From Heuristic to Habits: Financial Management Practices in Northern Sri Lanka's Sea Cucumber Entrepreneurs

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ABSTRACT

Sea cucumber aquaculture expands across Sri Lanka's Northern province, particularly Jaffna, Kilinochchi and Manner. This qualitative study examines how financial capability, institutional conditions and ecological exposure shape the financial management practices of sandfish (Holothuria scabra) enterprises. Using an interpretivist approach, around twenty-five pen/pond farmers were interviewed, transcripts were coded in two cycles and thematically analyzed using Nvivo. Findings reveal thin financial capability, where handwritten ledgers substitute for managerial accounts and budgets or cash flow forecasts are not available; heuristic management in which procurement, stocking densities and prices follow rules of thumb rather than costed plans; and institutional frictions, as multi agency licensing, limited credit and the absence of aquaculture insurance increase transaction costs and perceived risk. Ecology and finance are tightly coupled where salinity shocks, weather changes and volatile access to wild collected juveniles convert directly into cash flow stress during a roughly ten to twelve month grow out, while over stocking slows growth and erodes margins. Value chain asymmetry further weakens smallholder returns as thin buyer networks, grade opacity and limited post harvest capability concentrate value with integrators and intermediaries, especially when farm gate prices weaken. The study proposes cycle based micro bookkeeping, simple cash buffer rules, buyer readiness toolkits (grade logs, basic contracts), cooperative mini processing and harvest linked lending supported by a standardized underwriting pack such as stocking and mortality logs, buyer memoranda of understanding, site photos. Policy priorities include single window licensing, calibrated hatchery expansion, buyer price transparency and pilots of parametric cover for salinity shocks. Hence, the analyses translate heuristics into implementable financial routines for the sea cucumber industry.

Keywords: Aquaculture Finance, Financial Literacy, Northern Province, Sea Cucumber, Value Chain.

INTRODUCTION

Sea cucumber (beche de mer) production accelerates across Sri Lanka's Northern Province, most visibly in Jaffna, Killinochchi and Mannar, driven by export demand, targeted coastal aquaculture investment, surge of coastal aquaculture

permits and mapped farming areas (NAQDA, 2023; Ministry of Fisheries, 2023). By September 2023, pen culture in the north reached over 400 tonnes, with approximately 1,900 acres designated for village based sea cucumber farming. Within the broader Indo Pacific, sandfish (Holothuria scabra) farming is being revived through hatchery and grow-out initiatives, yet persistent bottlenecks in juvenile supply, farming and site governance continue to shape outcomes (Jayasekara and Dissanayake, 2025; Purcell et al., 2023).

Despite its high value export potential, the sea cucumber farming sector faces an array of risks and constraints. Biologically, sandfish aquaculture entails a long cash conversion cycle of around ten to twelve months from stocking to harvest, during which farmers are exposed to significant ecological volatility. Seasonal shifts in salinity, occasional jellyfish blooms and other environmental shocks can cause sudden stock mortality, transmitting biological volatility into cash flow risk for smallholders (Purcell et al., 2023, Purcell, Hair and Mills, 2012). Market dynamics further compound uncertainty, prices are highly sensitive to produce grade and moisture content and global demand fluctuations can alter farm gate prices. Value chain studies in Sri Lanka have documented thin buyer networks and steep mark ups from farm gate to export market, indicating that processors and exporters capture a disproportionate share of value. Nishanthan et al.(2019, 2022)found that local sea cucumber farmers often face grading differences and have little bargaining power, which discourages them from investing in improved practices when most profits accrue to middlemen.

Within this context, a critical but underexplored aspect is how small scale sea cucumber farmers manage their finances and risks on the farm. Much of the existing literature on sea cucumber in Sri Lanka and the region has focused on biological research, juvenile production or regulations with relatively less attention to the on-farm economic and financial routines of smallholders such as budgeting, record keeping, credit use, insurance uptake and marketing negotiations. This represents a significant knowledge gap as addressing the financial literacy and management practices of farmers could be key to improving their resilience and profitability in a high risk aquaculture industry.

