
Market Governance and Ecological Sacrifice in Tobacco Farming: Environment–Livelihood Trade-Offs and Hybrid Institutions in The Besuki Raya Region East Java Province, Indonesia

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Abstract

Tobacco farming in Besuki Raya, East Java, demonstrates how environmental degradation in smallholder agrarian systems is shaped by market power, livelihood dependence, and hybrid institutional arrangements. This study examines how economic governance structures influence environmentally consequential production practices and environment–livelihood trade-offs in tobacco farming. The study was conducted in the Besuki Raya region of East Java, Indonesia, covering Jember, Lumajang, Bondowoso, and Banyuwangi as major tobacco-producing districts. A qualitative political–economic ethnographic design was employed. Data were collected between March and November 2025 through 54 in-depth interviews, eight focus group discussions involving 56 participants, 36 field observation visits, document analysis, and limited netnographic observation of six WhatsApp and Facebook farmer communities. Data were analysed using ATLAS.ti 23 through open, axial, and selective thematic coding. The findings show that formal regulations, market mechanisms, cooperatives, and patron–client relations stabilise short-term livelihoods while reproducing environmentally intensive farming. Warehouse-based grading and advance financing encourage chemical input use, accelerated production, and quality compliance because prices and debt repayment are determined after harvest. This study contributes to ecological economics by showing that environmental degradation is embedded in market governance rather than arising from isolated farmer behaviour or technical inefficiency alone.

Keywords: Ecological Economics; Environment–Livelihood Trade-Offs; Market Power; Hybrid Institutions; Tobacco Farming; Besuki Raya.

INTRODUCTION

Tobacco farming in Besuki Raya, East Java, represents a critical empirical case for understanding the relationship between agrarian livelihoods, environmental degradation, and economic governance in smallholder production systems. The region, which includes Jember, Lumajang, Bondowoso, and Banyuwangi, has long been associated with strategic tobacco production, particularly Na-Oogst and Kasturi tobacco. Tobacco cultivation provides seasonal cash income, employment opportunities, and access to market networks for rural households. However, this economic role is accompanied by ecological pressures, including declining soil fertility, chemical input dependency, water stress, and vulnerability to climate variability. These conditions indicate that tobacco farming should not be viewed merely as a crop-based livelihood activity, but as an ecological–economic system in which farmers continuously negotiate between income security and environmental sustainability.

The importance of examining tobacco farming through an ecological–economic lens is supported by growing empirical evidence. Newsham et al., (2021) show that tobacco production is associated with environmental and health risks, including pesticide exposure, soil degradation, water contamination, and broader ecological stress. Chazovachii et al., (2021) further argue that tobacco farming remains embedded in wider political–economic structures that reproduce dependence on tobacco despite the availability of alternative livelihoods. In the Indonesian context, Promphakping et al., (2021); Shiringo et al., (2022) demonstrate that tobacco farming decisions are shaped by economic uncertainty, rainfall conditions, access to credit, farming experience, and the perceived profitability of tobacco relative to other crops. These studies provide an important basis for understanding why tobacco remains attractive to farmers, but they have not fully explained how market governance and hybrid institutional relations shape environmentally consequential production practices at the local level.

From the perspective of ecological economics, environmental degradation in tobacco farming cannot be understood merely as an externality or as the result of individual farmer behaviour. In Besuki Raya, farmers' production decisions are shaped by grading systems, post-harvest price determination, advance financing, debt relations, and informal patron–client ties. These mechanisms influence the type of input used, the timing of production, the willingness to take ecological risks, and the capacity to adopt environmentally sustainable practices. Kamuti (2018), in their qualitative study of tobacco farmers in Indonesia and the Philippines, show that farmers continue to grow tobacco not only because of expected income, but also because of crop familiarity, market access, environmental suitability, and available credit arrangements. This supports the argument that farmers' environmental decisions are embedded in constrained economic choices rather than in simple preference or ignorance.

Market power is particularly important in explaining the ecological consequences of tobacco farming. Lencucha et al., (2020; Mackie, (1985), in a study of the tobacco market in Jember Regency, found that the tobacco market tends toward oligopolistic competition with moderate market concentration, indicating that farmers operate within a market structure where bargaining power is unevenly distributed. This finding is highly relevant to Besuki Raya because farmers' ecological practices are not only determined by agronomic knowledge, but also by market arrangements involving middlemen, wholesalers, warehouses, and manufacturers. When prices are determined after harvest and quality is assessed through grading systems controlled by buyers or intermediaries, farmers face strong incentives to maximise output and comply with market-defined quality standards. Consequently, chemical intensification, accelerated production, and continued monocropping become economically rational strategies, even when farmers recognise their long-term ecological consequences.

The relationship between market power, debt, and environmental risk has also been documented in wider tobacco-farming literature. Chingosho et al., (2021) show that smallholder tobacco farmers involved in contract arrangements may experience debt dependency, while Mazwi et al., (2020); Scoones et al., (2018) demonstrate that tobacco contract farming can generate new forms of agrarian change, accumulation, and power asymmetry. Although these studies focus largely on African contexts, their insights are analytically useful for examining tobacco farming in Indonesia because they reveal how credit, contracts, and buyer control may discipline farmers' production decisions. However, their findings cannot simply be transferred to Besuki Raya without considering the specific role of local institutions, patron–client relations, cooperatives, farmer groups, and state-supported tobacco governance. This study therefore uses Besuki Raya as an empirical site to examine how such mechanisms operate in a Southeast Asian smallholder tobacco system.

