

Redesigning boat owner-crew labor relations in Kupang fisheries: a systems and behavioral analysis

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Abstract. Informal patron-client arrangements in capture fisheries can combine vessel finance, employment, social assistance, and market control, creating both protection and dependency. This study examined how boat owner-crew labor relations are reproduced and how a feasible transformation could be designed at Tenau Coastal Fishing Port and Oeba Fish Landing Base, Kupang City, Indonesia. A qualitative case study with descriptive economic support used observations, in-depth interviews, structured questionnaires, and document review from April to November 2024. The principal participants comprised 20 matched dyads, each consisting of one boat owner and one crew member; collectors, port managers, and local-government actors were supporting informants. The Theory of Planned Behavior (TPB) was used to explain why the existing arrangement persisted, while Soft Systems Methodology (SSM) translated the diagnosis into a purposeful activity system and staged intervention strategy. Owners financed vessels and operations and controlled first-sale decisions and records, whereas crew members supplied labor but did not determine buyers, prices, or post-landing revenue allocation. The arrangement persisted because crew work provided income and social support under limited alternatives, while owners sought to protect capital, manage risk, secure labor, and coordinate marketing. Norms of loyalty, gratitude, kinship, and informality reinforced these constraints. The analysis produced one multi-actor root definition and eight minimum activities for shifting opaque and dependency-based relations toward more transparent, clearly defined, and balanced arrangements. The strategy begins with shared information, followed by minimum work agreements and mediation, crew economic capability, and alternative economic access. Social-norm change, behavioral constraints, and system redesign must therefore be addressed together without disregarding the legitimate financing and risk-bearing role of boat owners. Methodologically, the sequential integration of TPB and SSM links behavioral explanation to conceptual system redesign.

Keywords: boat owner-crew relations, patron-client, social norms, Soft Systems Methodology, Theory of Planned Behavior.

Introduction. Capture fisheries provide food, employment, and income, but production growth does not automatically improve the welfare of people who work at sea. Livelihood outcomes also depend on access to productive assets, finance, markets, information, and institutions, and on the distribution of authority, risks, and benefits among actors (Allison & Ellis 2001; Béné 2003; Béné et al., 2010). A value-chain perspective is therefore important because workers who perform fishing operations may carry substantial occupational and income risks while having limited influence over post-harvest decisions, prices, and downstream value creation (Purcell et al., 2017; Rosales et al., 2017).

In many fishing communities, these economic functions are embedded in patron-client relations. Patrons can provide vessels, working capital, advances, housing, transport, and assistance during hardship, while clients provide labor, loyalty, and preferential access to catch. Such relations may reduce short-term insecurity, yet their asymmetry can also restrict mobility, information, and bargaining capacity (Scott 1976; Platteau 1995). Indonesian evidence shows that patron-client networks shape value chains, market access, livelihood strategies, and governance outcomes rather than functioning as purely private

relationships between two individuals (Roberts et al., 2022; Adisel et al., 2023; Elsler et al., 2023).

The analytical difficulty is that an unequal arrangement may persist even when its limitations are recognized by those involved. Crew members can remain because leaving threatens income, social ties, and access to assistance, while owners can retain existing arrangements because they finance costly and uncertain operations. Interventions that treat crew members only as deficient individuals, or owners only as exploitative actors, therefore risk misunderstanding the system. The Theory of Planned Behavior (TPB) helps explain how attitudes, subjective norms, and perceived behavioral control shape intentions and actual practices (Fishbein & Ajzen, 1975; Ajzen, 1991). TPB alone, however, does not specify how a socially complex work system should be redesigned.

Soft Systems Methodology (SSM) offers a complementary problem-structuring approach for situations characterized by multiple actors, contested interpretations, and no single technically optimal solution. SSM uses rich pictures, purposeful activity systems, Customers, Actors, Transformation, Worldview, Owners and Environmental constraints (CATWOE) analysis, and root definitions to move from an unstructured problem situation toward changes that are systemically desirable and culturally feasible (Checkland, 1981; Checkland & Scholes, 1990; Checkland & Poulter, 2006). Its strength lies not in predicting a social system but in organizing learning about what transformation is needed and which actors and constraints matter (Mingers, 2000). For the problem examined here, explaining why an unequal labor arrangement persists is not sufficient unless it can be connected to a structured process for considering how that arrangement might be changed. The analytical gap addressed in this study is therefore the link between behavioral explanation and purposeful multi-actor system redesign.

Kupang City in East Nusa Tenggara has active capture-fisheries operations centered on Tenau Coastal Fishing Port and Oeba Fish Landing Base, including handline fleets operating from Oeba (Ekawaty et al., 2015). Local studies have described low fisher income, concentrated marketing authority, and socially embedded relations among crew members, boat owners, and collectors (Sri 2013; Kobesi et al., 2019; Jehamat et al., 2024). An earlier publication from the same broader research reported the initial identification of social behaviors requiring intervention (Nggajo et al., 2026). The present article has a different analytical purpose: it reconstructs labor authority and value flows, distinguishes crew remuneration from first-sale prices, explains the persistence of both actors' behavior through the TPB, formulates one integrated SSM root definition, and compares the resulting activity model with field reality before deriving staged interventions. It asks four questions: (1) how are labor authority and economic dependence structured; (2) why do crew members and owners reproduce the arrangement; (3) what transformation and purposeful activity system are required; and (4) which interventions are systemically desirable, potentially culturally feasible, and consistent with field realities?

Material and Method

Study area and research design. The study was conducted at Tenau Coastal Fishing Port and Oeba Fish Landing Base, Kupang City, East Nusa Tenggara, Indonesia (Figure 1). These sites concentrate landing and marketing activities, and interactions among crew members, boat owners, collectors, port managers, and government actors. Data collection took place from April to November 2024 to capture variation in fishing and marketing conditions. The research used a qualitative case-study design with descriptive quantitative support. Its purpose was to provide contextual and analytical understanding rather than statistical generalization to all Indonesian capture fisheries.