RESEARCH PROBLEM

Multiple, interacting gaps constrain the financial resilience of smallholder sea cucumber enterprises in Northern Sri Lanka. First, thin financial capability is evident in handwritten and irregular ledgers, limiting cash flow forecasting and the substitution of tax paperwork for managerial accounts. This pattern is consistent with SME evidence showing that knowledge often fails to translate into routines without context specific frameworks (Lusardi & Mitchell, 2023). Second, institutional frictions raise transaction costs and perceived risks. These include multi agency licensing requirements, lender unfamiliarity with underwriting biomass in the ponds (number alive multiplied by average individual weight)

and the near absence of aquaculture insurance. Third, ecological shocks translate directly into financial stress over the ten to twelve months growth cycle. Salinity and weather variability, volatile access to wild collected juveniles and density related growth penalties all contribute to cash flow pressure. Fourth, value chain asymmetry concentrates value capture with larger integrators and intermediaries. Thin buyer options, grade opacity and limited on farm processing weaken smallholder margins. Taken together, these practical issues align with a broader theoretical gap. Sri Lankan and regional studies integrate financial literacy, institutional constraints and bounded rationality decsion making within a single qualitative account. As a result, the lag in formal financial systems within a high value, high risk aquaculture remains insufficiently explained.

OBJECTIVES

The objective is to explain how financial capability, institutional conditions and ecological exposure shape the financial management of startup sea cucumber entrepreneurs in Sri Lanka's Northern province. The study documents budgeting, record keeping and pricing practices across the approximately ten to twelve months grow out, identifies constraints and adaptive srategies in accessing credit, insurance and licensing, traces how environmental shocks and juvenile supply volatility translate into cash flow pressures, assesses bargaining conditions and value capture along the buyer, processor, exporter chain, and derives actionable, sector matched recommendations.

LITERATURE REVIEW

Financial literacy research shows that knowledge and numeracy improve cash flow management, borrowing and saving and the most effective programs are practical and behaviorally informed rather than classroom-based studies (Lusardi and Mitchell, 2023; Drexler, Fischer and Schoar, 2014). Studies show that simple, practical rules often work better than detailed accounting works for micro entrepreneurs because they turn big ideas into everyday habits they can actually use (Drexler, Fischer and Schoar, 2014; Carpena et al., 2019). Institutional theory holds that the formal rules and informal norms of a system shape how SMEs behave and make financial decisions. When licensing and finance are unclear, inconsistent or divided across multiple agencies, firms must spend more time and money to comply. These higher transaction costs and uncertainties raise perceived risk, leading many owners to avoid formal borrowing and comprehensive record keeping. By contrast, clear and predictable rules, delivered through a single window process, reduce costs and uncertainty, encouraging SMEs to formalize, invest and utilize various financial products (North, 1990; Scott, 2015; Mustafa, 2024). Bounded rationality shows that when information is costly and uncertainty is high, small firms rely on simple heuristics to make decisions quickly with limited cognitive effort (Simon, 1957;

Gigerenzer and Gaissmaier, 2011). These rules can be efficient because they reduce analysis time, stabilize day-to-day choices and lower coordination costs. However, if such rules are not embedded into repeatable practices, such as check lists, default thresholds and simple ledgers, they can lock firms into habitual underinvestment in formal planning, record keeping and performance review. Effective interventions therefore translate intuitive heuristics into standard operating routines with minimal data capture and feedback, aligning practical know-how with disciplined financial management. Taken together, the evidence supports a dual strategy that combines heuristics first training with institutional simplification, enabling everyday choices to translate more reliably into better financial outcomes.

Sea Cucumber Aquaculture Risks and Operations

Global and regional studies highlight the same set of risks such as limited supply of juveniles, weak biosecurity, sudden temperature and salinity changes, theft and compliance issues, and prices that rise or fall with product grade. Literature reviews in aquaculture describe how sandfish (Holothuria Scabra) farming develops and the main production models and they warn that boom-bust cycles are likely if husbandry and governance are not strong (Purcell et al., 2012). In Sri Lanka, government reports point to fast growth, noting 407 tonnes harvested from pens by September 2023 and about 1,900 acres in Jaffna mapped for sea cucumber village farming. Northern province strategic assessment confirms these opportunities and also records conflicts with capture fisheries and formalizes permit statistics (Ministry of Fisheries, 2023; NAQDA, 2023). Regional updates in the Pacific community, Beche de mer bulletin report renewed hatchery and grow out work but continuing limits in nursery capacity and technical skills (Eeckhaut, 2025). Sri Lankan processing studies show that simple post-harvest steps, namely boiling, salting, drying and grading, strongly determine export grade and price, so technical know how directly affects income for farmers and processors.