Existing ecological economics research has extensively examined environmental externalities, resource depletion, resilience, and sustainability transitions (Adger et al., 2022; Folke et al., 2016). Political ecology has also contributed significantly to understanding how

power relations, unequal resource access, and distributive conflicts shape environmental outcomes (Vadjunec et al., 2016). Meanwhile, institutional economics explains how formal rules, informal norms, and organisational arrangements structure economic behaviour (North, 1990; Ostrom, 1990). However, the integration of these perspectives remains limited in studies of tobacco farming, particularly in explaining how market power, debt-based production, warehouse grading, informal patronage, and hybrid institutions jointly produce environment–livelihood trade-offs. This gap is especially evident in the Indonesian tobacco sector, where studies have discussed farmer income, shifting behaviour, market structure, and institutional arrangements, but have paid less attention to how these elements interact with environmental degradation.

This study addresses that gap by examining tobacco farming in Besuki Raya as an ecological–economic system shaped by market domination and hybrid institutional governance. The central argument is that environment–livelihood trade-offs among smallholder tobacco farmers are not irrational decisions, but economically rational responses to structurally constrained conditions. Farmers may continue environmentally intensive practices not because they ignore ecological risks, but because grading standards, debt obligations, uncertain prices, and seasonal income dependence make short-term production success more urgent than long-term ecological restoration. In this sense, environmental degradation is interpreted as an outcome of economic governance rather than as a purely technical agricultural problem.

Theoretically, this study is grounded in ecological economics, which explains how economic incentives, institutional arrangements, and ecological limits interact within tobacco farming systems. Political ecology complements this framework by highlighting power relations and the unequal distribution of ecological costs. Institutional economics further supports the analysis by explaining how formal rules, informal norms, market arrangements, and hybrid institutions shape farmers' choices. These three perspectives are used in an integrated but focused manner: ecological economics provides the main analytical foundation, political ecology explains power and distributional effects, and institutional economics clarifies the role of governance structures in shaping incentive systems.

Empirically, this study contributes to the literature by providing evidence from Besuki Raya, an under-researched tobacco-producing region in Southeast Asia. The study uses political–economic ethnography, in-depth interviews, focus group discussions, field observations, document analysis, and limited netnographic observation to capture both material practices and digital discourses surrounding tobacco farming. Through this approach, the study shows how warehouse-based grading, advance financing, patron–client relations, cooperative structures, and online agrarian discussions reproduce a system in which environmental sacrifice becomes normalised as part of livelihood survival. These empirical materials strengthen the conceptual claim that environmental degradation in tobacco farming is embedded in market and institutional arrangements.

This study offers three main contributions. First, it conceptualises environment–livelihood trade-offs as economically rational responses to market power and livelihood insecurity, rather than as individual failures of environmental awareness. Second, it explains how hybrid institutions can simultaneously stabilise farmers' short-term livelihoods and reproduce long-term ecological vulnerability. Third, it introduces the concept of institutional expansion to describe how local institutions gradually incorporate environmental functions, such as organic input trials, collective pest management, and adaptive planting calendars, while remaining constrained by dominant market structures. These contributions are expected to enrich ecological economics, political ecology, and institutional analysis by demonstrating how sustainability problems in smallholder tobacco farming are produced through concrete governance mechanisms.

The remainder of this article is structured as follows. The next section presents the conceptual framework based on ecological economics, political ecology, and institutional analysis. The methodology section explains the political–economic ethnographic design, study area, data collection procedures, netnographic observation, and thematic coding strategy. The results and discussion section analyses the main empirical findings on environmental vulnerability, market power, hybrid institutions, social capital, environment–livelihood trade-offs, institutional expansion, and digital agrarian discourses. The final section presents policy implications and conclusions for redesigning tobacco governance in ways that better align livelihood security with environmental sustainability.

CONCEPTUAL FRAMEWORK: AN ECOLOGICAL ECONOMICS PERSPECTIVE

From an ecological economics perspective, environmental degradation in agrarian systems cannot be separated from economic incentives, institutional arrangements, and power relations. Unlike neoclassical models that treat environmental damage as an externality or a consequence of individual behavioral failure, ecological economics emphasizes that ecological degradation is often structurally embedded within economic systems themselves, particularly where market power asymmetries and livelihood insecurity prevail (Duit et al., 2023; Folke et al., 2016).

In tobacco farming, market power exercised through grading systems, advance financing, and exclusive trading arrangements operates as an indirect form of ecological control. These mechanisms systematically shape farmers' production decisions and environmental practices by incentivizing short-term output maximization and chemical intensification, while simultaneously shifting ecological risks and costs downward to smallholders. Environmental degradation thus emerges not as an unintended side effect, but as a predictable outcome of value-chain governance structures that prioritize profitability and quality compliance over ecological sustainability (Ngunha et al., 2021).

Hybrid institutions combining informal patron–client relations, cooperatives, and state interventions mediate these economic incentives. While such institutions play a critical role in stabilizing income and reducing short-term livelihood risk under conditions of market volatility and climate uncertainty, they may also reproduce long-term ecological degradation by leaving underlying incentive structures intact. Social capital further conditions this process by enabling risk-sharing and adaptive responses, while at the same time reinforcing dependency and limiting farmers' capacity to challenge dominant market arrangements (Holden & Lee, 2009; Smith & Fang, 2020).

Building on this framework, the study conceptualizes institutional expansion as an endogenous adaptation pathway through which existing institutions gradually extend their scope toward environmental governance without fundamentally altering prevailing market power relations. Rather than representing a transformative shift, institutional expansion reflects a form of constrained adaptation that allows incremental ecological learning while remaining embedded within market-dominated systems. This perspective highlights both the potential and the limits of bottom-up sustainability initiatives in agrarian contexts characterized by persistent economic and institutional asymmetries (Ruckert et al., 2023)

METHOD

Analytical Approach: An Ecological Economics Perspective

This study adopts a qualitative analytical approach grounded in ecological economics, emphasizing the interaction between economic incentives, institutional arrangements, and ecological outcomes in smallholder agrarian systems. In contrast to technocratic or purely biophysical approaches, ecological economics conceptualizes environmental degradation as an outcome of structurally embedded economic and institutional processes, particularly under

conditions of market power asymmetry and livelihood insecurity (Nascimento et al., 2022; Whalen, 2018).