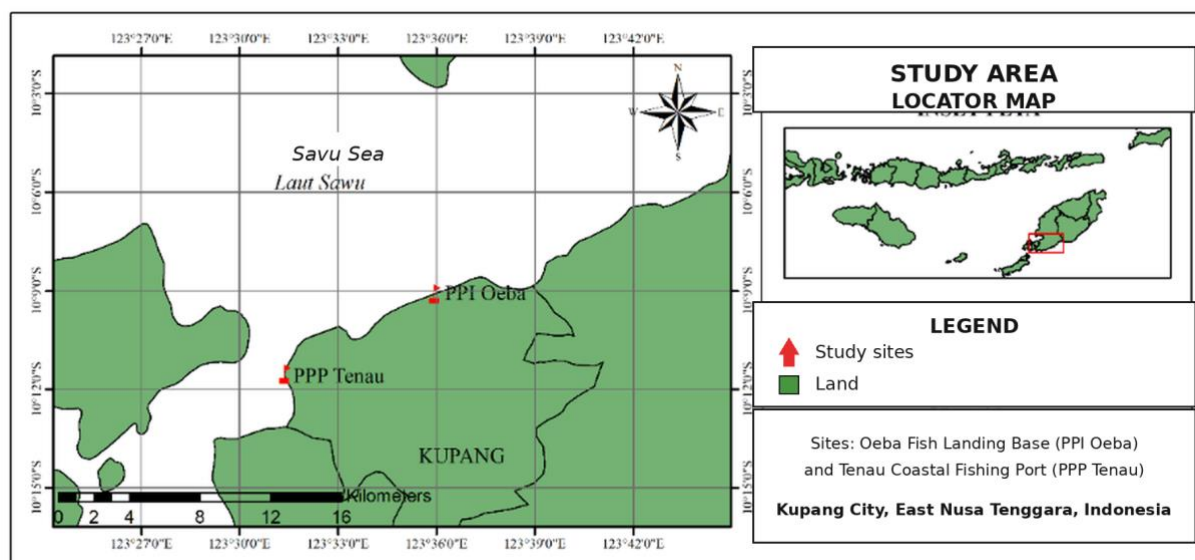


Figure 1. Location of Tenau Coastal Fishing Port and Oeba Fish Landing Base, Kupang City, Indonesia.

Participants and data collection. The principal participants comprised 20 matched owner-crew dyads: each of the 20 boat owners was paired with one crew member who worked within the same labor relationship. Participants were selected purposively because of their direct involvement in capture-fisheries labor relations. The focused case-study aim, the specificity of the matched owner-crew dyads, and the use of established analytical frameworks provide a basis for judging sample adequacy in terms of information power rather than statistical representativeness (Malterud et al., 2016). Fishing units included handline, bottom longline, mini purse-seine, and pole-and-line operations (Figure 2). Collectors, port managers, local-government officials, and other relevant actors supplied supporting information on marketing, facilities, and institutional roles. Data were obtained through field observation, in-depth interviews, structured questionnaires, and document review. Topics included recruitment, employment status, operating finance, control of landed catch, first-sale decisions, price information, payment or sharing systems, advances and assistance, conflict, perceived fairness, reasons for remaining in the relationship, and barriers to change.

Qualitative analysis. Interview notes, questionnaire responses, observation records, and documentary evidence were organized by matched dyad and actor category. Initial coding described actor roles, authority, assistance, information access, conflict, and perceived fairness. Statements concerning behavioral persistence were then coded deductively by the first author into attitude, subjective norm, perceived behavioral control, intention, and actual behavior, while additional relationship mechanisms were retained inductively. For TPB coding, attitude referred to evaluations of maintaining or changing the existing arrangement; subjective norm referred to perceived social expectations or obligations concerning loyalty, obedience, kinship, or customary practice; perceived behavioral control referred to the perceived ability to act differently or perceived barriers to doing so; intention referred to expressed plans or preferences; and behavior referred to reported or observed practices. Accounts were compared within each owner-crew dyad and across supporting actors. A theme was retained when it was supported by convergent evidence from more than one actor or method. The analysis was explanatory and was not used to estimate population prevalence.



Fishing vessel at Oeba Fish Landing Base



Fishing fleet in Kupang

Figure 2. Examples of fishing vessels operating from the study area: (a) a vessel at Oeba Fish Landing Base and (b) the Kupang fishing fleet.

Table 1
Research questions, evidence, and analytical procedures

<i>Research component</i>	<i>Main evidence</i>	<i>Analytical procedure</i>	<i>Output</i>
Structure of labor relations	Actor roles, recruitment, control of catch, sales, payments, operating finance and social assistance	Actor-role and authority mapping; rich picture; descriptive cost and first-sale indicators	Empirically supported problem structure, value flows and dependency map
Behavioral persistence	Reasons, norms, perceived options, risks and actual practices of crew members and owners	Theory of Planned Behavior interpretation: attitude, subjective norm, perceived behavioral control, intention and behavior	Motives and mutually reinforcing locking factors
Required transformation	Synthesis of diagnosis and TPB findings	Customers, Actors, Transformation, Worldview, Owners and Environmental constraints analysis; root-definition formulation and minimum purposeful activities	Purposeful system and minimum activities
Intervention strategy	Comparison of minimum activities with field reality	Model-reality comparison and three E criteria: efficacy, efficiency and effectiveness	Staged actions, responsible actors and monitoring focus

Note: TPB - Theory of Planned Behavior.

Economic indicators. Quantitative evidence supported the relational diagnosis rather than a stand-alone causal claim. Costs and prices are reported in Indonesian rupiah (IDR). Monthly general and operating-cost values were summarized from boat-owner interview estimates; they were not derived from audited accounts or from an independent profitability calculation. Marketing margin was calculated as $M = P_f - P_l$, where P_f is the observed final-market price and P_l is the landings-level or first-sale price. A first-sale price shares (FSPS), adapted from the price-share formulation of Hanafiah and Saefuddin (1983), was calculated as $FSPS = (P_l/P_f) \times 100\%$. In this case, P_l was the price at the first recorded sale controlled by boat owners or collectors; it was not the wage or benefit share received by crew members. Only observations recorded in comparable per-kilogram units were retained. The indicator described the position of the first-sale transaction within the observed value chain and could not by itself demonstrate crew remuneration, net profit

or exploitation. The limited field snapshot was interpreted together with owner costs, product quality, and spoilage risks, actor functions, and qualitative evidence.

