies, CPCRI's coconut-product infrastructure and CIFT's fisheries equipment therefore address a genuine market-entry barrier rather than simply offering subsidised office space (ICAR-Central Institute of Fisheries Technology, n.d.; ICAR-Indian Institute of Spices Research, n.d.; Kerala Agricultural University, n.d.-a, n.d.-e; Muralidharan & Jayasekhar, 2020). The foundational university-incubator literature similarly identifies laboratories, equipment, institutional image and university-linked resources as potential sources of tenant value (Mian, 1996).

Yet shared infrastructure can create value only if it changes venture behaviour or economics. Access that is infrequent, poorly matched to process requirements, too costly after initial subsidy, or unavailable when seasonal raw material arrives may have little commercial effect. There is also a graduation problem: a venture that proves a product inside an institutional facility must eventually acquire, lease or contract production capacity elsewhere. If the economics of that transition are not tested during incubation, the incubator can demonstrate

technical possibility without establishing a viable operating model. This distinction helps interpret why incubator outcomes are heterogeneous. The value of resource provision is contingent on the relationship between resource type and the external environment rather than being uniformly positive (Amezcua et al., 2013). Kerala evaluations should therefore record not just whether a facility was offered, but the intensity and purpose of use, the unit cost of pilot production, the time to repeatable product specifications, and the pathway by which the venture moves from shared infrastructure to commercially sustainable capacity.

4.2 Technology Transfer, Validation and Intellectual Property

Research-based incubators have an additional function: translating public research outputs into entrepreneurial assets. Technology licensing can shorten the technical search process by giving a venture access to validated formulations, processes, planting materials or devices. It can also provide a reputational signal when a young enterprise enters markets where buyers, financiers or regulators have limited information about product quality. The IISR model explicitly integrates technology management and incubation; the KAU Technology Hub consolidates university technologies for dissemination and investment; and CTCRI links incubation with technology development, refinement and intellectual-property support (ICAR-Central Tuber Crops Research Institute, 2026; ICAR-Indian Institute of Spices Research, n.d.; Kerala Agricultural University, n.d.-b). Such linkages are consistent with evidence that university ties can influence incubated-firm trajectories, although stronger university dependence may simultaneously reduce failure and delay graduation (Rothaermel & Thursby, 2005).

Technology transfer is not synonymous with commercialisation. A licensed process may still require adaptation to local input variability, packaging, consumer preferences, scale, food standards and distribution economics. The Kerala spice study is instructive because the incubator's technologies were visible in the product portfolios of participating enterprises, yet the study design could not isolate whether technology access caused superior market performance (Ashwini et al., 2021). A more defensible model treats technology transfer as an intermediate outcome. Relevant questions include whether incubation reduces time from disclosure or idea to minimum viable product, improves process reproducibility, raises the probability of regulatory clearance, or increases the share of licensed technologies that reach sustained market sales. This approach avoids the common error of counting technology licences as successful commercialisation even when subsequent demand, margins or repeat purchase are unknown.

4.3 Entrepreneurial Capability, Mentoring and Service Utilization

Training and mentoring address a different constraint: a technically competent founder may lack pricing, accounting, marketing, negotiation, regulatory or team-building capability. Kerala's programmes repeatedly include entrepreneurship development, expert mentoring and handholding, and Thomas et al. (2021) found training and institutional support to be salient elements of the KAU incubatee experience. Comparative Indian evidence also associates perceived incubation services and facilities with agri-tech start-up success, although cross-sectional designs make reverse causality and common-method bias difficult to exclude (Isher & Gangwar, 2025). Accelerator evaluation in India likewise shows that learning and behavioural outcomes can be examined separately from business results rather than assuming that training attendance translates directly into firm growth (Ponnaganti et al., 2026).

The broader incubation literature warns that service supply and service use are not equivalent. Bruneel et al. (2012) found that service portfolios can look similar across incubator generations even when tenants make different use of them. van Weele et al. (2017) showed that entrepreneurs may not recognise gaps in intangible resources and may therefore underuse

mentoring or developmental support. Albort-Morant and Oghazi (2016) similarly found that perceived usefulness of incubator advice varies with entrepreneur characteristics. For Kerala, this suggests that a programme should not be evaluated simply because it has mentors on its roster or delivers a prescribed number of sessions. The more informative measures are mentor-venture fit, service uptake, changes in identified capability gaps, implementation of advice, and whether support arrives at the decision point where it can alter the venture's trajectory. Stage-gated models such as RAISE and PACE are promising precisely because they can align support to different problems, but their advantage remains a hypothesis until service exposure and subsequent outcomes are measured.

4.4 Finance as a Bridge, not a Stand-alone Theory of Change

Finance is highly visible in India's current agri-incubation policy because the national programme combines technical support with grants at pre-seed and seed stages (Government of India, Ministry of Agriculture & Farmers Welfare, 2024). For agriculture-related ventures, early finance can fund prototypes, certification, packaging, small equipment, market testing and working capital that would otherwise delay commercialisation. KAU's RAISE and PACE architecture places such support within a developmental pathway rather than treating grants as independent transfers (Kerala Agricultural University, n.d.-c, n.d.-d, 2026). This integration is conceptually preferable because capital is productive only when a venture has sufficient technical, managerial and market capacity to deploy it.

Evidence nevertheless cautions against assuming that grant provision is the strongest incubation mechanism. Seitz et al. (2026) found a small positive overall incubation effect but considerable heterogeneity, and their moderator analysis did not show a robust aggregate advantage for programmes emphasising direct finance. This result should not be read as evidence against funding; it indicates that the observable effect of finance depends on how it is combined with selection, mentoring, networks and venture conditions. In Kerala, evaluation should therefore separate the effect of incubation services from the effect of financial awards, and should compare funded participants with credible eligible non-funded or later-funded groups when policy rules make such comparisons possible. Otherwise, a successful funded cohort may reflect competitive selection as much as post-selection support.

4.5 Market Linkage, Legitimacy and Networks

Market access is the point at which technical accomplishment becomes enterprise performance. Public research institutes can broker relationships with processors, distributors, industry bodies, farmer organisations, financiers and regulatory actors; their reputation may also reduce information asymmetry for a young firm. KAU's ecosystem study emphasised linkages among entrepreneurs, facilitators and investors, while IISR and CTCRI explicitly describe market-linkage or market-facilitation roles (ICAR-Central Tuber Crops Research Institute, 2026; ICAR-Indian Institute of Spices Research, n.d.; Thomas et al., 2021). Network-based incubation research provides a strong theoretical foundation for this activity: incubators can create access to resources, knowledge, learning and social capital, but evidence linking those intermediate gains to final performance remains less consistent (Eveleens et al., 2017). Scillitoe and Chakrabarti (2010) likewise show that direct and networking interactions can yield different forms of assistance.