Accordingly, the study applies a political–economic ethnographic design to examine how environment–livelihood trade-offs are produced, negotiated, and reproduced within tobacco farming systems. Political ecology is employed as a complementary analytical lens to capture power relations and distributive conflicts, while ecological economics provides the core framework for interpreting environmental degradation as an economically rational response to constrained choice sets rather than as individual behavioral failure (Faxon, 2023; Sharma & Jaggi, 2022). This combined approach allows the analysis to focus on economic governance mechanisms such as pricing systems, debt relations, and institutional hybridity that shape farmers’ environmental decision-making under ecological limits (North, 1990; Ostrom, 1990).

Study Area

The empirical analysis focuses on the Besuki Raya region of East Java, Indonesia, comprising the districts of Jember, Lumajang, Bondowoso, and Banyuwangi. This region represents one of Indonesia’s most important tobacco production zones, particularly for Na-Oogst and Kasturi tobacco, which are integrated into national and international value chains (Muktianto & Diartho, 2018; Sulistyono et al., 2022).

From an ecological–economic perspective, Besuki Raya constitutes a structurally constrained agrarian system, characterized by: (1). smallholder-dominated production, (2). land scarcity and seasonal income dependence, (3). strong market integration through warehouse-based grading systems, and (4). increasing ecological stress related to climate variability, soil degradation, and water scarcity (Muktianto & Diartho, 2018).

These characteristics make the region a suitable case for examining how economic incentives and institutional arrangements interact with ecological limits, producing persistent environment–livelihood trade-offs (Duit et al., 2023; Mackie, 1985).

Data Collection

Data were collected between March and November 2025 through in-depth interviews, participant observation, focus group discussions, document analysis, and limited netnographic observation. These techniques were combined to capture farming practices, market relations, institutional arrangements, and environmental decision-making in tobacco farming across Besuki Raya, East Java.

In-depth Interviews and Participant Observation

Semi-structured interviews were conducted with 54 informants selected through purposive and snowball sampling. The informants consisted of 32 smallholder tobacco farmers, 8 local traders or middlemen, 4 warehouse intermediaries, 4 cooperative or farmer group leaders, 4 agricultural extension officers, and 2 local government representatives. They were selected based on their direct involvement in tobacco production, trading, institutional support, and local agricultural governance.

The interviews explored production decisions, input use, pricing mechanisms, grading practices, debt relations, institutional affiliations, and perceptions of environmental change. Participant observation was conducted through 36 field visits across Jember, Lumajang, Bondowoso, and Banyuwangi. Observations covered land preparation, planting, fertilization, pest control, harvesting, curing, warehouse grading interactions, and farmer group meetings. Field notes were used to document observed practices, actor interactions, and environmental conditions.

Focus Group Discussions

Eight focus group discussions were conducted, with two FGDs in each district. Each FGD involved 6–8 participants, resulting in 56 participants in total. Participants were selected purposively from tobacco farmers, farmer group members, cooperative members, and local actors familiar with tobacco production and marketing. The FGDs discussed price volatility,

climate uncertainty, input dependency, grading practices, debt relations, institutional support, and environment–livelihood trade-offs. They also served to validate emerging themes from interviews and observations.

Document Analysis

Document analysis was used to contextualize field findings within broader policy and institutional frameworks. The documents reviewed included local agricultural policy documents, extension materials, cooperative records, tobacco production reports, local development planning documents, and reports on tobacco excise revenue allocation or *Dana Bagi Hasil Cukai Hasil Tembakau* (DBHCHT). These documents helped compare formal policy objectives with field-level practices in tobacco governance.

Netnographic Observation of Digital Agrarian Spaces

Limited netnographic observation was conducted in six digital communities, consisting of four consent-based WhatsApp groups and two farmer-oriented Facebook communities. A total of 312 relevant posts, comments, discussion threads, and message excerpts were documented and anonymized. The observed discussions focused on tobacco prices, warehouse grading, quality standards, weather uncertainty, chemical inputs, debt relations, selling strategies, and environmental risk.

Netnographic data were used for analytical triangulation rather than statistical representation. All digital materials were coded thematically alongside interview, observation, and document data using ATLAS.ti 23. Ethical safeguards were applied by removing personal identifiers, avoiding traceable usernames, and paraphrasing sensitive excerpts where necessary.

Data Analysis

Qualitative data were systematically analyzed using ATLAS.ti 23, following an iterative thematic coding process consistent with ecological economics' emphasis on institutional and incentive-based mechanisms. The analytical process involved:

First, **Open Coding**, was conducted to identify recurrent patterns across interviews, FGDs, field notes, documents, and netnographic data. Following the principles of qualitative thematic analysis, initial codes were generated inductively from the data to capture empirical meanings emerging from participants' experiences rather than from predetermined categories (Clarke & Braun, 2017; Saldaña & Omasta, 2016). The codes covered themes such as environmental stress, production costs, chemical input dependency, pricing systems, grading practices, debt relations, market access, institutional support, and livelihood uncertainty. To improve coding reliability, a preliminary codebook was developed, containing code definitions, inclusion criteria, and examples of relevant quotations. The coding scheme was refined through constant comparison across data sources, as recommended in qualitative data analysis procedures (Creswell & Poth, 2016; Miles et al., 2014).

Next, **Validation** was strengthened through triangulation, peer debriefing, member checking, and audit trail documentation. Interview data were compared with FGD results, observation notes, documents, and digital materials to confirm the consistency of emerging codes. This procedure followed qualitative trustworthiness criteria emphasizing credibility, dependability, and confirmability in interpretive research (Guba & Lincoln, 1994; Nowell et al., 2017). All code revisions and analytical memos were documented in ATLAS.ti 23 to support transparency and analytical dependability.