Integrated systems and behavioral analysis. SSM and the TPB were integrated sequentially (Figure 3). SSM was selected because the problem involved multiple actors, contested interpretations, and no single technically optimal solution, making problem structuring and purposeful redesign appropriate to the study objective. First, empirical diagnosis mapped actors, roles, authority, catch, and money flows, informal norms and dependency; these relationships were synthesized in a rich picture. Second, observed behaviors were interpreted through the TPB, not to forecast future behavior statistically, but to explain why existing practices continued. Third, the diagnosis and behavioral findings were translated into the required outcome and operational transformations. The customers, actors, transformation, worldview, owners, and environmental constraints analysis identified the elements of the purposeful system, from which a root definition and minimum purposeful activities were constructed. Fourth, each conceptual activity was compared with field reality to identify gaps, principal constraints, and responsible actors. The model was assessed through the three E criteria—efficacy, efficiency, and effectiveness (3E). Finally, the gaps and provisional feasibility assessment were used to formulate a staged intervention strategy.

Model-reality and 3E assessment. The comparison and 3E assessment were conducted by the researchers as an analytical appraisal based on the empirical diagnosis; they were not a stakeholder-validation exercise or an implementation test. Efficacy referred to the logical capacity of an activity to produce the required relational output. Efficiency considered whether existing actors and resources could undertake the activity. Effectiveness referred to the prospective contribution of the activity to longer-term relational change. Cultural feasibility was treated as provisional and was judged based on compatibility with observed norms, practices, and constraints.

Ethical participation. Participation was voluntary. All principal participants and supporting informants agreed to be interviewed. Personal identities were not reported, and findings were presented by actor category and matched owner-crew relationship.

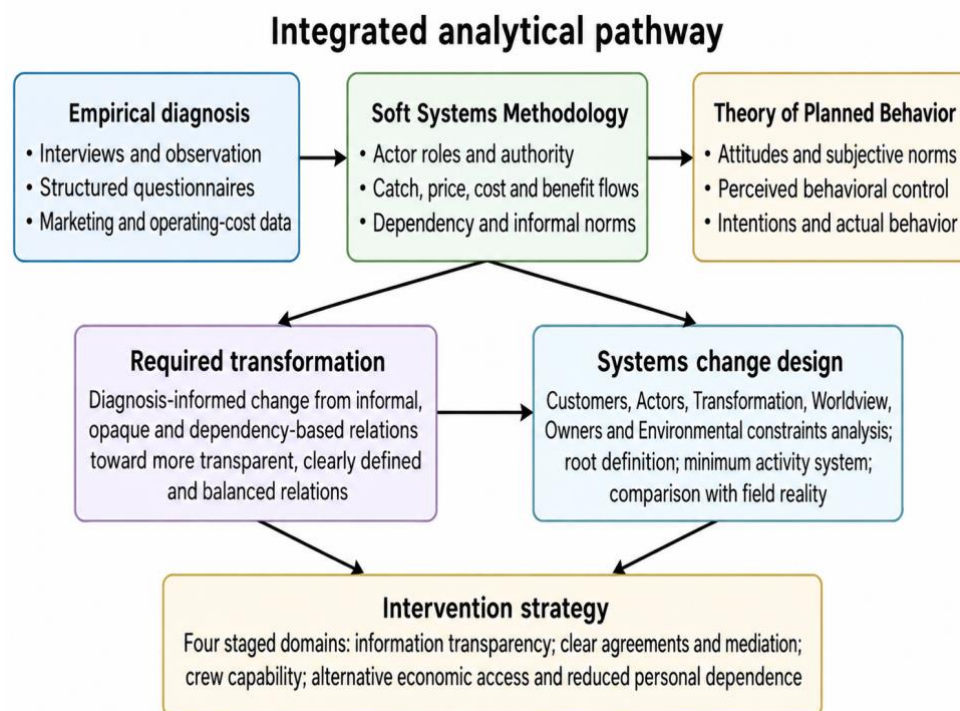


Figure 3. Sequential integration of empirical diagnosis, SSM problem structuring, and TPB explanation used to derive the intervention strategy.

Data credibility and interpretation limits. Credibility was strengthened through source triangulation among crew members, owners, collectors, port personnel, government actors, and documents; method triangulation among interviews, questionnaires, observation, and economic calculations; and within-dyad consistency checks across all 20 matched owner-crew relationships. The case-study findings are analytically transferable to comparable relational problems but are not statistically representative of all capture fisheries. The first-sale price analysis does not measure crew income. The proposed interventions and 3E judgments remain conceptual and require stakeholder review and field testing before effects on payment, conflict, agency or welfare can be claimed.

Results

Participants and owner-financed operating structure. Most owners and crew members were of working age: 10 of 20 owners were 41-50 years old, whereas 10 of 20 crew members were 31-40 years old. Interviews and field observations showed a consistent division of authority. Boat owners supplied vessels, gear, operating capital and marketing connections and commonly arranged recruitment and advances. Crew members supplied labor and fishing skills but, once the catch was landed, generally did not decide the buyer, first-sale price, accounting record, or downstream allocation of revenue. The self-reported cost estimates indicate that owners perceived substantial and variable financial exposure (Table 2). Bottom-longline operations had the highest reported average general and operating costs. These interview-based estimates support the diagnosis of owners' financing and risk-bearing role, but they are not audited measures of actual expenditure or profit. This financing role was also associated with concentrated information and decision-making authority.