This distinction matters in geographically dispersed agri-food systems. A useful network is not the number of contacts introduced but the reduction of a specific transaction constraint: a reliable raw-material supplier, a food-testing laboratory, a buyer willing to conduct a trial order, a bank that understands seasonal cash flow, or a distributor capable of cold-chain

handling. Network quality can also become a source of unequal access if better educated or socially connected founders are more able to mobilise incubator relationships. The incubation process should therefore be evaluated at the level of realised ties and transactions, not events attended. A network-introduction metric is weak evidence; a verified buyer relationship, financing agreement, technology partnership or supply contract is a stronger intermediate outcome, though still not proof of durable profitability.

4.6 A Mechanism-based Interpretation of the Kerala Model

The central implication is that incubation should be treated as a sequence of mechanisms rather than a package with a single treatment label. Infrastructure can de-risk technical experimentation; technology transfer can reduce search and development costs; mentoring can change decision quality; grants can relax liquidity constraints; institutional affiliation can confer legitimacy; and networks can open access to resources and markets. Failure at any link can prevent the expected outcome. A technically validated product may not secure repeat demand; a grant-funded prototype may fail to meet food-safety requirements; a trained founder may not use mentoring; and a strong market connection may be insufficient if production economics remain unfavourable. Frameworks that explicitly connect context, intervention, mechanism and outcome are therefore more useful than comparisons based only on incubator membership (Sohail et al., 2023).

Table 2 translates this mechanism view into the Kerala setting. It distinguishes the bottleneck each support component is intended to address from the evidence needed to establish that the mechanism actually worked. This prevents an institutional activity from being mistaken for an entrepreneurial outcome and clarifies where existing evidence is strongest or weakest.

5. What Is Known About Venture Outcomes in Kerala?

5.1 KAU-supported Agri-enterprises: Useful Description, Limited Attribution

Thomas et al. (2021) provide the broadest peer-reviewed account of enterprises facilitated through KAU agri-business incubators. The study selected beneficiaries supported between 2017 and 2020 and used an ex-post facto design with purposive sampling. Its indicators included preferences for training, extent of support, technology transfer, legitimisation and enterprise upgrading, and the authors concluded that KAU-ABI strengthened linkages among entrepreneurs, facilitators and investors while creating entry points into agricultural value chains. For understanding what incubatees experience, these observations are valuable: they show that incubation is perceived as more than equipment rental and that technology, training, institutional legitimacy and networking coexist in the local support bundle. They also align with wider incubation theory, which expects value to arise from access to resources and network mediation rather than from physical space alone (Eveleens et al., 2017; Mian et al., 2016).

The study is much less decisive as an impact evaluation. Purposive selection and retrospective observation make it difficult to separate programme effects from founder quality, venture attractiveness, prior networks or differences in motivation. No matched non-incubated group is used to estimate what would have happened without KAU support, and the indicators emphasise support processes and enterprise development rather than a consistent panel of sales, survival, employment, productivity or investment outcomes. Because the sample comprises beneficiaries, the design is also vulnerable to survivorship if unsuccessful or disengaged ventures are less visible. These limitations do not invalidate the

findings; they narrow the inference. The study supports the conclusion that KAU incubators delivered and mediated specific forms of support. It does not establish how much those services increased venture performance relative to comparable entrepreneurs who did not receive them.

Table 2. Support mechanisms, intended bottlenecks and evidence requirements for Kerala agri-business incubation

Support mechanism	Entrepreneurial bottleneck addressed	Kerala implementation examples	Plausible intermediate outcome	Main residual risk / evaluation need	Supporting references
Shared processing and laboratory infrastructure	High fixed cost of pilot production, testing and process experimentation	KAU processing facilities; IISR, CPCRI and CIFT sector-specific equipment	Faster prototype iteration; reproducible process; lower pilot cost	Facility access may not translate into viable post-incubation production economics	Mian (1996); Kerala Agricultural University (n.d.-a, n.d.-e); Muralidharan & Jayasekhar (2020)
Technology transfer and product validation	Limited access to validated scientific knowledge and commercialisable technologies	IISR technology management; KAU Technology Hub; CTCRI technology refinement	Reduced technical search; validated formulation/process; licensing or adoption	Technology adoption can be counted without evidence of sustained market demand	Rothaermel & Thursby (2005); ICAR-Indian Institute of Spices Research (n.d.); Kerala Agricultural University (n.d.-b)
Training and mentoring	Managerial, financial, regulatory, marketing and strategic capability gaps	KAU RAISE/PACE; institutional entrepreneurship development and handholding	Improved business model, pricing, compliance, negotiation and decision quality	Service availability differs from service use; self-report can overstate learning effects	Bruneel et al. (2012); van Weele et al. (2017); Thomas et al. (2021)
Grant and credit facilitation	Early-stage liquidity and inability to finance prototypes or launch	PM-RKVY-linked grants; credit facilitation in satellite/commodity models	Prototype completion, certification, launch or working-capital bridge	Competitive selection confounds grant impact; capital may substitute for rather than complement capability	Government of India, Ministry of Agriculture & Farmers Welfare (2024); Seitz et al. (2026)
Market linkage and network brokerage	Weak access to buyers, suppliers, investors and complementary expertise	KAU ecosystem linkage; IISR market guidance; CTCRI market facilitation	Verified commercial tie, pilot order, supplier relationship or investment connection	Introductions may be counted as outcomes although no transaction follows	Eveleens et al. (2017); Scillitoe & Chakrabarti (2010); Thomas et al. (2021)
Institutional legitimacy and IP support	Information asymmetry, weak credibility and uncertainty over ownership/licensing	University/research-institute affiliation, patent or IP support, formal technology licensing	Improved credibility; clearer appropriation; reduced contracting uncertainty	Strong institutional dependence may alter or delay graduation; IP activity may not produce commercial value	Mian (1996); Rothaermel & Thursby (2005)
Stage-gated incubation and referral	Mismatch between generic services and venture maturity	RAISE idea-to-prototype; PACE product-to-market; specialised ICAR pathways	Better timing and fit of support; clearer milestones and exit decisions	Benefits require evidence that stage matching improves outcomes and does not simply select stronger ventures	Fukugawa (2018); Kerala Agricultural University (n.d.-c, n.d.-d)