SME Finance and Training

Studies on small forms in developing countries find that standard business training yields only modest gains unless it is short, practical and habit forming (McKenzie & Woodruff, 2014). Randomized evaluations show that simple rules of thumb often outperform accounting heavy courses because they translate ideas into routines owners actually use (Drexler, Fischer and Schoar, 2014; Carpena et al., 2011). Studies show stronger effects when programs/apps/ tech tools give notifications and help the owner keep the new habits. Evidence from Sri Lanka indicates that improvements in financial literacy and access to formal finance are associated with stronger SME performance and higher credit uptake; however, firms in the Northern Province continue to trail other regions in these dimensions.(Thathsarani, Jianguo and Alariqi, 2023; Kalapriya, 2024). Overall,

the evidence favors brief, concrete, heuristic first training paired with lower frictions in formal finance such as clear rules, simpler forms, mobile tools with priority to Northern districts.

Sea cucumber farming holds long uneven cash conversion cycles and exposure to ecological and market volatility, which increases the importance of disciplined budgeting, contingency buffers, and transparent record keeping. In Northern Sri Lanka, the institutional setting, characterized by multi agency approvals, an evolving hatchery pipeline and enforcement pressures, together with social realities such as reliance on family capital and informal buyer networks, tends to steer producers toward informal management. Despite rapid sector growth, systematic qualitative evidence that connects these financial, institutional and social dimensions remains limited. Accordingly, this study formulates the following testable propositions.

- Proposition 01 – Financial literacy and practice gap: Most startup sea cucumber entrepreneurs in Jaffna exhibit limited awareness of budgeting, cash flow forecasting and cost tracking aligned with a twelve month growth out
- Proposition 02 – Heuristic dominance: Entrepreneurs rely on simple rules (prior cycle quantities, fixed markups) instead of structured budgets or forecasts.
- Proposition 03 – Institutional frictions: Licensing complexity, low familiarity among lenders with the cycle and limited aquaculture insurance deter formal finance and record keeping.
- Proposition 04 – Ecology to finance transmission: Salinity shocks, juvenile shortages and biosecurity events transmit as cash flow crises due to thin buffers.
- Proposition 05 – Bargaining and value capture: Thin buyer networks and quality grading opacity shift margins to larger integrated firms/middlemen, weakening smallholder incentives to formalize.

METHODOLOGY

An interpretivist qualitative design was adopted to produce the meanings underlying financial practices among sea cucumber farmers in Northern Sri Lanka. The study was situated in Jaffna District, where shallow lagoons host dense pen culture and government reports indicate substantial mapped acreage for sea cucumber village farming. Using purposive and snowball sampling through farmer associations and NAQDA officers, the sample comprised 25 entrepreneurs for at least three years across one to five acre pens with or without small on site manual processing. Participants vary in education, gender and prior fishing experience and few held formal accounting qualifications. Data were collected via sixty to ninety minute semi structured interviews in Tamil and then translated to English covering budgeting and forecasting, record keeping,

financing and bank interactions, licensing and compliance, juvenile sourcing, mortality and bio security, processing and marketing and buyer relations. Interviews were audio recorded, transcribed, anonymized and members checked for factual accuracy.

An interview guide with open ended questions was used.

Budgeting and Forecasting

- Do farmers prepare any budgets or cost estimates for their grow out cycle?
- How do they plan expenses and project income if at all?

Record Keeping

- What kind of financial records (if any) are maintained (daily logs, ledgers)?
- Are personal and farm finances recorded separately?

Financing and Bank Interactions

- How do farmers finance their operations (own funds, loans, informal credit?)
- What has been their experience with banks or microfinance (loan application, collateral)?

Licensing and Compliance

- What processes do they follow to obtain permits and licenses?
- Any challenges faces in regulatory compliance or costs incurred?

Juvenile Sourcing and Operational Decisions

How do they obtain juveniles (hatchery vs wild collection)?