Table 2
Self-reported monthly cost estimates provided by boat owners, by fishing unit

<i>Fishing unit</i>	<i>Reported general-cost range (USD month⁻¹)</i>	<i>Reported operating-cost range (USD month⁻¹)</i>	<i>Reported average general cost (USD month⁻¹)</i>	<i>Reported average operating cost (USD month⁻¹)</i>
Handline	1,892-11,353	631-1,892	4,778	1,080
Bottom longline	2,271-37,842	315-6,307	12,172	2,554
Mini purse seine	3,027-9,839	441-1,261	5,424	685
Pole-and-line	3,027	1,198	3,027	1,198

Values are interview-based estimates rather than audited accounts or independent profitability calculations. General costs included permits, wages, vessel berthing or parking, and other recurring non-trip expenses; operating costs included fuel, food and drink, cigarettes for crew members, fishing-gear repair, and other trip-related expenses. Reported averages summarize the estimates recorded for each fishing-unit category. Currency conversion: USD 1 = IDR 15,855.45, based on the 2024 average official exchange rate reported by the World Bank

Marketing position and distribution of value. Catch moved through channels managed by owners or collectors. Landings-level prices, final prices, marketing margins, and FSPSs varied among fish groups with comparable per-kilogram observations (Table 3). The observed FSPS ranged from 16% for mouse grouper to 36% for tiger grouper. The variation indicates that species, quality, perishability, handling cost, and channel length matter. This ratio does not represent the payment received by crew members, because crew members were workers rather than first sellers. Its relevance to the labor-relation diagnosis is limited to showing that post-landing value formation occurred within channels and records controlled mainly by owners and collectors.

Table 3

Landings-level prices, final prices, marketing margins, and first-sale price shares for fish groups with comparable per-kilogram observations

<i>Fish group</i>	<i>Landings-level price (USD kg⁻¹)</i>	<i>Final price (USD kg⁻¹)</i>	<i>Marketing margin (USD kg⁻¹)</i>	<i>First-sale price share (%)</i>
Skipjack	1.70	7.57	5.87	23
Kombong scad	1.58	8.83	7.25	18
Mouse grouper	1.89	11.86	9.97	16
Anggoli snapper	1.89	8.83	6.94	21
Tiger grouper	3.15	8.83	5.68	36
Tongkol tuna	0.95	5.05	4.10	19
Mackerel	1.58	8.83	7.25	18
Anchovy	0.95	5.05	4.10	19
Scad	1.07	5.05	3.97	21

Note: Marketing margin = final price - landings-level price. First-sale price share = landings-level price/final price x 100%. The indicator describes the recorded first-sale transaction and does not represent crew earnings or an audited allocation of net value. Two observations recorded in non-weight units were excluded because no defensible conversion to kilograms was available. Currency conversion: USD 1 = IDR 15,855.45, based on the 2024 average official exchange rate reported by the World Bank

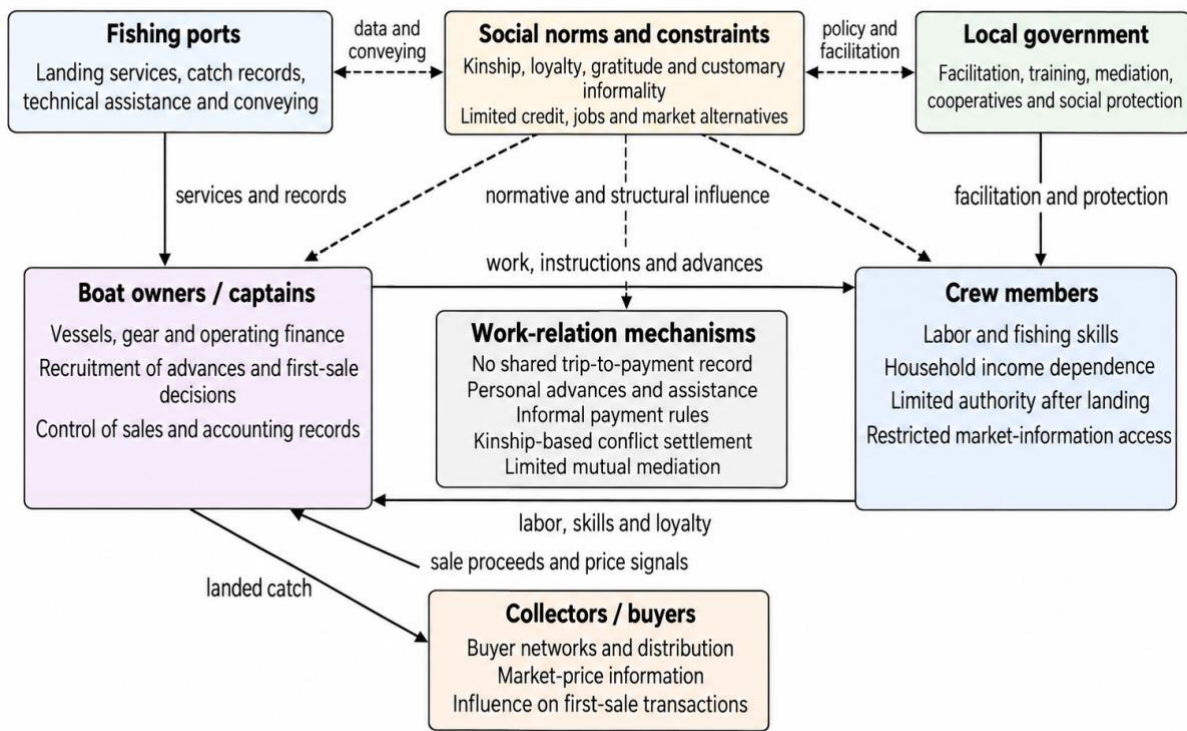
Social norms and dependency mechanisms. The unequal distribution of authority was sustained through more than market transactions. Recruitment often relied on recommendation from family members, fellow villagers, or other trusted persons recommendations. Owners could pay travel costs, provide accommodation, offer advances or loans, and assist crew households. Crew members valued these functions because formal credit, alternative work, and social protection were limited. The same assistance generated moral obligations expressed as loyalty, gratitude, and reluctance to challenge an owner. Conflict was normally addressed personally or through kinship networks, while written agreements, shared records, and neutral mediation were uncommon. Port and local-government roles remained focused on technical services, facilities, and general assistance rather than labor-relation governance. Table 4 distinguishes the norms that stabilized the relationship from the norms required for a more transparent and balanced arrangement.