Note. The table describes hypothesised mechanisms supported by the reviewed literature. It does not imply that each pathway has been causally demonstrated in Kerala

5.2 Coconut Enterprises: Commercial Activity Without a Counterfactual

Ashwini et al. (2020) focused on 30 randomly selected graduated entrepreneurs operating coconut enterprises associated with agribusiness incubators in Kerala. The sample was dominated by micro-enterprises and nascent ventures, with virgin coconut oil and coconut chips among the prominent products. The study also conducted break-even analysis for two purposively selected enterprises and reported that their production and sales exceeded calculated break-even quantities. These data help characterise who uses commodity-specific incubation and demonstrate that at least some graduates had moved beyond technology exposure into actual commercial production. They also support the practical rationale for CPCRI's commodity-specific infrastructure: product diversification in coconut can require technologies and processing capacities that small founders would find expensive to develop independently (Muralidharan & Jayasekhar, 2020).

The strongest language in the coconut paper should nevertheless be interpreted cautiously. The authors suggest that incubation graduates experienced greater success because of access to technology and entrepreneurship programmes, but the design does not compare incubated firms with otherwise similar non-incubated coconut ventures. Break-even performance for two selected firms demonstrates viability of those cases at the observed production-sales configuration; it does not estimate an average programme effect and cannot establish whether incubation caused the firms to cross break-even. The sample also includes enterprises that graduated and remained in business, making it unsuitable for estimating failure rates among all admitted ventures. A future coconut-incubation evaluation should construct cohorts from the point of admission, retain dropouts and closures, observe technology and service use, and follow performance after graduation. Only then can the contribution of specialised processing support be distinguished from selection into incubation and ordinary market survival.

5.3 Spice Enterprises: Evidence of Technology diffusion, Not Yet Impact

The IISR-linked spice study similarly examined 30 enterprises and reported that many were at a nascent stage, with spice-powder technologies prominent among incubated businesses (Ashwini et al., 2022). Its value lies in showing a concrete technology-commercialisation pathway within a major Kerala commodity: research-institute capabilities can be embodied in products and production practices adopted by entrepreneurs. This observation is consistent with IISR's institutional mandate, which combines technology management, processing facilities and business incubation (ICAR-Indian Institute of Spices Research, n.d.). The study also draws attention to continued technical and financial needs after initial incubation, indicating that graduation or technology uptake should not automatically be equated with scaling.

As with the coconut research, causal confidence remains low. The sample is small and context-specific, the design is ex-post facto, and the study does not model a counterfactual or measure long-term differences in survival, revenue growth or productivity attributable to the incubator. The presence of institute technologies in a venture's product portfolio is good evidence of diffusion; it is weaker evidence of incremental commercial performance. There is also a possible technology-selection effect: entrepreneurs attracted to IISR may be systematically more interested in formal processing and value addition than non-users. Evaluating IISR's additionality therefore requires separating at least three stages: whether the incubator increases technology adoption; whether adoption improves technical or market performance; and whether any improvement persists after the venture no longer relies on institutional facilities.

5.4 Uneven Evidence Across Sectors and Generations of Incubation

The distribution of evidence is itself a finding. Peer-reviewed Kerala studies are concentrated in KAU-supported enterprises and in coconut and spice sectors, while the current institutional landscape also includes fisheries, tropical tuber crops, fruit and vegetable processing, staged PM-RKVY cohorts and satellite incubation. CIFT provides a strong sector-specific support proposition, but accessible evidence is predominantly institutional rather than a comparative study of incubated fisheries firms (ICAR-Central Institute of Fisheries Technology, n.d.). CTCRI's satellite model is too recent for long post-incubation follow-up and is presented primarily as a value-chain and inclusion innovation (ICAR-Central Tuber Crops Research Institute, 2025, 2026). The RAISE/PACE model is likewise visible through programme design and cohort announcements but lacks a publicly documented longitudinal evaluation capable of isolating incubation and grant effects (Kerala Agricultural University, n.d.-c, n.d.-d, 2026).

This asymmetry matters because Kerala's incubation system is evolving faster than its evaluation evidence. Early studies largely examine firms that passed through facility- and technology-oriented models, whereas newer programmes combine staged mentoring, finance, commercialisation and outreach. It would be inappropriate to generalise the limitations of older facility-centred programmes to newer models; it would be equally inappropriate to presume that new programme design has solved the evaluation problem. The evidence base therefore supports a differentiated conclusion: incubation has demonstrably facilitated access to technology, facilities and institutional support for a set of Kerala agri-enterprises, but the magnitude, durability and distribution of incremental economic outcomes remain uncertain.

5.5 The Causal Attribution Problem

The central methodological weakness is selection into treatment. Incubators normally screen applicants for novelty, feasibility, founder capability, sector fit or growth potential. IISR's guidelines explicitly state selection conditions related to feasibility and synergy with institute resources (ICAR-Indian Institute of Spices Research, n.d.), and screening is a recognised part of incubation design more generally (Aerts et al., 2007). This creates a built-in evaluation paradox: better selection can improve observed portfolio performance while making it harder to know whether incubation created the difference. A cohort of carefully selected ventures may outperform ordinary firms because the incubator chose promising founders, because the incubator supported them effectively, or both. Without a comparison strategy, raw graduation or survival rates combine selection and treatment effects.

The second problem is outcome timing. Incubation can accelerate experimentation or market entry without immediately improving employment or sales, and strong institutional ties may even prolong time in incubation while reducing failure (Rothaermel & Thursby, 2005). Lukeš et al. (2019) found that incubator tenancy was associated with negative short-term sales effects but possible later sales growth, while employment effects were negligible. Schwartz (2011) found that long-term post-graduation growth could be weaker than policy narratives imply. Kerala studies that observe firms at one point after incubation cannot therefore resolve whether support generates temporary stabilisation, durable growth, dependency or simply earlier commercialisation. A credible evaluation horizon should begin at application or admission and continue for several years after graduation, with failures and exits treated as data rather than disappearing from the sample.

Table 3 compares the direct Kerala empirical studies. The most striking pattern is consistency in what they can show and what they cannot: all provide useful evidence about incubatee characteristics, support exposure, technology use or observed business activity, but none

supplies a robust counterfactual estimate of incubation additionality. The literature is therefore better interpreted as an empirical foundation for stronger future evaluation than as proof of programme effectiveness.