Mortality and Biosecurity

Experiences with disease or mortality events and how they cope financially (do they set aside emergency funds or adjust practice after a shock)?

Processing and Marketing

- Do they do any value addition or just sell live?
- Who do they sell to, how are prices determined and what negotiations (if any) occurs?

Buyer Relations and Contracts

The nature of agreements with buyers, trust and dependence on middlemen, experiences of price changes

Household and Enterprise Interactions

How farm income is used in the household and vice versa and whether financial decisions are influenced by family needs.

Analysis followed Braun and Clarke (2021, 2006)'s thematic approach. The software Nvivo was used to manage and organize the qualitative data. The analysis proceeded in two main coding cycles. In the first cycle, an open coding was applied to capture participants' own words and basic concepts line by line. Dozens of initial codes were generated, reflecting issues raised by the farmers such as " no formal records", all in one notebook", "limited access to bank loans", "few buyers". In the second cycle, these codes were examined for patterns and grouped into higher order categories using axial or pattern coding. Through interactive refinement, the codes converged into a set of candidate themes that reflected broader dimensions of financial management. Codes about basic ledgers, lack of budgeting and mixing household expenses were clustered under " basic financial routines", while codes about carrying over last year's inputs and pricing by rule of thumb were grouped as " heuristic practices" and codes related to licensing, loans, and insurance difficulties fell under institutional frictions. In total six provisional categories emerged, which were further reviewed against the data and the study's initial propositions. These yielded five final themes that structure the findings namely " thin financial literacy and ad hoc bookkeeping" , " heuristic budgeting and pricing", " institutional frictions and missing risk markets", ecological exposure and cash flow stress", " unequal value capture and buyer dependence". Throughout the analysis, reflective memos were kept to document analytical decisions and check for any researcher biases. The use of NVivo helped in systematically retrieving all quotes under a given code or theme, ensuring that the thematic development remained grounded in participants' narratives. Trustworthiness of qualitative analysis was further supported by triangulating insights with secondary information where available, such as cross checking a farmer's remark about licensing delays with official policy documents or comparing reported farm gate prices with export market reports.

ANALYSIS AND DISCUSSION

Five interrelated themes emerged from the thematic analysis, highlighting diverse patterns in how sea cucumber farmers handle financial decision-making and resource management.

Thin Financial Literacy and Ad hoc Bookkeeping

Most interviewees relied on simple cash books to track cash in and out, with limited separation of household and enterprise spending. One farmer admitted that "*I just note down expenses and sales in a notebook. It's all in one place, I don't separate the farm money from the household money*". Another said "*Whatever we earn from the harvest goes to family needs immediately. There's no separate account for the farm*". Rolling cash flow forecasts were absent and only a small minority attempted a basic annual budget. Several respondents equated financial statements with tax files rather than managerial accounts. As one participant explained, "*We prepare accounts only if the bank or government asks. For*

ourselves, we know what we spent roughly, that's enough". Many struggled to cost operating costs against expected harvest volumes with few tracking unit costs per surviving 400g animal. Our farmer noted, "*I honestly cannot tell how much one sea cucumber costs me to raise. I spend on guard, juveniles, but I never added it up per batch*". These observations align with global evidence that knowledge does not readily convert into routines without simple, sticky practices that fit day to day constraints (Lusardi and Mitchell, 2023; Drexler, Fischer and Schoar, 2014).

Heuristic Budgeting, Pricing and Procurement

Farmers commonly carried forward the previous cycle's input bundle. Participant said, "*Last year I stocked 3,000 juveniles and this year I planned around 3,500. We don't really calculate new budgets and based on 1 acre capacity, we just follow a rule of thumb*". Output prices were largely determined by processing units and exporter demand, leaving farmers with little bargaining power and prompting them to apply fixed markups or copy nearby competitors. Such heuristics economize on complexity under uncertainty but can underreact to structural changes, for example, salinity driven mortality or density related growth penalties, which obscure true margins. This pattern aligns with entrepreneurship training studies showing that rules of thumb can be effective but benefit from framing into repeatable habits to improve outcomes (Drexler, Fischer and Schoar, 2014).