Third, **Axial Coding**, grouping codes into broader categories such as market power, financial dependency, hybrid governance, social capital, and ecological degradation.

Fourth, **Selective Coding**, integrating these categories into higher-order analytical themes, including: (1). environmental vulnerability as an economically produced condition, (2). market power and indirect ecological control, (3). hybrid institutions as risk-stabilizing mechanisms, (4). environment–livelihood trade-offs as rational survival strategies, and (5). institutional expansion as an endogenous adaptation pathway.

Research Quality, Reflexivity, and Ethics

To ensure analytical rigor, the study applied four quality criteria commonly employed in qualitative ecological–economic research: credibility, transferability, dependability, and confirmability. Credibility was enhanced through prolonged field engagement, triangulation across data sources, and member checking. Transferability was supported through thick contextual description, while dependability and confirmability were ensured through transparent coding procedures and audit trails within ATLAS.ti.

Research reflexivity was continuously practiced to acknowledge the positionality of the researcher in relation to power asymmetries within tobacco governance systems. Ethical standards were upheld through informed consent, anonymization of participants, and careful handling of sensitive information related to debt relations and market practices.

RESULTS AND DISCUSSION

This chapter presents and discusses the empirical findings through the lens of ecological economics, emphasizing how economic incentives, market power, and institutional arrangements interact with ecological constraints to shape livelihood and environmental outcomes. Rather than treating environmental degradation as an externality or behavioral failure, the analysis demonstrates that ecological stress in tobacco farming emerges as an economically produced condition, embedded within market governance structures and hybrid institutional systems. The findings are organized into eight interrelated themes that together constitute an integrated ecological–economic configuration of tobacco farming in the Besuki Raya region.

Quantitative Representation of ATLAS.ti Qualitative Findings

To enhance analytical transparency, selected qualitative findings derived from ATLAS.ti coding are presented in a descriptive quantitative summary. The quotation frequency in Table 1 indicates how often each theme appeared across interviews, focus group discussions, field notes, documents, and netnographic materials. However, quotation frequency is not used to determine the analytical importance, causal strength, or theoretical priority of a theme.

In qualitative analysis, a theme with fewer quotations may still be analytically significant if it reveals a critical mechanism, contradiction, or conceptual contribution. Therefore, the quotation counts presented below should be read only as indicators of empirical visibility within the coded dataset, while the analytical significance of each theme is interpreted through contextual meaning, triangulation, co-occurrence patterns, and its relevance to the ecological economics framework.

Table 1
Distribution of Core Themes Identified through ATLAS.ti Coding

Core Theme	Number of Quotations	Percentage of Total Quotations	Analytical Interpretation
Environmental vulnerability	46	17.6%	Ecological stress appeared repeatedly as a structural condition in tobacco farming.
Market power domination	58	22.2%	Market governance was frequently identified in relation to farmers' production and environmental decisions.
Hybrid institutional governance	41	15.7%	Formal and informal institutions frequently appeared as mechanisms mediating production risk and market dependence.
Social capital mechanisms	39	14.9%	Social networks appeared as livelihood support mechanisms, while also showing potential links to dependency.
Environment–livelihood trade-offs	52	19.9%	Ecological compromise frequently appeared in relation to income insecurity and constrained choices.

Institutional expansion	25	9.6%	Incremental environmental adaptation appeared less frequently but remained analytically relevant as an emerging sustainability pathway.
Total	261	100%	

Note: Data processed from ATLAS.ti 23 output, 2025. Quotation frequency is presented only as a descriptive indicator of empirical visibility within the coded qualitative materials. It does not imply analytical importance, causal weight, statistical representativeness, or theoretical priority. The interpretation of each theme is based on contextual analysis, triangulated evidence, co-occurrence patterns, and its relevance to the study's ecological economics framework.

In addition to quotation frequency, this study also presents a co-occurrence matrix to show how selected codes appeared together within the same or closely related empirical segments. Co-occurrence is analytically useful because it helps identify thematic connections between different dimensions of the tobacco farming system, such as market power, debt dependency, chemical intensification, and environmental sacrifice. However, co-occurrence should not be interpreted as statistical correlation, causal evidence, or hierarchical importance. Rather, it serves as a qualitative analytical aid for tracing how themes are connected within participants' narratives, field observations, documents, and netnographic materials. The interpretation of co-occurrence patterns is therefore grounded in contextual reading, triangulation, and the ecological economics framework used in this study.

Table 2
Co-Occurrence Matrix of Selected ATLAS.ti Codes

Theme Intersection	Co-Occurrences	Interpretation
Market power × Environmental vulnerability	31	Market control frequently appeared alongside ecological stress, indicating that environmental vulnerability was often discussed in relation to value-chain dependency and unequal bargaining power.
Market power × Chemical intensification	28	Market-based grading and quality standards were often associated with input-intensive practices, particularly the use of chemical fertilizers and pesticides.
Debt dependency × Environmental sacrifice	34	Debt pressure frequently appeared together with ecological compromise, suggesting that farmers' environmental decisions were shaped by repayment obligations and short-term income needs.
Hybrid institutions × Risk stabilization	29	Formal and informal institutions were often linked to livelihood risk management, although they did not necessarily transform the underlying market structure.
Social capital × Institutional lock-in	22	Social networks appeared as sources of support, but they were also connected to dependency on patrons, traders, or established market arrangements.
Institutional expansion × Environmental learning	17	Emerging environmental practices, such as organic input trials or adaptive planting calendars, appeared in relation to gradual institutional learning, although these practices remained limited.

Note: Data processed from ATLAS.ti 23 output, 2025. Co-occurrence refers to the appearance of two codes within the same or closely related empirical segment. It should be interpreted as an indication of thematic association in the qualitative data, not as evidence of causality, statistical correlation, or analytical priority. The meaning of each co-occurrence pattern is determined through contextual interpretation, triangulation across data sources, and its relevance to the ecological economics framework.