Table 3. Direct peer-reviewed empirical evidence on agri-business incubation outcomes in Kerala

Study and setting	Design and sample	Incubation exposure examined	Principal evidence contributed	Main inferential limitations	Supporting references
KAU-facilitated agri-enterprises	Ex-post facto design; beneficiaries facilitated during 2017-2020; purposive sampling	Training, support, technology transfer, legitimisation, upgrading, ecosystem linkage	Documents multiple support functions and perceived strengthening of entrepreneurial linkages/value-chain entry	No non-incubated comparison; purposive sampling; retrospective process indicators; limited causal attribution	Thomas et al. (2021)
Coconut enterprises facilitated by Kerala ABIs	30 randomly selected graduated entrepreneurs in business; break-even analysis for two purposively selected cases	Technology and entrepreneurship-development support in coconut-sector incubation	Characterises micro/nascent enterprises and product mix; selected cases operated above calculated break-even quantities	Survivor/graduation conditioning; only two break-even cases; no matched control; causal language exceeds design strength	Ashwini et al. (2020)
Spice enterprises associated with ICAR-IISR ABI	30 agri-entrepreneurs; ex-post facto, context-specific enterprise analysis	Spice technologies and institute-linked incubation support	Shows technology diffusion into enterprise product portfolios and continuing technical/financial needs	Small sample; no counterfactual; unclear long-term outcome trajectory; selection into specialised incubation	Ashwini et al. (2021)

Note. The studies differ in sampling and indicators. Their common strength is direct observation of Kerala incubatees; their common limitation is the absence of a credible non-incubated counterfactual for estimating programme additionality

6. Incubation as an Entrepreneurial-Ecosystem Intervention

6.1 Resource Brokerage and the Limits of Resource Abundance

A narrow view of incubation asks what services sit inside an incubator. An ecosystem view asks whether the incubator reduces the venture's dependence on any single institution by helping it assemble a viable external resource network. This distinction is especially relevant to Kerala's research-based incubators, where scientific infrastructure is a major attraction. Resource access during incubation can improve experimentation, lower search costs and confer legitimacy, yet ventures must eventually operate in markets where laboratories, mentors and subsidised processing are not permanently bundled. The long-term objective should therefore be capability to mobilise external resources, not continuing dependence on the incubator. Patton et al. (2009) identify networks, empathy with founders, idea flow and appropriate exit as important elements of high-technology incubation, while Eveleens et al. (2017) show that network-based incubation can strengthen resources, knowledge, learning and social capital even though the translation of those intermediate benefits into final performance remains ambiguous.

This perspective reframes public support. An incubator may create substantial value even when it does not directly finance a firm if it enables the firm to locate a suitable processing partner, recruit technical talent, obtain a buyer trial, understand certification, or access specialised university knowledge. Conversely, a heavily resourced incubator may add little if support is generic or if entrepreneurs use the facility without developing transferable routines. Amezcua et al. (2013) demonstrate that sponsorship resources interact with founding environments rather than universally improving survival. Mas-Verdú et al. (2015) likewise conclude that incubation alone is insufficient for survival and must combine with firm and sector characteristics. Kerala's institutional diversity should therefore be treated as a resource-brokerage opportunity, but performance governance should test whether incubatees become more independent and connected over time.

6.2 Specialisation, Mission and Regional Context

The strongest comparative argument for Kerala's commodity-specific model is contingency. Grimaldi and Grandi (2005) showed that incubator models differ because venture requirements and institutional origins differ; Barbero et al. (2012) demonstrated that incubator typology is associated with different performance profiles; and Fukugawa (2018) found that incubator capabilities interact with technological field and venture life-cycle stage. Xiao and North (2017) further showed that the effects of funding, technical support and mentoring varied across city tiers in China. These studies collectively weaken the case for a universal benchmark in which all incubators are expected to maximise the same outcomes. A fisheries incubator may create public value through processing technology adoption and cold-chain enterprise development, while a spices incubator may emphasise technology licensing, product quality and export-oriented value addition. A satellite incubator serving tribal or grassroots entrepreneurship may reasonably prioritise locally embedded enterprise formation and value-chain participation over venture-capital readiness. Agri-specific comparative research from Ghana similarly conceptualises innovation hubs as intermediaries that combine ecosystem brokerage, resource mobilisation, mentoring and knowledge exchange, although the setting differs materially from Kerala and direct transfer of effects should not be assumed (Ayamga et al., 2026).

Mission sensitivity does not mean that every programme can define success after seeing its results. Each incubator still needs ex ante objectives and measurable outcome pathways. Bergek and Norrman (2008) argue that best-practice assessment must connect incubator goals to incubator models, while Pattanasak et al. (2022) show that business-incubator performance measurement spans multiple critical factors and outcomes. For Kerala, a common evaluation framework can coexist with mission-specific metrics. All incubators can report survival, revenue trajectory, employment, investment, service use and graduation, while specialised modules capture technology licensing, product validation, farmer linkages, value-added processing, food-safety compliance or inclusion. Such a framework would allow comparison where comparison is meaningful without erasing sectoral differences.

6.3 Selection, Graduation and Post-incubation Independence

Selection is both a management tool and an evaluation challenge. Aerts et al. (2007) show that screening practices are central to incubator operation, while Bergek and Norrman (2008) place selection among core components of the incubation model. Strong screening can preserve scarce facility capacity and improve founder-programme fit, but it can also lead an incubator to select ventures likely to succeed anyway. Public incubators therefore need to define whether they seek to maximise portfolio success, support high-additionality ventures that markets would undersupply, address geographic or social exclusion, commercialise public research, or

balance these missions. Kerala's programmes appear to pursue several objectives simultaneously, including technology commercialisation, rural enterprise, youth and student entrepreneurship, commodity value addition and, in the Pattambi satellite model, tribal entrepreneurship. These goals imply different selection thresholds and different counterfactual questions.

Graduation poses a parallel problem. It is administratively convenient to count enterprises that complete an incubation programme, but graduation is an institutional milestone rather than an economic outcome. Rothaermel and Thursby (2005) found that stronger university linkages could reduce failure while delaying graduation, illustrating that rapid exit is not always desirable. Schwartz (2011) found that long-term performance after graduation may not match optimistic expectations. Kerala incubators should therefore treat graduation as the beginning of a post-incubation observation period. Indicators should include the share of graduates still operating after one, three and five years; the proportion no longer dependent on subsidised facilities; revenue and employment trajectories; repeat-market transactions; follow-on finance; and whether the venture continues to use licensed or validated technologies successfully. Such measures would help distinguish durable capability from temporary programme completion.