Table 4

Existing social norms, their functions, and the intended normative transition

<i>Existing norm or practice</i>	<i>Protective or coordinating function</i>	<i>Constraining effect</i>	<i>Intended normative transition</i>	<i>Change mechanism</i>
Personal loyalty and obedience	Maintains trust, labor continuity and rapid coordination	Discourages questions and objection by weaker workers	Loyalty based on reciprocal, understandable obligations	Minimum work agreement and regular dialogue
Advances and owner assistance	Provides emergency finance, transport, housing or household support	Creates economic and moral dependence when terms are unclear	Support with recorded amounts, repayment terms and non-retaliatory exit options	Shared advance records and safe alternative finance
Owner control of sales and records	Allows rapid marketing and risk management	Excludes crew from information used to calculate payments	Owner authority retained, but calculations become visible and verifiable	Shared catch, sale-price, cost and payment records
Kinship-based conflict settlement	Preserves harmony and avoids formal confrontation	May silence weaker parties and leave structural issues unresolved	Culturally sensitive mediation with a neutral avenue for complaint	Communication forum and agreed mediator
Informality as normal business practice	Provides flexibility under uncertain fishing conditions	Leaves rights, duties, safety and payment procedures ambiguous	Flexible but explicit minimum standards	Periodic review of simple agreements

Rich picture of the current boat owner-crew labor relation in Kupang fisheries



Solid arrows: material or decision flows. Dashed arrows: normative or structural influence.

Figure 4. Rich picture of actors, flows, social norms, and dependency mechanisms in the current boat owner-crew labor relationship in Kupang fisheries.

TPB explanation of the behavioral lock. The behavior of both central actors reinforced the same equilibrium (Table 5; Figure 5). Crew members' attitude toward remaining in the relationship was pragmatic: the job was imperfect but realistic and relatively secure. Subjective norms emphasized obedience, loyalty, kinship, and gratitude. Perceived behavioral control was low because crew members lacked vessels, capital, direct market access, independent price records, and equivalent employment. Their intention was therefore to retain work and avoid the risk of exit. Owners' attitudes were shaped by the belief that control was justified by investment and risk. Informal arrangements were normalized within the business community, and owners had a high degree of control over internal decisions while facing weather, catch, price, and market uncertainty. Their intention was to maintain labor availability, operational flexibility, and marketing control.

Table 5

Main behaviors, Theory of Planned Behavior interpretation, and locking factors

<i>Actor and maintained behavior</i>	<i>Attitude and subjective norm</i>	<i>Perceived control and intention</i>	<i>Principal locking factors</i>
Crew members remain in employment without authority over landed catch	Crew work is viewed as the most realistic income source; loyalty, kinship and reluctance to object are socially valued	Low control because crew members lack vessels, capital and market access; intention is to avoid job loss	Few equivalent jobs; household income need; no productive assets
Crew members accept owner-led prices, sales and payments	The arrangement is treated as customary; compliance with owner/captain decisions is expected	No shared records or independent price access; intention is to preserve the relationship	Worker status; weak information rights; informal payment system
Owners retain control of finance, catch and marketing	Control is viewed as reasonable because owners provide capital and bear operational risk; informal practice is normalized	High internal control; intention is to protect investment, secure labor and stabilize marketing	Vessel ownership, buyer network, operating costs and risk
Owners provide advances and assistance and keep arrangements informal	Assistance is understood as both support and a normal patron role	Owners can condition recruitment and continued work; intention is to retain dependable crews	Weak social protection and credit alternatives; personalized trust

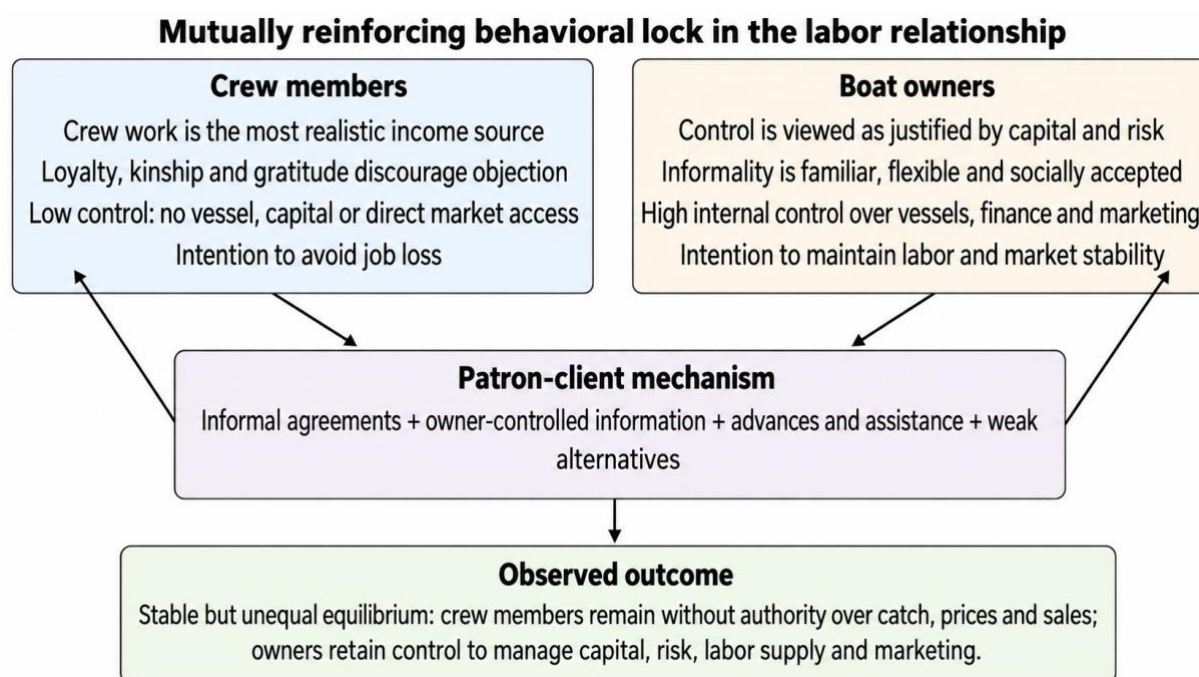


Figure 5. Mutually reinforcing attitudes, norms, and control conditions that stabilize an unequal labor relationship.