The co-occurrence matrix indicates that several themes were repeatedly connected in the empirical materials. The strongest co-occurrence was found between debt dependency and environmental sacrifice, suggesting that livelihood pressure and repayment obligations were closely related to farmers' willingness to accept environmentally intensive practices. Similarly, the relationship between market power and environmental vulnerability shows that ecological stress was frequently narrated in connection with grading systems, price uncertainty, and value-chain control. Nevertheless, these patterns are not treated as causal relationships. They are used to guide qualitative interpretation and to support the broader argument that environmental degradation in tobacco farming is embedded in economic governance and institutional relations.

To complement the descriptive distribution of quotations, a Relative Salience Index (RSI) was calculated to indicate the proportional visibility of each core theme within the coded qualitative dataset. The RSI is used only to show how frequently a theme appeared relative to the total number of coded quotations. It should not be interpreted as an inferential statistic, causal indicator, or measure of theoretical importance. In this study, the analytical significance of each theme remains determined through contextual interpretation, triangulation, co-occurrence patterns, and its relevance to the ecological economics framework. The RSI was calculated using the following formula:

$$RSI_i = \frac{Q_i}{\sum Q}$$

where RSI_i refers to the Relative Salience Index of theme i , Q_i refers to the number of quotations assigned to theme i , and $\sum Q$ refers to the total number of coded quotations across all core themes.

Table 3
Relative Salience Index of Analytical Themes

Theme	Relative Salience Index (RSI)
Market power domination	0.22
Environment–livelihood trade-offs	0.20
Environmental vulnerability	0.18
Hybrid institutions	0.16
Social capital	0.15
Institutional expansion	0.10

Note: Data processed from ATLAS.ti 23 output, 2025. RSI values are calculated by dividing the number of quotations for each theme by the total number of coded quotations. The RSI is used only as a descriptive indicator of empirical visibility within the qualitative dataset. It does not imply analytical importance, causal weight, statistical representativeness, or theoretical priority.

The RSI results show that *market power domination* and *environment–livelihood trade-offs* were the most visible themes in the coded materials, with RSI values of 0.22 and 0.20, respectively. This indicates that issues related to market governance, livelihood pressure, and ecological compromise appeared frequently across interviews, FGDs, field observations, documents, and netnographic materials. However, higher RSI values do not automatically mean that these themes are more important analytically than themes with lower RSI values. For example, *institutional expansion* has the lowest RSI value, but it remains theoretically relevant because it captures emerging forms of local environmental adaptation. Therefore, RSI is used as a supporting descriptive tool, while final interpretation remains grounded in qualitative evidence and the ecological economics framework.

Environmental Vulnerability as an Economically Produced Condition

The findings indicate that environmental vulnerability in the tobacco farming system of Besuki Raya is not solely due to climatic variability or biophysical stress. Rather, it is shaped by the interaction between ecological pressure and economic incentives embedded in the tobacco

value chain. Field data show that farmers experienced irregular rainfall, delayed planting seasons, declining soil fertility, and rising chemical input dependency.

However, these ecological problems were intensified by market demands that encouraged farmers to maintain leaf quality, colour, texture, and volume according to warehouse grading standards. This pattern is consistent with ecological economics, which views environmental degradation as structurally embedded in economic incentives and governance arrangements rather than as an isolated externality (Duit et al., 2023; Folke et al., 2016). It is also supported by studies showing that tobacco farming is associated with soil degradation, chemical input dependency, and livelihood pressure in smallholder agrarian systems (Lencucha et al., 2020; Mazwi et al., 2020).

As one farmer in Jember explained, “If the leaf does not meet the warehouse standard, the price will fall. We have no choice but to use more fertilizer and pesticides, even though the soil is getting tired.” This statement illustrates that environmental degradation was not perceived simply as a natural process, but as a consequence of production pressure linked to market valuation. Similar patterns were observed during field visits in Lumajang and Bondowoso, where farmers reported that reducing chemical inputs was considered risky because lower leaf quality could reduce post-harvest prices. In several farmer group discussions, participants stated that soil fertility had declined over time, yet tobacco remained difficult to abandon because it provided higher seasonal cash income than most alternative crops.

These findings suggest that environmental vulnerability is economically produced through incentive structures that prioritise short-term productivity, quality compliance, and income security over long-term ecological restoration. From an ecological economics perspective, the ecological costs of tobacco farming are therefore embedded within market governance arrangements, rather than resulting solely from climate variability or individual farming decisions. This supports the argument that smallholder environmental choices are shaped by constrained livelihood conditions and market-dependent production systems (Lencucha et al., 2020; Sahadewo et al., 2020).

Market Power and Indirect Ecological Control

Market power emerged as a central mechanism shaping environmental outcomes in Besuki Raya tobacco farming. It operated through post-harvest pricing, warehouse-based grading, advance financing, and exclusive selling arrangements. Farmers rarely knew the final price before harvest because tobacco value was determined through grading indicators such as leaf colour, aroma, dryness, thickness, and texture.

These standards encouraged farmers to intensify chemical input use and accelerate production to meet buyer-defined quality benchmarks. Similar patterns have been found in tobacco and agrarian value-chain studies, where buyer control, credit dependency, and contract-like arrangements shape farmers’ production decisions and bargaining position (Chingosho et al., 2021; Scoones et al., 2018).

As one farmer in Bondowoso stated, “The price depends on the warehouse grade. If the colour is not good or the leaf is considered too thin, the price can fall. That is why farmers usually add more fertilizer and spray more often before harvest.” This statement illustrates how grading practices indirectly shaped ecological decisions. Farmers were not explicitly forced to use more chemicals, but the market system made chemical intensification appear economically necessary. This interpretation is consistent with (Muktianto & Diartho, 2018), who found that the tobacco market in Jember tends toward oligopolistic competition, reflecting unequal bargaining power between farmers and market actors.