6.4 External Evidence: Positive Average Effects, Substantial Heterogeneity

The most recent quantitative synthesis strengthens the case for calibrated rather than dismissive interpretation. Seitz et al. (2026) combined 65 effect sizes from 22 empirical studies and reported a statistically significant overall correlation of $r = 0.067$ between incubation and new-venture performance. The effect is positive but small, and the authors identify substantial heterogeneity and moderator patterns related to programme design, specialisation, sponsorship and context. The practical implication is not that incubation "works" in the abstract, but that average effects conceal configurations that perform better or worse. This conclusion is consistent with earlier reviews that emphasised conceptual fragmentation and varied incubation processes (Ayatse et al., 2017; Hackett & Dilts, 2004; Mian et al., 2016; Sohail et al., 2023).

Individual studies reinforce the heterogeneity. Sedita et al. (2019) found positive innovation effects among incubated start-ups in Northern Italy, whereas Lukeš et al. (2019) found no convincing employment advantage and a negative short-term sales association in a large sample of innovative Italian start-ups. Mas-Verdú et al. (2015) found that incubators alone were not sufficient for survival, and Amezcua et al. (2013) showed that resource sponsorship can have different survival implications depending on founding conditions. Such evidence is directly relevant to Kerala because it discourages single-metric policy narratives. A venture can improve technically without growing employment; it can survive without scaling; it can graduate quickly without building resilient markets; or it can take longer to graduate because it is exploiting research linkages productively. Evaluation must therefore measure a vector of outcomes and interpret them against programme mission, venture stage and sector.

Table 4 summarises the comparative evidence most useful for interpreting Kerala. It distinguishes mechanisms with relatively consistent support from areas where outcome evidence remains mixed or strongly context-dependent. The table reinforces the review's central claim: incubators are best understood as contingent intermediaries whose value depends on fit among venture needs, service design, institutional capabilities and local markets.

Table 4. Comparative incubation evidence and implications for interpreting Kerala programmes

Evidence theme	Representative design / evidence	Main finding	Implication for Kerala	Confidence / caveat	Supporting references
Overall incubation effect	Meta-analysis of 22 studies and 65 effect sizes	Small positive average association with venture performance; substantial heterogeneity	Avoid binary claims that incubation is uniformly effective; analyse moderators and programme configurations	Highest-level synthesis, but primary studies remain heterogeneous	Seitz et al. (2026)
Incubator model and typology	Conceptual and comparative empirical studies	Different incubator types pursue and achieve different outcomes	Judge commodity, university and satellite models against explicit missions rather than one universal benchmark	Model classifications vary across settings	Grimaldi & Grandi (2005); Barbero et al. (2012); Bergek & Norrman (2008)
University and research linkages	Longitudinal incubated-firm analysis; university-incubator studies	Scientific linkages can add resources and reduce failure but may also slow graduation	KAU/ICAR linkages are potentially valuable, but dependency and exit must be measured	Evidence largely from technology incubators outside agriculture	Mian (1996); Rothaermel & Thursby (2005)
Network-based incubation	Systematic review and interaction research	Networks reliably provide intermediate resources, knowledge and social capital; final performance effects are less clear	Track realised commercial relationships and capability gains, not networking events alone	Mechanism evidence stronger than final-outcome attribution	Eveleens et al. (2017); Scillitoe & Chakrabarti (2010)
Service utilisation	Qualitative comparative research across incubators	Entrepreneurs may underuse intangible services because resource gaps are not recognised	Measure uptake and implementation of mentoring, not only availability	Qualitative evidence; service-use mechanisms require local testing	van Weele et al. (2017); Bruneel et al. (2012)
Context and life-cycle contingency	Cross-regional and technology/life-cycle studies	Effects of support differ by region, technology and venture stage	Stage-gated RAISE/PACE and commodity specialisation are plausible designs requiring outcome validation	External settings differ from Kerala	Fukugawa (2018); Xiao & North (2017)
Growth and long-term outcomes	Large-sample and post-graduation studies	Short-term sales, employment and long-term growth effects can be weak or inconsistent	Follow ventures beyond graduation and report multiple outcomes including failures	Outcomes are sensitive to design and comparison group	Lukeš et al. (2019); Schwartz (2011); Mas-Verdú et al. (2015)

Note. The comparative evidence is used to interpret mechanisms and evaluation design, not to assume that effect sizes from other regions transfer directly to Kerala

7. Inclusion, Accessibility and Territorial Reach

7.1 From High-growth Start-ups to Heterogeneous Agripreneurs

Agri-entrepreneurship policy often uses the language of start-ups, but the actual users of Kerala's incubators include a broader set of enterprise forms. The coconut study found many micro-enterprises and sole proprietorships among ABI graduates (Ashwini et al., 2020), while KAU's Vellayani centre explicitly serves prospective entrepreneurs and self-help groups (Kerala Agricultural University, n.d.-e). CTCRI's satellite model names agripreneurs, self-help groups, farmer producer organisations, start-ups and micro, small and medium enterprises as target users (ICAR-Central Tuber Crops Research Institute, 2026). This diversity matters because high-growth venture metrics can systematically undervalue incubation that enables local processing, livelihood diversification or collective enterprise. At the same time, a broad beneficiary definition can make programmes difficult to evaluate if all forms of activity are aggregated into a single success count.

A more coherent approach is to segment ventures at entry by ambition, business model and expected pathway. A research-derived product seeking national markets, a women's self-help group commercialising a local food product, a farmer producer organisation building value-chain services and a digital agritech venture do not face the same capital needs or growth horizon. The evidence from general incubation shows that entrepreneur characteristics affect perceived service utility (Albort-Morant & Oghazi, 2016) and that venture characteristics can moderate programme effects (Seitz et al., 2026). Kerala's evaluation system should therefore report outcomes by venture category rather than allow a small number of rapidly growing start-ups to dominate averages or, conversely, allow large counts of very small enterprises to create an appearance of scale without evidence of sustained income.

7.2 Gender, Youth and Student Pathways

KAU's RAISE programme explicitly includes students and early-stage innovators, and the 2026 cohort notification invited start-ups, entrepreneurs and students with agricultural ideas (Kerala Agricultural University, 2026, n.d.-c). Such entry routes can lower experiential barriers and connect academic knowledge with entrepreneurship before founders have substantial assets. The opportunity is significant because agricultural innovation often originates from technical observation rather than from founders with prior commercial networks. The risk is that training-centred programmes measure participation rather than progression. A student or young founder who completes orientation but does not advance to prototype, formal enterprise, first sale or sustained operation represents a different outcome from a venture that moves through the full incubation pathway.