Institutional Frictions and Missing Risk Markets

Multi agency approvals involving aquaculture and environmental authorities were described as navigable, but time consuming with uncertainty about renewals and reporting. *Farmers said " It took nearly 9 months to get all the permits for the farm*". Strategic environmental assessments for the Northern province documented a rapid rise in permits and applications, implying administrative strain. Commercial lenders were reluctant to underwrite year long growth out cycles that carry biological risks, only small subset of respondents held bank loans, and many others used family gold and other properties to get loans from banks. Farmer said " *the bank doesn't understand our farm assets, they wanted land , jewels or something. I ended up using my house deed to get a loan for the farms.* No respondent reported aquaculture insurance, consistent with Food and Agriculture Organization (FAO) reviews which noted low penetration and poor fit of insurance products for smallholders in Asia (NAQDA, 2023; Van Anrooy et al., 2022; Ministry of Fisheries, 2023).

Ecological Exposure and Cash Flow Stress

Farmers said seasonal salinity spikes and jellyfish incursions as primary mortality drivers. Farmer said "*This April, the water quality changed due to high flood and we lost thousands of juveniles in a week. It was a big loss*". Juvenile supply is strongly seasonal, wild collection is feasible only during a limited window each year, forcing farmers to stock in that period, whereas in other

seasons, juveniles are scarce or unavailable. Farmer said *"We get juveniles around August and September and then we won't see money back until may be March or April when we harvest"*. Hatchery capacity remains underdeveloped and does not provide sufficient or timely juveniles to smooth these seasonal gaps or support planned stocking schedules. When shocks occurred, producers paused stocking and reduced guard labor, classical liquidity responses that can affect next cycle. Farmer *stated "I could n't afford five workers after losing so much stock, so I managed with two. But then theft risk increases"*. Regional reviews for Sri Lanka describe the same vulnerabilities and ongoing efforts to expand juvenile availability and optimize sites (Eeckhaut, 2025).

Unequal Value Capture and Buyer Dependence

Smallholders typically sold to a single intermediary who set grades and written contracts were rare. Many perceived farm gate price softening, for example a shift from roughly LKR 1,000 per sea cucumber to about LKR 650 to 850, but lacked grade wise records to challenge offers. Farmer said " *We all sell to a particular buyer, he's been collecting from our village for years"*. Sri Lankan value chain analysis have long documented steep mark ups from farmers to processors to exporters and the central role of post harvest quality in determining final price, consistent with respondents' experiences and with processing studies that link boiling, salting, drying and grading to realized export grades and values (Nishanthan et al., 2022; Nishanthan et al., 2019).

DISCUSSION

Results suggest that sea cucumber farmers in Northern Sri Lanka manage their finances informally, using heuristic approaches conditioned by institutional and environmental constraints. Despite some exposure to financial training, most farmers use simplified habits and experiential judgments, showing patterns of bounded rationality (Simon, 1991) and confirming Lusardi and Mitchell's (2023) findings that awareness of financial tools does not guarantee their use in practice.

Institutional frictions, including complex licensing processes, lack of collateral recognition for aquaculture assets and the absense of insurance discourage formalization and long term financial planning. These barriers reinforce informal financial behaviour and keep farmers within an informality trap (North, 1990Douglass North develops an analytical framework for explaining the ways in which institutions and institutional change affect the performance of economies, both at a given time and over time. Institutions exist, he argues, due to the uncertainties involved in human interaction; they are the constraints devised to structure that interaction. Yet, institutions vary widely in their consequences for economic performance; some economies develop institutions that produce growth and development, while others develop institutions that produce stagnation. North first explores the nature of institutions and explains the role of transaction and production costs in their development. The second

part of the book deals with institutional change. Institutions create the incentive structure in an economy, and organizations will be created to take advantage of the opportunities provided within a given institutional framework. North argues that the kinds of skills and knowledge fostered by the structure of an economy will shape the direction of change and gradually alter the institutional framework. He then explains how institutional development may lead to a path-dependent pattern of development. In the final part of the book, North explains the implications of this analysis for economic theory and economic history. He indicates how institutional analysis must be incorporated into neo-classical theory and explores the potential for the construction of a dynamic theory of long-term economic change. Douglass C. North is Director of the Center of Political Economy and Professor of Economics and History at Washington University in St. Louis. He is a past president of the Economic History Association and Western Economics Association and a Fellow, American Academy of Arts and Sciences. He has written over sixty articles for a variety of journals and is the author of The Rise of the Western World: A New Economic History (CUP, 1973, with R.P. Thomas; Scott, 2015). Without appropriate financing mechanisms or state support, most resort to personal savings or pawned assets as similarly observed in smallholder aquaculture systems in South and Southeast Asia (Zhang et al., 2022).