Required transformation, CATWOE, and root definition. The combined diagnosis indicated that the required outcome was not simply a higher payment, but a shift from informal, opaque, and relations based on economic dependency toward relations that were more transparent, clearly defined, and balanced. This does not imply equal ownership of capital or removal of the owners' legitimate decision role. It means that catch records, first-sale information, costs, advances, payment calculations, rights, duties, and avenues for objection become understandable and verifiable. The Customers, Actors,

Transformation, Worldview, Owners, and Environmental constraints analysis translated this transformation into a purposeful system (Table 6).

Table 6

CATWOE formulation for the purposeful system of labor-relation change

<i>Component</i>	<i>Formulation</i>
Customers	Crew members as the most directly affected group; owners and other business actors are also affected because change influences operational stability.
Actors	Crew members, boat owners, port managers, local government, collectors/buyers, fisher organizations and supporting institutions.
Transformation	Informal, opaque and dependency-based labor relations become more transparent, clearly defined and balanced.
Worldview	Crew welfare depends not only on production, but also on information authority, risk distribution, benefit sharing and position in the value chain.
Owners	Boat owners, local government, port managers and market actors who can enable, modify or block change.
Environmental constraints	Patron-client norms, limited jobs and finance, informal conflict resolution, seasonal prices and catches, port/cold-chain conditions and local policy capacity.

The resulting root definition was: a facilitation system operated by crew members, boat owners, port managers, local government, collectors and supporting actors, using transparent catch, cost, first-sale and payment information; clearer work agreements; stronger economic access; and communication and mediation mechanisms to transform informal, opaque and dependency-based relations into more transparent, clearly defined and balanced relations, thereby improving procedural fairness and the potential for a more equitable distribution of fisheries benefits.

Conceptual activity system and gaps in field reality. Eight minimum activities followed from the root definition: map actors and dependency; document catch, first-sale prices, costs, and benefit flows; disclose understandable information; establish minimum work agreements; create communication and mediation; build crew economic capability; develop alternative economic access; and monitor change. These activities represent a logical system, not a list of completed programs. Comparison with field reality showed that some element of the system existed - personal communication, owner assistance and family-based conflict settlement - but they did not constitute transparent or accountable arrangements. The activity system is summarized in Figure 6, and the model-reality comparison and 3E assessment are presented in Table 7.

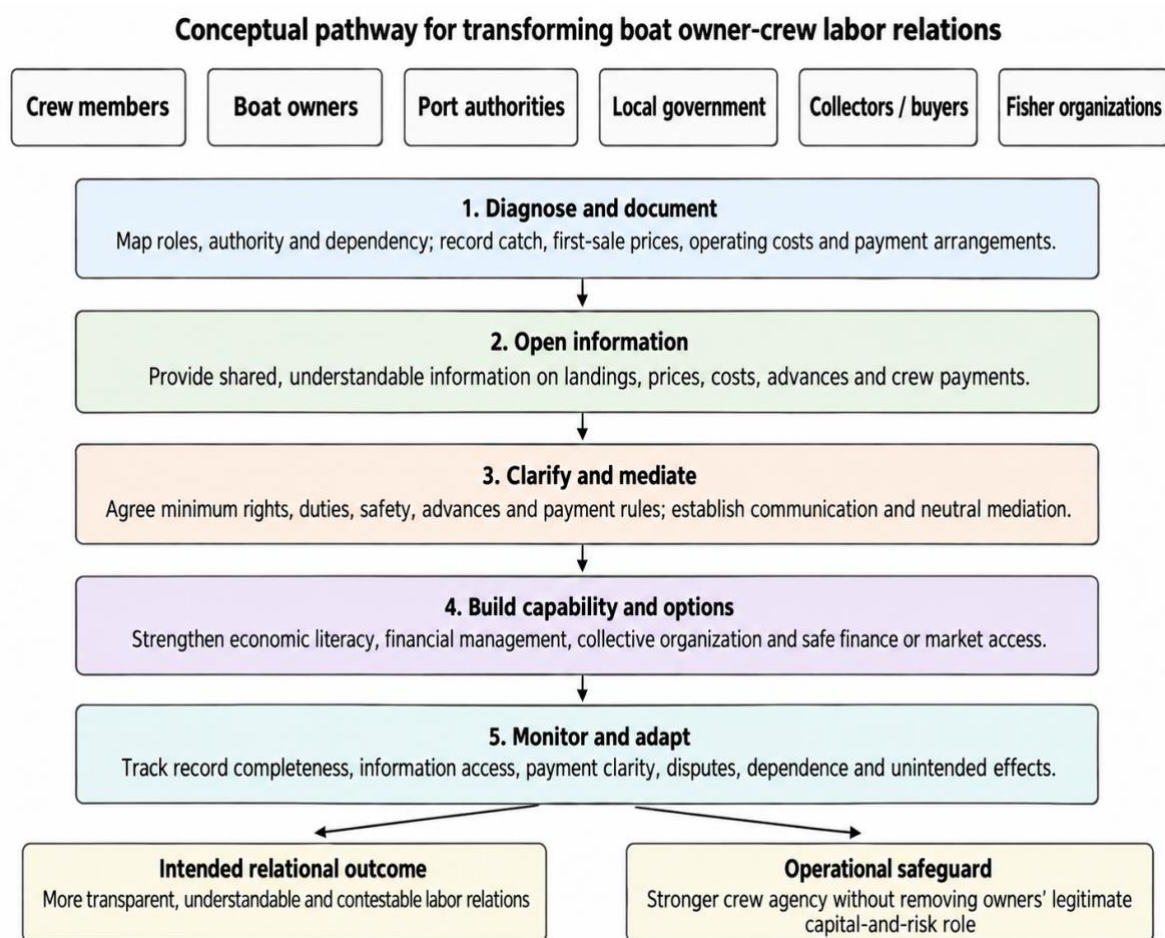


Figure 6. Minimum purposeful activities and intended outcomes of the conceptual labor-relation transformation system.