The same principle applies to gender inclusion. National agri-start-up programmes have increasingly reported participation by women, but participation counts do not reveal whether women-led ventures receive equivalent mentoring intensity, grants, facility access, investor introductions or post-incubation growth opportunities. Indian agri-incubation research identifies founder and applicant characteristics as relevant to programme experience and outcomes (Isher & Gangwar, 2025; Mohankumar et al., 2025). Kerala's public incubators are well positioned to collect disaggregated data because they operate structured application and cohort processes. Equity evaluation should follow the full pathway from application and selection through service exposure, finance, commercialisation and survival, while avoiding the assumption that equal numerical representation necessarily implies equal benefit.

7.3 Satellite Incubation and the Geography of Access

Physical distance can be a hidden selection mechanism. Centralised incubators are easier to use for founders who can travel, reside near campuses or temporarily relocate, while rural entrepreneurs may face travel costs, care responsibilities, seasonal farm obligations or weak digital connectivity. The Pattambi satellite model is therefore strategically important because it moves incubation closer to a specific value-chain and tribal context rather than requiring all entrepreneurs to travel to the parent institute (ICAR-Central Tuber Crops Research Institute, 2025, 2026). Its stated service bundle also goes beyond outreach training by including technology refinement, mentoring, credit and market facilitation, intellectual-property management and networking. This makes satellite incubation a potentially meaningful institutional innovation rather than a conventional extension camp.

The evidence base is not yet mature enough to conclude that decentralisation improves entrepreneurial outcomes. A satellite centre can reduce distance while still reproducing centralised decision rules, weak market access or limited follow-up. Its value should be tested by comparing application-to-participation conversion, service use, time and travel costs, prototype completion, formalisation, market entry, income and survival across centrally and locally supported cohorts. For tribal and grassroots entrepreneurship, culturally appropriate mentoring, collective enterprise structures and value-chain power relations also require attention. The relevant question is not merely whether an incubator is geographically closer, but whether proximity changes who can enter, what support they can use, and what economic relationships they can sustain.

8. Performance Measurement and Governance: From Activity Counts to Additionality

8.1 The Hierarchy of Incubation Outcomes

A central weakness in incubation evaluation is the tendency to combine inputs, activities, outputs and impacts. Training days, mentor hours, grant amounts and equipment use are inputs or activities. Prototypes, licences, registrations, first sales and graduation are outputs or intermediate outcomes. Revenue growth, survival, employment, productivity and investment are venture outcomes. Farmer income effects, reduced post-harvest loss, local value addition, technology diffusion, nutrition outcomes or regional employment are broader impacts. These levels should be linked but not conflated. Hackett and Dilts (2004) and Phan et al. (2005) identified performance ambiguity as a longstanding problem in incubation research, while Pattanasak et al. (2022) demonstrate the continuing breadth of performance dimensions considered in the literature. Kerala's public incubators need an outcome architecture that makes this hierarchy explicit.

The hierarchy also clarifies timing. Process measures are available almost immediately and are useful for operational control. Venture outcomes need repeated observation. Broader public-value effects often require several years and may depend on interactions with farmers, suppliers or local employment. If a programme is judged only by annual activity counts, management incentives may favour recruitment and events over intensive support for difficult commercialisation problems. If it is judged only by short-term sales, technically promising ventures in long development cycles may be penalised. Balanced governance requires leading indicators of mechanism activation together with lagging indicators of commercial and social performance.

8.2 Additionality and the Counterfactual

Additionality asks what happened because the programme existed. It is the appropriate standard for public incubation because the objective is not simply to associate institutions with successful firms, but to create outcomes that would have been less likely, slower or smaller without support. Selection makes this difficult. Incubators often choose stronger ideas, and ventures that actively seek incubation may already be more motivated or networked than non-applicants. The small positive average effect in Seitz et al. (2026) is therefore especially informative because it synthesises comparative empirical research rather than relying on success stories. It also underscores that the average effect is modest, so uncontrolled portfolio statistics can easily overstate impact.

Kerala programmes have several practical options short of randomised assignment. Applicants near a selection threshold can support regression-discontinuity or matched comparison designs when scoring rules are consistent. Eligible but non-funded cohorts can be compared with funded cohorts if grant assignment produces a defensible contrast. Later cohorts can serve as prospective comparison groups for short windows when programme rules remain stable. Propensity-score or other matching approaches can combine founder, venture, technology and baseline performance characteristics, although unobserved differences will remain. Difference-in-differences designs are possible when outcome data exist before and after incubation for treated and comparable firms. The essential requirement is baseline measurement before substantial support begins. Retrospective questions to successful graduates cannot reconstruct the counterfactual reliably.

8.3 Measuring Service Dose and Mechanism Activation

A credible evaluation also requires exposure data. Binary membership assumes that all incubatees receive the same treatment, yet service portfolios are heterogeneous and entrepreneurs use them unevenly (Bruneel et al., 2012; van Weele et al., 2017). Kerala incubators should record facility hours by purpose, technologies licensed, mentor contacts, technical consultations, regulatory support, market introductions, grant disbursement timing, credit referrals and participation in product-validation activities. These data allow analysts to test which combinations of services are associated with intermediate and final outcomes. They also improve management by identifying underused services and bottlenecks. Service-dose analysis must still account for endogeneity: struggling ventures may consume more mentoring, so a simple positive or negative correlation between mentoring hours and performance can be misleading.

Mechanism measures should be specific enough to distinguish completion from change. A mentoring session is an activity; adoption of a cost-accounting system or revised pricing model is a behavioural change. A buyer meeting is an activity; a purchase order is a realised network outcome. Laboratory access is an activity; a validated shelf-life protocol or consistent production yield is a technical outcome. Patent advice is an activity; a defensible licensing strategy or filed application is an IP outcome. By tracking these transitions, incubators can learn where their theory of change breaks down even before long-run firm outcomes are available.