Market asymmetry worsens the situation. Farmers depend on single buyers and lack mechanisms for transparent pricing or collective bargaining, aligning with Gereffi et al.'s (2005) framework on captive value chain governance. This dependence discourages proactive financial planning as pricing and income remain externally dictated. The limited adoption of post harvest value addition, as highlighted by Nishanthan et al. (2022; 2019), further reduces margins and affects income stability.

Ecological shocks such as salinity changes and disease outbreaks impose significant financial risks in the absence of insurance or contingency funding. These environmental pressures force reactive cost cutting and perpetual financial stress, supporting findings by Eeckhaut (2025) on ecological constraints in sea cucumber aquaculture.

Hence, improving financial behavior requires more than training; it needs structural reforms. Regulatory simplification, aquaculture adapted credit products, market information tools and risk sharing mechanisms like community insurance are essential (Reardon et al., 2020). Interventions should be simple, visual and embedded in farmers' routines to convert existing heuristics into sustainable financial practices.

IMPLICATIONS

Theoretical Implications

Evidence supports a behavioral institutional view of SME finance, literacy gaps interact with institutional frictions and ecological risk, reinforcing informal

routines. In settings where rules of thumb already guide decisions, training that adopts and upgrades these heuristics, rather than replacing them with heavy accounting, has a higher chance of being used consistently in practice.

Practical Program Design for Farmers

A six module, heuristic first program can turn know-how into routines that fit a 12 month grow out. Module one can teach a four line monthly cash flow (opening cash, cash in, cash out, grow out) with a simple buffer rule, such as keeping at least eight weeks of core costs. Module two may track cost per survivor by lining juveniles stocked, survival and all cash costs to LKR(Sri Lankan rupees) per market per market size juvenile (around 350 to 450g). Module three can convert common habits into checklists, for example, procurement rules triggered by salinity or temperature thresholds. Module four can build buyer readiness with a one page grade log (size, moisture, defects), a basic invoice, use of photos to reduce grade disputes. Module five can provide a bilingual licensing and compliance map showing permits, renewals and reporting windows. Module six can establish a micro safety net that matches the grow out cycle (savings circle/ rotating fund) and explores simple index type cover for salinity or rainfall shocks.

Finance and Insurance innovations

Credit products should reflect same as crop finance, working capital lines aligned to stocking and harvest dates, with repayment at sale. Lenders benefit from a standard underwriting pack (stocking density and mortality logs, site photos, buyer MoUs) and from collateral substitutes such as group guarantees. On the risk side, test parametric "stop loss" covers that trigger partial payouts when salinity or temperature crosses the agreed thresholds, consistent with international guidelines for small scale aquaculture insurance.

Policy Implications

Policy action can lower friction and improve margins. A single window process with published service standards would shorten licensing times, digitalized renewals would reduce uncertainty. Hatchery capacity and quality control should be explained in step with farm permits, with farm permits, with regular public dashboards on juvenile availability and prices to reduce dependence on seasonal wild collection. Market access can be strengthened through vetted buyer registries and standard contract templates, while upgraded labs and post harvest training help farmers meet grades and capture more value at farm gate.

CONCLUSION

Sea cucumber entrepreneurs in Northern Sri Lanka are building a high value industry amid long, uncertain biological cycles. Interview evidence indicates that thin financial literacy, heuristic management and institutional frictions,

increased by ecological shocks and buyer concertation, keep small many smallholders outside strong financial routines. These same heuristics can become assets when codified into simple budgets, buffer rules, grade logs and contract templates. Coupled with clearer licensing, more reliable juvenile supply, and finance/insurance matched to the production cycle, such tools can lower failure risk and strengthen bargaining power. For policy and finance, the priority is to translate risk into low friction mechanisms that farmers can use, for research, the priority is to quantify which behavior and institutional fixes most improve cash flow resilience and value over repeated cycles.

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