Model-reality comparison and 3E assessment. The researcher-led comparison confirmed four cross-cutting gaps: no shared information system, unclear minimum rights and duties, no neutral mediation route, and insufficient economic alternatives. The activities were judged to have high logical efficacy because they addressed the diagnosed causes directly. Potential efficiency varied: information and agreement pilots could use existing port and government actors, whereas alternative finance and collective marketing required greater resources. Effectiveness remained prospective because the model had not been field-tested or validated through implementation.

Table 7

Comparison of conceptual activities with field reality and the derived intervention response

<i>Conceptual activity</i>	<i>Field reality and principal gap</i>	<i>Researcher-led 3E and provisional feasibility assessment</i>	<i>Derived intervention response</i>
Map actors, authority and dependency	Actors were identifiable, but authority and dependency were not documented as a work-governance system	High logical efficacy; feasible as a baseline exercise using port and local-government facilitation	Participatory actor and authority map
Document catch, first-sale prices, costs and payments	Records were controlled by owners or collectors; no shared trip-to-payment record	High logical efficacy; a low-cost pilot is possible, but owner acceptance is essential	Simple shared landing, sale and payment record
Disclose understandable information	Transparency was not an established work norm	Systemically desirable and potentially culturally feasible if introduced gradually and reciprocally	Crew access to price, cost and payment calculations
Clarify minimum work agreements	Rights, duties, advances, safety and payment procedures were largely informal	Potentially efficient if agreements remain simple and flexible rather than rigid contracts	Minimum agreement reviewed by owners and crew
Create communication and mediation	Disputes were handled personally or through kinship; no neutral route existed	Potentially feasible through a locally trusted forum; prospective effectiveness depends on perceived neutrality	Communication forum and agreed mediator
Build crew economic capability	Fishing skills were strong, but financial, market and negotiation capability was limited	Moderate resource requirement; expected to support perceived behavioral control	Economic literacy, recording and communication training
Develop alternative economic access	Credit, cooperatives and equivalent jobs were weak	Most resource-intensive and long-term activity; likely necessary for durable effectiveness	Safe finance, group institutions and supplementary income
Monitor changes in labor relations	No indicators or responsible institution existed	Potentially feasible after pilot design; required for learning and adaptation	Process and outcome monitoring by port, government and participant representatives

Staged intervention strategy. Four intervention domains were formulated from the gaps and feasibility assessment (Table 8). Transparency is the entry point because immediate redistribution of ownership or decision authority would be socially and operationally disruptive. Shared records are intended to establish a new norm of verifiable reciprocity rather than to deny owners' financing role. Clear agreements and mediation then convert information into more predictable and contestable relations. Capacity building helps crew members understand costs, prices, advances, payments, and household finance. Alternative economic access reduces the personalized dependence that prevents workers from voicing concerns. Monitoring is required throughout because the intervention is a negotiated learning process rather than a one-time program.

Table 8

Staged intervention strategy for Tenau Coastal Fishing Port and Oeba Fish Landing Base

<i>Intervention domain</i>	<i>Core actions</i>	<i>Lead and supporting actors</i>	<i>Indicative staging</i>	<i>Early monitoring indicators</i>
1. Information transparency	Simple shared landing records; first-sale price and operating-cost information; explanation of payment calculations; routine verification by both parties	Boat owners and crew members; port and fisheries service as facilitators	Year 1 pilot; gradual expansion in year 2	Proportion of trips recorded; crew access to price and payment information
2. Clear agreements and mediation	Minimum agreement on rights, duties, advances, payment, safety and dispute handling; communication forum; neutral mediator; periodic review	Boat owners and crew members; local government, community figures and port	Forum formation in year 1; application and review in year 2	Agreements used; disputes raised and resolved; participant trust
3. Crew capability	Economic literacy, catch and income recording, financial management, market understanding, safety, communication and awareness of rights and duties	Fisheries service, port, training institutions and universities	Basic training and follow-up in years 1-2	Knowledge gain; use of records; ability to explain payment calculation
4. Economic access and reduced dependence	Strengthen cooperatives or groups; safe credit; financial literacy; supplementary income; cold-chain support linked to transparent market access	Fisher organizations or crew groups, cooperative service, banks, fisheries service and port	Institution building and finance access in years 1-3	Use of non-personal finance; collective marketing; reduced reliance on owner advances

Discussion

The central problem is authority within the labor relation, not production alone.

The study confirms that low crew welfare cannot be understood only through catch, productivity, or nominal income. Crew members on this case were not independent sellers with weak bargaining power in an otherwise open market. They were workers within owner-controlled enterprises and had no authority over catch after landing. This distinction matters because a market-price intervention designed for autonomous producers would be insufficient if workers still lack recognized access to sale, cost, and payment information. The finding is consistent with livelihood and value-chain scholarship showing that productive assets, market institutions, and relationships determine who can convert fish production into welfare (Allison & Ellis, 2001; Rosales et al., 2017; Roberts et al., 2022).

Patron-client relations are both protective and constraining. The findings caution against a simple moral division between exploitative owners and passive workers. Owners financed vessels and recurrent operations, faced catch and market uncertainty, recruited crews, and frequently supplied forms of assistance that public or formal institutions did not provide. These functions explain why crew members valued the relationship and why owners regarded control as legitimate. Patron-client arrangements often endure because they provide insurance and coordination while distributing authority asymmetrically (Scott 1976; Platteau 1995). The policy task is therefore to preserve legitimate financing, risk-bearing and reciprocal support while changing the norms that make information, advances,

and dispute resolution dependent solely on personal discretion. Abruptly prohibiting advances or imposing rigid contracts could remove protection before viable alternatives exist.