8.4 Venture, Ecosystem and Public-value Metrics

No single venture metric is sufficient. Survival is important but can reward low-growth firms that persist without meaningful innovation. Revenue captures market traction but can be volatile in seasonal businesses. Employment matters for regional development but may not rise

in technology-intensive or highly productive firms. Investment is informative for scalable ventures but is not a universal objective for self-help groups or family businesses. Innovation measures can capture new products and processes but should distinguish adoption of existing institutional technology from genuinely new-to-market outputs. Sedita et al. (2019) show that innovation performance can respond differently from growth outcomes, while Lukeš et al. (2019) demonstrate that sales and employment effects need not move together. Kerala therefore requires a dashboard rather than a league table based on one headline indicator.

Agri-business incubation also creates potential effects beyond the incubated firm. A processing enterprise may create demand for local produce, reduce waste, stabilise quality standards or change farmer-market linkages. A biofortified sweet-potato enterprise may interact with nutrition objectives. Fisheries technology can influence utilisation and value addition. These impacts are plausible but should be measured only when a clear pathway exists. Public-value metrics could include the number and value of verified purchases from farmer groups, share of local raw materials, price or quality premiums, reduction in rejected or wasted product, adoption of institute technologies by non-incubated actors, and local employment attributable to supported ventures. Such metrics should be reported separately from firm performance so that ecosystem benefits are not double counted.

8.5 Governance, Data Continuity and Learning

The distributed nature of Kerala's incubation system creates a strong case for common data standards. KAU and ICAR centres need not use identical selection processes or mission metrics, but basic definitions of applicant, admitted incubatee, active venture, graduate, closure, survival, revenue, employment, technology licence and follow-on finance should be interoperable. A unique venture identifier would help prevent double counting when the same enterprise receives support from more than one incubator or scheme. Annual public reporting should separate unique firms from repeat participants and distinguish programme activity from outcome evidence. Such practices would also reduce the risk that a growing ecosystem is measured mainly through cumulative counts that cannot be reconciled across institutions.

Governance should use data for learning rather than only compliance. Poor outcomes in a cohort may indicate weak selection, inadequate support, adverse market conditions or an intentionally high-risk portfolio. Conversely, excellent survival may reflect conservative selection of ventures that needed little public assistance. Performance review should therefore combine quantitative trajectories with structured case analysis of failure, pivoting and delayed commercialisation. Incubator failure cases are particularly valuable because they reveal where technical, financial or market assumptions did not hold. A learning-oriented system would preserve these cases rather than allowing them to vanish from success-focused reporting.

9. Future Directions

The immediate research priority is to move Kerala's evidence base from retrospective descriptions of beneficiaries to prospective estimates of additionality. The most practical design would enrol applicants at the point of application, collect a common baseline, document selection scores and follow admitted and credible comparison ventures over time. Where programme rules create thresholds or funding discontinuities, quasi-experimental approaches should be considered. Outcomes should be observed at least annually during incubation and for three to five years after graduation because short-term commercialisation can diverge from long-term survival and growth (Lukeš et al., 2019; Rothaermel & Thursby, 2005;

Schwartz, 2011). A shared longitudinal design across KAU, IISR, CPCRI, CIFT and CTCRI would also make it possible to examine whether specialisation, support intensity or venture stage modifies programme effects without pretending that all incubators have identical missions.

A second priority is to measure the treatment rather than only membership. The current literature makes clear that incubator service portfolios and actual service use can differ substantially, and entrepreneurs may not recognise or use the intangible resources intended for them (Bruneel et al., 2012; van Weele et al., 2017). Kerala evaluations should therefore capture a service-dose record for each venture: equipment and laboratory use, technical consultations, technology transfer, mentoring, business training, product validation, regulatory support, finance, market introductions and post-incubation follow-up. This would support mechanism-based analysis and allow incubators to identify combinations of services associated with prototype completion, market entry, improved margins, investment or survival. Because greater service use may reflect greater underlying difficulty, analyses should model baseline risk and timing rather than interpret raw correlations causally.

Third, performance measurement should be segmented by venture type and public mission. A high-growth agritech company, a micro food-processing unit, a self-help group and a farmer producer organisation cannot reasonably be assessed against the same financing or employment expectations. Nonetheless, each should have a defined trajectory with measurable milestones. Core venture metrics can include survival, revenue, gross margin, employment, repeat customers, production capacity utilisation and independence from subsidised infrastructure. Technology-commercialisation metrics can include validated products, licences used in commercial production, regulatory milestones and time from technology access to sustained sales. Ecosystem metrics should capture verified links with farmers, buyers, suppliers and financiers. Inclusion metrics should track application, selection, service exposure, finance and outcomes by gender, age, geography and enterprise form rather than report participation alone.

Fourth, the newer models deserve purpose-built evaluation. RAISE and PACE provide an opportunity to test whether stage-gated incubation improves fit between venture needs and support, a principle supported by contingency research but not yet demonstrated locally (Fukugawa, 2018; Kerala Agricultural University, n.d.-c, n.d.-d). The Pattambi satellite centre creates a natural research agenda on territorial access and grassroots entrepreneurship: whether decentralisation changes who applies, who completes incubation, which services are used, and whether value-chain and livelihood outcomes differ from centralised delivery (ICAR-Central Tuber Crops Research Institute, 2025, 2026). Such studies should include implementation process measures because null outcomes could arise from weak delivery rather than an invalid programme concept.

Fifth, economic evaluation should accompany effectiveness analysis. Public incubation consumes staff time, equipment capacity, grants, laboratory resources and administrative support. Cost per participant is therefore a weak metric unless linked to incremental outcomes. Once credible counterfactual estimates are available, Kerala could calculate cost per additional surviving venture, additional job, successful commercialised technology or unit of verified farmer/value-chain benefit. These measures should not force all incubators into a narrow financial-return framework; rather, they would make trade-offs visible. A satellite centre serving remote communities may have a higher cost per firm but still be justified if it reaches ventures that centralised support systematically excludes. Public value should be explicit rather than assumed.

Finally, the research programme should treat failure and non-use as substantive outcomes. A venture that withdraws before receiving services, a founder who repeatedly declines mentoring, a technology that is licensed but never commercialised, or a graduate that returns to subsidised production facilities all reveal different weaknesses in the incubation pathway. Current success-oriented evidence tends to obscure these states. Cohort databases should preserve unsuccessful, inactive and pivoted ventures and document reasons for exit. Qualitative follow-up with both high- and low-performing founders can then be integrated with quantitative outcome trajectories. This mixed-method approach would be particularly valuable in understanding why the same institutional resources generate different results across commodities, districts and founder groups.