Advance financing reinforced this dependency. Production loans from traders or warehouse-linked intermediaries helped farmers cover input costs, but tied them to specific buyers after harvest. Consequently, farmers had limited space to reduce chemical inputs,

experiment with organic alternatives, or seek more sustainable practices because lower grades could reduce prices and weaken their ability to repay debts. Previous studies also show that debt and credit relations in tobacco farming may deepen farmer dependency and restrict autonomous decision-making (Kamuti, 2018; Shiringo et al., 2022). Thus, grading systems and advance financing shifted ecological risks to smallholders while market actors retained control over price, quality assessment, and market access.

Hybrid Institutions as Risk-Stabilizing Economic Arrangements

The governance of tobacco farming in Besuki Raya operates through hybrid institutions that combine informal patron–client relations, cooperatives, and state programs. These institutions were repeatedly coded as mechanisms for managing price volatility, climate uncertainty, and production risk. From an ecological economics standpoint, hybrid institutions function as second-best economic arrangements, stabilizing livelihoods under conditions of market failure and ecological stress (Lencucha et al., 2020; Mackie, 1985).

While cooperatives and farmer groups provide access to subsidies, extension services, and limited collective bargaining, informal patronage networks continue to dominate credit provision and market access. This hybridity reduces short-term income risk but does not fundamentally alter the incentive structures driving ecological degradation. As such, hybrid institutions simultaneously mitigate livelihood vulnerability and reproduce long-term environmental extraction, illustrating a trade-off between risk stabilization and sustainability transformation (Ruckert et al., 2023).

Social Capital as an Adaptive but Constraining Economic Resource

Social capital plays a crucial role in mediating economic and ecological risks. Bonding social capital supports labor exchange and informal insurance, bridging capital facilitates knowledge diffusion, and linking capital connects farmers to state agencies and formal programs. These networks enhance adaptive capacity under climate stress by reducing transaction costs and enabling collective responses to uncertainty (Aldrich & Meyer, 2015).

However, the findings also reveal that social capital operates as a constraining economic resource. Strong bonding ties are often embedded within patron–client relations, reinforcing exclusive trading arrangements and limiting collective bargaining power. In ecological economics terms, social capital provides short-term efficiency gains but contributes to institutional lock-in, constraining the system’s capacity for structural ecological change (Faxon, 2023).

Environment–Livelihood Trade-Offs as Rational Economic Strategies

One of the most consistent findings of this study is that environment–livelihood trade-offs emerged as rational economic strategies under market uncertainty, debt obligations, and limited livelihood alternatives. Farmers acknowledged the long-term consequences of soil degradation, declining fertility, chemical input dependency, and rising production costs. However, they continued to prioritize input-intensive tobacco cultivation because tobacco remained one of the most reliable sources of seasonal cash income in Besuki Raya.

This trade-off was evident in fertilizer and pesticide use. Although farmers understood that excessive chemical inputs could damage soil quality, reducing input use was considered economically risky because it could lower leaf quality, warehouse grades, and selling prices. As one farmer in Jember explained, “We know the soil is not as fertile as before, and fertilizer costs keep increasing. But if we reduce fertilizer or pesticide, the harvest quality may decline, and the selling price can be lower. We still need tobacco income to pay debts and household needs.” This statement shows that environmental sacrifice was not caused by ignorance, but by livelihood pressure and market-based quality standards.

FGDs in Lumajang and Bondowoso showed similar patterns. Farmers stated that shifting to alternative crops or reducing chemical inputs was difficult because tobacco provided faster cash returns and was already connected to established market networks. From an ecological

economics perspective, these practices reflect bounded rationality under structural constraint, where farmers prioritize household survival over long-term ecological efficiency (Muktianto & Diartho, 2018; Sedyati et al., 2019). Thus, environment–livelihood trade-offs in Besuki Raya tobacco farming should be understood as rational strategies shaped by price uncertainty, debt dependency, grading pressure, and limited livelihood diversification (Mackie, 1985; Sahadewo et al., 2020).

Institutional Expansion as an Endogenous Adaptation Pathway

Despite structural constraints, the findings show that local institutions in Besuki Raya gradually incorporated environmental functions into their existing roles. This process is referred to here as institutional expansion, meaning the gradual extension of farmer groups, cooperatives, and informal networks beyond economic coordination toward limited environmental governance. The concept is not proposed as an entirely new theory, but is adapted from critical institutionalism and sustainability governance literature, which explains how institutions evolve through gradual adjustment, bricolage, and localized problem-solving under social and ecological constraints (Ison et al., 2015).

In tobacco farming, institutional expansion was observed in practices such as organic fertilizer trials, collective pest management, soil conservation training, and adaptive planting calendars. These initiatives indicate that local institutions did not only stabilize production and livelihoods, but also began to facilitate ecological learning. However, this adaptation remained partial because farmers' decisions were still shaped by grading standards, price uncertainty, input dependency, and tobacco-based livelihood needs.

Therefore, institutional expansion should be understood as incremental adaptation rather than full sustainability transformation. It enables environmental learning to emerge from within existing institutions, but it does not automatically overcome market domination or structural dependency. This finding extends institutional analysis by showing how local agrarian institutions can gradually accommodate environmental concerns while remaining embedded in unequal tobacco value-chain governance.

Digital Discourses and the Economic Normalization of Environmental Sacrifice

Netnographic observations reveal that economic rationales for environmental sacrifice are also reproduced in digital agrarian spaces. Online discussions among farmers frequently frame ecological degradation as an unavoidable cost of market participation, reinforcing the normalization of environmentally intensive practices (Nascimento et al., 2022; Sharma & Jaggi, 2022). Digital platforms function as extensions of economic governance, where price expectations, grading norms, and livelihood rationalities are collectively reinforced. Dominant actors within these spaces such as warehouse-linked intermediaries or group administrators shape acceptable narratives, further entrenching market-driven ecological rationality (Faxon, 2023).