TPB explains persistence; SSM organizes feasible change. The integrated use of TPB and SSM is the main methodological contribution. TPB showed that crew members' continued participation was not simply a knowledge deficit: a favorable evaluation of income security, social expectations of loyalty, and low perceived behavioral control combined to sustain behavior. Owners also acted under a coherent set of beliefs, norms, and constraints. SSM extended the analysis beyond individual intention. The rich picture and CATWOE reframed the problem as a multi-actor system requiring shared records, agreements, mediation, capability, economic options, and monitoring. The explicit model-reality and 3E comparison then showed why these activities were relevant and which could be introduced first. This sequence addresses a common weakness in intervention design: programs are often selected before the problem structure, social norms, and behavioral incentives are understood (Mingers 2000; Mingers & Rosenhead 2004).

Transparency is a practical first move, but it is not the final outcome. First-sale price transparency and shared catch and payment records can reduce information asymmetry and create a factual basis for payment discussions. Comparable value-chain studies show that weak access to price information can limit actors' ability to understand downstream value and that improved governance may strengthen economic returns (Purcell et al., 2017; Penca et al., 2021). Yet transparency alone does not redistribute assets or provide alternative livelihoods. In Kupang, its immediate value is procedural and normative: crew members can understand how payments were calculated, owners can demonstrate costs and risks, and both parties begin to treat verifiable information as a normal element of the work relation. The intervention must then progress to agreements, representation, mediation and economic options. Otherwise, information is available without the power or institutional channel to use it.

Ports and local government can facilitate without taking over private business. Fishing ports already record landings, provide services, and convene actors. They are therefore strategically placed to host simple information systems, communication forums, and training, while local government can support mediation, cooperative development, safe finance, and social protection. This role should be facilitative rather than managerial: neither the port nor government needs to set every private payment. Their function is to establish minimum procedural fairness, credible records, and support for the party with less control. The Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries, issued by the Food and Agriculture Organization of the United Nations (FAO), similarly emphasize rights, participation, livelihood support, social development, and access to markets rather than production assistance alone (FAO, 2015).

Interpreting the economic indicators cautiously. The observed FSPSs ranged from 16% to 36% among the fish groups retained in the comparable per-kilogram analysis. These ratios do not measure wages, sharing payments, or net economic benefits received by crew members, because the first seller was generally a boat owner or collector. Comparable fisheries studies caution that benefit distribution cannot be inferred from price spreads alone. Value-chain analysis must distinguish costs, margins, profits, actor roles, information flows, and governance relations (Rosales et al., 2017), while market structures and social relations can mediate which actors ultimately benefit from seafood trade (Drury O'Neill et al., 2018). The ratios therefore cannot establish unfairness: downstream prices incorporate handling, spoilage, transport, market risk, and other functions, and the observations were not a longitudinal audit of every transaction. This qualification is also important because traded volumes and benefit distribution may vary substantially between seasons (Jueseah et al., 2020). Two non-weight observations were excluded rather than converted without evidence. Nevertheless the indicator provides contextual evidence that value formation after landing occurred within channels in which crew members lacked

decision rights and access to records. This interpretation is consistent with evidence from an Indonesian island based fisheries system, where patron-client relationships structured access to finance, market information, bargaining power, and trading flexibility across the value chain (Roberts et al., 2022). Future work should separately document crew payment formulas, owner net returns, product-specific costs and losses, seasonal variation, and transaction-level first-sale and final prices.

Limits and research agenda. The study involved 20 purposively selected matched owner-crew dyads at two Kupang landing centers and was designed for analytical depth, not statistical inference. The conceptual strategy has not yet been implemented, and the researcher-led 3E assessment has not been validated through a stakeholder process or field trial. The study therefore does not claim demonstrated effects on payment, conflict, agency, or welfare. A field trial should begin with a small number of willing dyads. This staged, and participatory approach is warranted because Indonesian experience with traceability interventions shows that attempts to change information flows are mediated by the established practices of fishers and traders (Doddema et al., 2020). Research from Sumbawa similarly demonstrates that market-oriented interventions interact with customary norms, social ties, and trust within small-scale fisheries systems (Phelan et al., 2023). This staged and participatory approach is warranted because Indonesian experience with traceability interventions shows that attempts to change information flows are mediated by the established practices of fishers and traders (Doddema et al., 2020). Research from Sumbawa similarly demonstrates that market-oriented interventions interact with customary norms, social ties, and trust within small-scale fisheries systems (Phelan et al., 2023). Process indicators should include record completeness, crew access to information, clarity of advances and payment calculations, agreement use, dispute handling, perceived fairness, and reliance on personalized finance. Outcome evaluation should examine payment variability, labor retention, owner costs, conflict, crew agency, norm change, and unintended effects. Because fisher-trader relations can both enable adaptation and alter power balances or vulnerability, their effects remain context dependent (Orach et al., 2024). The activity system should therefore be adapted and stakeholder validated rather than copied mechanically.

Conclusions. Labor relations at Tenau Coastal Fishing Port and Oeba Fish Landing Base were structured by the owner's control of vessels, operating finances, landed catch, first-sale decisions, and records, while crew members provided labor without authority over post-landing decisions. The arrangement persisted because it offered workers income and social support under limited alternatives and offered owners a mechanism to protect capital, manage risk, secure labor, and coordinate sales. The problem was therefore not simply a low price or income, but a labor relation in which economic dependence and social norms concentrated information and decision authority.

Integrating TPB with SSM showed that behavior change cannot be separated from system and norm redesign. The required transformation is not the elimination of boat owners' legitimate role, but a move toward relations in which catch, first-sale prices, costs, advances, and payments are visible; rights and obligations are clearer; communication and neutral mediation are available; and crew members have greater capability and economic options. The rich picture, CATWOE, root definition, and model-reality comparison provide a traceable analytical basis for that transformation.

The proposed strategy starts with shared and verifiable information, proceeds to minimum agreements and culturally sensitive mediation, and is reinforced by crew capability and alternative economic access. It is a conceptual, staged, and testable pathway rather than a demonstrated welfare program. Success should be judged by whether labor relations become more transparent, understandable, and contestable while remaining operationally viable for the owners who finance and bear the risk of fishing enterprises. The analytical approach may also provide a starting point for examining and redesigning comparable informal patron-client labor relations in other small-scale fisheries, provided that it is adapted to their specific behavioral, institutional, and market contexts.

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