Table 5 converts these priorities into an evaluation agenda that can be implemented incrementally. The sequencing is deliberate: standardised baseline and cohort data are an immediate prerequisite, service-dose measurement and credible comparison designs follow, and longer-horizon ecosystem and cost-effectiveness analyses become possible once data continuity is established. This sequence would shift evaluation from proving that incubation activity occurred to estimating where, for whom and through which mechanisms it created additional value.

Table 5. Prioritised research and evaluation agenda for agri-business incubation in Kerala

Priority question	Recommended design	Key unit / comparison	Minimum outcome set	Decision use	Supporting references
Does incubation create additional venture performance?	Prospective cohort with baseline; matched comparison, threshold design or difference-in-differences where feasible	Admitted ventures versus credible eligible non-admitted/non-funded ventures	Survival, revenue, margins, employment, investment, market entry, graduation, post-graduation independence	Estimate programme additionality and avoid attributing selection effects to incubation	Seitz et al. (2026); Hackett & Dilts (2004); Lukeš et al. (2019)
Which services activate useful mechanisms?	Venture-level service-dose panel linked to outcome trajectories	Within-cohort variation in actual facility, mentoring, technology, finance and market-support exposure	Prototype validation, behavioural changes, buyer/supplier ties, regulatory milestones, technology adoption	Reallocate staff and resources towards service combinations associated with desired outcomes	Bruneel et al. (2012); van Weele et al. (2017); Sohail et al. (2023)
Does stage-gated support improve fit?	Compare RAISE/PACE stages and transitions; track milestone attainment before and after support	Idea-stage versus prototype/market-stage ventures, adjusted for baseline quality	Time to prototype, validation, launch, repeat sales, follow-on finance	Refine entry, progression and graduation rules	Fukugawa (2018); Kerala Agricultural University (n.d.-c, n.d.-d)
Does satellite incubation improve territorial inclusion?	Prospective central-versus-satellite access and outcome study with qualitative process evaluation	Comparable rural/tribal/value-chain entrepreneurs with different delivery locations	Application conversion, travel/time burden, service uptake, formalisation, sales, income, market links, survival	Determine whether decentralisation changes access and outcomes rather than location alone	ICAR-Central Tuber Crops Research Institute (2025, 2026)
What public value extends beyond the venture?	Value-chain tracing and linked stakeholder survey	Incubated ventures plus farmer groups, suppliers, buyers or local workers	Local procurement, price/quality effects, waste reduction,	Align incubator mission with agricultural and rural-development	Eveleens et al. (2017); Fernández Fernández et al. (2015)

Priority question	Recommended design	Key unit / comparison	Minimum outcome set	Decision use	Supporting references
		connected to them	technology diffusion, jobs, value-added retention	outcomes	
Are benefits proportionate to public cost?	Cost-consequence or cost-effectiveness analysis after credible impact estimates exist	Programme/cohort costs versus incremental outcomes	Cost per additional surviving venture, job, commercialised technology or defined social outcome	Support budget allocation and transparent comparison of mission-specific models	Pattanasak et al. (2022); Seitz et al. (2026)

Note. The designs are prioritised according to feasibility and inferential value. Random allocation is not required for every question, but baseline measurement and a defensible comparison strategy are essential for estimating additionality

10. Conclusions

Agri-business incubation in Kerala has developed into a distributed public support architecture rather than a single institutional programme. Kerala Agricultural University combines processing-oriented incubation, technology transfer and stage-differentiated start-up support, while ICAR institutes provide commodity-specific incubation in spices, plantation crops, fisheries and tropical tuber crops. The resulting model has a coherent economic logic: shared scientific infrastructure can lower experimentation costs, public research can shorten technology-development pathways, mentoring can address managerial capability gaps, finance can bridge early commercialisation constraints, and institutional networks can connect ventures with markets and complementary resources. Commodity specialisation and newer satellite or stage-gated models further improve the potential fit between support and the problems faced by heterogeneous agripreneurs.

The evidence does not, however, justify treating the presence or growth of this architecture as proof of effectiveness. Kerala's direct peer-reviewed outcome literature is small and methodologically limited. Existing studies document real enterprises, technology use, support experiences and selected commercial indicators, but they largely observe beneficiaries retrospectively and lack credible non-incubated comparison groups. Their strongest contribution is therefore descriptive and mechanism-oriented rather than causal. Wider incubation research reinforces this caution: average effects are positive but small, and outcomes vary with programme type, regional context, venture characteristics, life-cycle stage, service utilisation and the performance measure chosen. Incubation should consequently be understood as a contingent intermediary process, not a universally effective treatment.

The most important policy shift is from activity reporting to additionality. Kerala's incubators need common cohort definitions, baseline data, service-exposure records and multi-year post-graduation follow-up. Evaluation should distinguish incubator activity, intermediate capability change, venture performance and broader agricultural or social value. It should also retain failures and dropouts rather than allowing survivor portfolios to define success. With prospective data and credible comparison strategies, Kerala could identify which combinations of specialised infrastructure, technology transfer, mentoring, finance and market brokerage produce durable outcomes for different kinds of agripreneurs. Until such evidence accumulates, the defensible conclusion is that Kerala has built a substantial and plausibly valuable agri-business incubation system whose mechanisms are visible, but whose incremental long-term economic and social effects remain incompletely demonstrated.

11. Limitations

This critical narrative review is intrinsically vulnerable to selection and interpretive bias despite the use of a transparent search logic, explicit eligibility principles and repeated bibliographic verification. It was based on sources accessible through open scholarly indexes, repositories and institutional websites and did not include a completed search of subscription bibliographic databases. English-language verification was used, which may have excluded relevant Malayalam-language programme material or local research. The Kerala-specific peer-reviewed evidence is sparse, small-sample and heterogeneous in outcome definitions, which limits cross-study comparison and precludes quantitative synthesis. Several descriptions of incubator services necessarily rely on official institutional sources; these are appropriate for programme characteristics but cannot independently establish effectiveness. The institutional landscape is also evolving, so newer stage-gated and satellite models have had limited time to generate long-term post-graduation evidence. Finally, the review integrates comparative international incubation research to clarify mechanisms and evaluation problems, but effect estimates from non-agricultural or non-Kerala settings cannot be assumed to transfer directly to Kerala's commodity, market and institutional conditions.

Declaration of AI Use

This manuscript was prepared through the intellectual contributions of the author(s) to the study design, data analysis, interpretation of results, and scholarly content. Grammarly and ChatGPT were used solely to assist with grammatical refinement and reference formatting during manuscript revision. The author(s) accept full responsibility for the accuracy, integrity, and final content of the manuscript.

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