Integrated Ecological Economics Configuration of Tobacco Farming

Integrating these findings, tobacco farming in Besuki Raya can be conceptualized as an ecological–economic system characterized by market power asymmetries, hybrid institutional mediation, and structurally embedded environment–livelihood trade-offs. Environmental vulnerability emerges as an economically produced condition, while hybrid institutions and social capital provide adaptive capacity without fundamentally altering incentive structures. This configuration demonstrates that sustainability challenges in tobacco-based agrarian systems are not primarily technical but institutional and economic in nature. Environmental outcomes are shaped by governance mechanisms that prioritize short-term livelihood security under conditions of market domination and ecological constraint (Adger et al., 2022; Duit et al., 2023).

Table 4 summarizes the key results of the ATLAS.ti qualitative analysis, demonstrating how environmental vulnerability, market power domination, hybrid institutional governance,

social capital mechanisms, environment–livelihood trade-offs, and institutional expansion interact within the political ecology of tobacco farming in the Besuki Raya region. The table highlights that environmental degradation is not merely a biophysical process, but is politically and institutionally mediated through value-chain control, debt dependency, and hybrid governance arrangements. At the same time, social capital and institutional expansion provide partial endogenous pathways toward environmental sustainability, albeit under persistent structural constraints (Ison et al., 2015; Partelow & Nelson, 2020).

Table 4
Summary of ATLAS.ti–Based Qualitative Analysis Results on the Political Ecology of Tobacco Farming in Besuki Raya

Open Codes (Sample)	Axial Category	Core Theme	Political–Ecological Interpretation	Implications for Environmental Sustainability
Irregular rainfall, delayed rainy season, crop failure	Climate variability	Environmental Vulnerability	Climate change increases production risk but adaptive capacity is constrained by market dependence	Climate stress deepens ecological fragility and livelihood insecurity
Soil exhaustion, declining soil fertility, chemical residue	Land degradation	Environmental Vulnerability	Soil degradation is driven by intensive monocropping under industrial quality demands	Long-term loss of agro-ecological resilience
Price fixing, post-harvest grading control	Value chain domination	Market Power Domination	Market actors exercise indirect ecological control through quality standards	Environmental costs are shifted to farmers
Debt bondage, advance financing	Financial dependency	Market Power Domination	Farmers’ ecological decisions are subordinated to debt relations	Limits adoption of sustainable farming practices
Patron–client ties, exclusive selling	Informal institutional control	Hybrid Institutional Governance	Informal institutions govern both market access and environmental practices	Reproduction of unequal ecological governance
Cooperative membership, subsidy access	Formal collective organization	Hybrid Institutional Governance	Formal actors coexist but do not replace informal power structures	Partial institutional capacity for sustainability
Mutual labor exchange, kinship-based support	Bonding social capital	Social Capital Mechanisms	Strengthens survival under climate stress but also reproduces dependency	Adaptive buffer but not transformative
Knowledge exchange among farmers, curing techniques	Bridging social capital	Social Capital Mechanisms	Enables diffusion of adaptive ecological knowledge	Increases localized environmental adaptation
Access to extension officers, government programs	Linking social capital	Social Capital Mechanisms	Farmers gain partial access to formal environmental governance	Limited upgrading of sustainability practices
Chemical intensification, water overuse	Ecological sacrifice for income	Environment–Livelihood Trade-Off	Environmental degradation is a rational survival strategy	Sustainability remains subordinated to livelihood security

Organic fertilizer trials, soil conservation training	Adaptive local innovation	Institutional Expansion	Informal institutions expand toward formal environmental governance	Emergence of endogenous sustainability pathways
Collective pest management, adaptive planting calendars	Community adaptation	Institutional Expansion	Hybrid institutions negotiate ecological adaptation internally	Partial transition toward sustainable agriculture

Table 4 summarizes the key results of the ATLAS.ti qualitative analysis, demonstrating how environmental vulnerability, market power domination, hybrid institutional governance, social capital mechanisms, environment–livelihood trade-offs, and institutional expansion interact within the political ecology of tobacco farming in the Besuki Raya region. The table highlights that environmental degradation is not merely a biophysical process, but is politically and institutionally mediated through value chain control, debt dependency, and hybrid governance arrangements. At the same time, social capital and institutional expansion provide partial endogenous pathways toward environmental (Aldrich & Meyer, 2015; Appau et al., 2019).

It is important to acknowledge that the empirical patterns observed do not suggest a linear or uncontested pathway toward sustainability. While the concept of institutional expansion helps explain the emergence of community-based environmental practices, not all forms of institutional adaptation observed in the field necessarily lead to ecological improvement. In several instances, hybrid institutions appeared to stabilize production and livelihoods without substantively altering extractive farming practices, thereby postponing rather than resolving underlying environmental pressures (Partelow & Nelson, 2020; Sedyati et al., 2019).

This ambivalence highlights a key tension within political ecology: adaptive capacity does not automatically translate into transformative sustainability. Institutional expansion may simultaneously enable incremental ecological learning while reproducing dependency on market-dominated value chains and short-term income imperatives. Recognizing this tension prevents a romanticized reading of local institutions and underscores that sustainability transitions in tobacco-based agrarian systems remain politically negotiated, structurally constrained, and inherently partial (Vadjunec et al., 2016).

Policy Implications: Reforming Economic Governance under Ecological Constraints

The findings of this study underscore that environmental degradation in tobacco-based agrarian systems is fundamentally an outcome of economic governance failures rather than a lack of technical knowledge or environmental awareness. From an ecological economics perspective, policy interventions must therefore move beyond technocratic solutions and address the institutional and incentive structures that shape farmers' environmentally consequential decisions (Adger et al., 2022; Duit et al., 2023).

First, policies should prioritize reforms that reduce market power asymmetries within tobacco value chains. Warehouse-based grading monopolies and opaque price-setting mechanisms systematically shift ecological costs onto smallholder farmers, incentivizing environmentally intensive practices. Enhancing price transparency, establishing independent grading oversight, and promoting fair contract arrangements are essential to realign economic incentives with ecological sustainability. Without such reforms, environmental policies risk being undermined by persistent economic coercion (Promphakping et al., 2021; Shiringo et al., 2022).

Second, fiscal instruments linked to tobacco production should be reoriented toward ecological restoration and risk reduction. In the Indonesian context, the redistribution of tobacco excise revenue (DBHCHT) represents a significant economic lever. Rather than functioning primarily as income stabilization or administrative support, these funds should be

explicitly tied to soil restoration, integrated pest management, water conservation, and climate-adaptive farming practices. From an ecological economics standpoint, such reorientation internalizes environmental costs that are currently externalized within the production system.

Third, hybrid institutions should be strengthened as core arenas of negotiated environmental governance. Cooperatives, farmer groups, and informal community organizations already play a central role in stabilizing livelihoods under market and climate uncertainty. Policy interventions should therefore build upon these institutions by embedding environmental performance criteria into their operational mandates. This approach aligns with ecological economics' emphasis on embedded institutions and recognizes that sustainability transitions are more likely to succeed when they work through existing social and economic structures rather than attempting institutional replacement (Chazovachii et al., 2021; Lencucha et al., 2020).

Fourth, policies should support institutional expansion as an endogenous adaptation pathway. The emergence of organic input trials, collective pest management, and adaptive planting calendars indicates that local institutions are capable of incremental ecological learning. However, these initiatives remain fragile without long-term financial support, regulatory recognition, and technical assistance. Public policy should therefore focus on scaling such locally embedded innovations while acknowledging that they represent adaptive responses rather than complete sustainability transformations (Partelow & Nelson, 2020)

Fifth, strengthening collective bargaining capacity is essential to relax environment–livelihood trade-offs. Social capital currently functions as an informal insurance mechanism but often reinforces dependency on dominant market actors. Policies that enhance linking social capital such as legal support for cooperatives, collective marketing platforms, and inclusive representation in value chain governance can shift farmers' economic position and expand their feasible set of environmentally sustainable choices (Aldrich & Meyer, 2015).

Finally, livelihood diversification must be treated as a central component of environmental policy. As long as tobacco remains the dominant source of rural cash income, environment–livelihood trade-offs will persist. Ecological economics emphasizes that sustainability requires reducing structural dependence on environmentally intensive activities. Supporting alternative high-value crops, off-farm employment opportunities, and rural green enterprises can ease livelihood constraints and create space for genuine ecological transition (Muktianto & Diartho, 2018; Scoones et al., 2018).

CONCLUSION

This study concludes that sustainability challenges in tobacco-based agrarian systems are not primarily technical farming problems, but are deeply rooted in economic governance and institutional arrangements. Evidence from Besuki Raya, East Java, shows that environmental degradation in tobacco farming is shaped by the interaction of warehouse-based grading systems, advance financing, debt relations, patron–client networks, cooperative mediation, and livelihood dependence. These mechanisms create constrained choices for smallholder farmers, making environmentally intensive practices economically rational despite their long-term ecological consequences.

The empirical contribution of this study lies in demonstrating how market power operates as an indirect form of ecological control. Grading standards and post-harvest pricing encourage farmers to prioritize chemical input use, accelerated production, and quality compliance, while debt-based financing limits their ability to adopt lower-input or more sustainable alternatives. The study also shows that hybrid institutions play an ambivalent role. They help stabilize short-term livelihoods through credit access, group support, extension services, and informal risk-sharing, but they do not fully transform the market structures that reproduce ecological vulnerability.

The concept of institutional expansion further explains how local institutions gradually incorporate environmental functions through organic fertilizer trials, collective pest management, soil conservation training, and adaptive planting calendars. However, these initiatives remain partial and fragile because they operate within a tobacco value chain dominated by unequal bargaining power, price uncertainty, and livelihood dependency. Thus, institutional expansion represents incremental adaptation rather than a complete sustainability transition.

This study has several limitations. First, the qualitative design does not aim to produce statistically generalizable findings, but to provide an in-depth interpretation of tobacco farming governance in Besuki Raya. Second, the netnographic component was limited to selected WhatsApp and Facebook communities, so it may not capture the full diversity of digital agrarian discussions. Third, the study focuses on farmers' and local actors' perspectives, while further research could include more detailed analysis of warehouse companies, manufacturers, and policy actors. Future studies may also combine qualitative ethnography with household survey data, environmental indicators, or value-chain analysis to examine the relationship between market governance, farmer income, and ecological degradation more comprehensively.

Overall, this study contributes to ecological economics, political ecology, and institutional analysis by showing that environment–livelihood trade-offs in tobacco farming are structurally embedded in market governance. Meaningful sustainability transitions therefore require more than technical improvements in farming practices. They require reforms in price transparency, grading systems, credit arrangements, farmer bargaining power, and institutional support so that livelihood security and environmental sustainability can be aligned within smallholder tobacco economies.

ETHICAL CONSIDERATIONS

This study involved non-invasive qualitative research with adult participants. Ethical clearance was not required under the institutional guidelines applicable to this research, as the study did not involve vulnerable populations, medical procedures, or experimental interventions. Participation was entirely voluntary, and informed consent was obtained orally from all participants prior to data collection. Participants were informed about the purpose of the study, their right to withdraw at any time, and the use of the data for academic research only. To ensure confidentiality, all personal identifiers were removed during transcription and analysis, and pseudonyms were used in reporting the findings. Audio recordings, transcripts, and field notes were securely stored and accessed only by the research team.

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