

Impact of Vanilla Sector Degradation on the Socioeconomic in Rural Madagascar

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Abstract

This study examines the economic impacts of vanilla sector degradation in rural Madagascar, with the primary aim of understanding how market instability and environmental stress affect smallholder livelihoods. The study uses a qualitative dominant mixed approach, combining household surveys, semi-structured interviews, and group discussions conducted with 20 participants drawn from major vanilla producing communities. The findings show that heavy dependence on vanilla income exposes households to pronounced vulnerability during periods of price decline, leading to reduced food security, increased labor pressure, and unstable land use practices. These impacts interact and reinforce one another, extending the consequences of sector degradation beyond income loss alone. The study demonstrates that degradation of the vanilla sector generates multidimensional livelihood risks in rural Madagascar.

Keywords: *Vanilla; Degradation; Economy; Society; Madagascar.*

Introduction

Madagascar occupies a distinctive position within global agricultural commodity systems, where export-oriented crops structure both national economic performance and local livelihood strategies (Andriamihaja et al., 2019). In rural regions, particularly in the northeast, agriculture is not only a productive activity but a fundamental social institution that governs land allocation, labor organization, and access to income (Andriatsitohaina et al., 2020). Land use patterns in these areas reflect complex interactions between subsistence needs, market integration, and environmental constraints, shaped by both historical and contemporary drivers of change (Scales, 2014; Heinimann et al., 2017). Export crop specialization has intensified these dynamics, linking remote rural landscapes to volatile international markets and distant consumers through global value chains (Levers et al., 2016; Piquer Rodríguez et al., 2018). Within this context, vanilla cultivation has emerged as one of the most influential yet fragile pillars of rural economic organization, embedding local livelihoods within global circuits of demand, speculation, and risk.

Vanilla production in Madagascar is highly concentrated in the SAVA region and adjacent areas, where agroecological conditions favor the cultivation of *Vanilla planifolia*. The crop's biological characteristics, including its reliance on manual pollination and lengthy curing processes, make it uniquely labor intensive and technically demanding (Gallage et al., 2018; Banerjee & Chattopadhyay, 2019; Watteyn et al., 2022). For rural households, vanilla represents both opportunity and exposure, offering high potential returns while requiring substantial investments of time, labor, and land. Income from vanilla often exceeds that of staple crops, shaping household priorities toward market engagement and monetary accumulation (Kalemile et al., 2024; De Vasconcelos et al., 2025; Aripnanata et al., 2025). At

the same time, this specialization depends on a single commodity, increasing sensitivity to price shocks and production failures within a context of limited institutional protection.

Fluctuations in international vanilla prices have repeatedly destabilized rural economies in northeastern Madagascar, creating cycles of boom and bust that reverberate across social and ecological systems (Fleming et al., 2025). Price surges have historically encouraged rapid expansion of cultivation areas, speculative behavior, and increased monetization of village economies, while subsequent crashes have triggered income loss, debt accumulation, and livelihood insecurity (Zhu, 2018; Celio et al., 2023). These oscillations directly affect food access, as households increasingly rely on purchased staples rather than own production, exposing them to compounded risks when income declines (Andriamparany et al., 2021; Rakoto Harison et al., 2024; Kunz et al., 2020). Empirical evidence suggests that vanilla price instability not only undermines household welfare but also reshapes land use decisions, labor allocation, and long-term planning, reinforcing patterns of vulnerability in regions already characterized by limited economic diversification.

Environmental degradation has emerged as a closely intertwined dimension of vanilla sector decline, particularly through its relationship with land use change and forest conversion. Expansion of vanilla cultivation often occurs through the clearing of secondary forests or fallow land, contributing to deforestation and ecosystem fragmentation in biodiversity rich landscapes (Zaehringer et al., 2015; Gardner et al., 2018; Kull, 2000). These processes are reinforced by market incentives during high price periods, when rapid land conversion is perceived as a rational economic response (Piquer Rodríguez et al., 2018; Scales, 2014). Yet environmental degradation ultimately undermines the ecological conditions required for successful vanilla cultivation, including soil fertility, humidity regulation, and shade cover, creating a feedback loop between environmental decline and agricultural vulnerability (De Groot et al., 2002; Rasmussen et al., 2024).

Climate variability and extreme weather events further compound these challenges, intensifying production risks and threatening the sustainability of vanilla based livelihoods. Northeastern Madagascar is increasingly exposed to cyclones, irregular rainfall, and prolonged dry periods, all of which disrupt flowering, pollination, and pod development (Rakoto Harison et al., 2024; Bhagyanathan & Dhayanithy, 2023; Van Versendaal & Schickhoff, 2025). These climatic shocks often coincide with market downturns, generating compounded crises that erode household resilience and increase reliance on coping strategies such as forest resource extraction or distressed land sales (Brimont et al., 2015; Elhini et al., 2024). The interaction between climate stress and commodity dependence underscores the limits of mono crop systems in environments marked by high ecological and economic uncertainty.

Governance and institutional arrangements play a critical role in shaping how rural communities experience and respond to vanilla sector degradation. Liberalized markets, weak regulatory enforcement, and uneven power relations within supply chains have limited the capacity of smallholder farmers to manage risk and capture value (Watteyn et al., 2022; Rakotonarivo et al., 2021). At the same time, decentralized governance structures in Madagascar face persistent challenges related to accountability, coordination, and resource allocation, constraining effective policy responses at local levels (Emynorane et al., 2025). These institutional gaps contribute to unequal benefit distribution and reinforce structural vulnerabilities, particularly for households with limited access to contracts, livestock assets, or diversified income sources (Andriamparany et al., 2021; Kunz et al., 2020; De Pinto et al., 2020).

Theoretical perspectives on agricultural resilience and rural development provide important lenses for interpreting the economic consequences of vanilla sector degradation. Study on crop diversification emphasizes its role in buffering households against climatic and market shocks, particularly in export-oriented systems (Birthal & Hazrana, 2019;

Rasmussen et al., 2024; Dale, 2020). Agroecological and agroforestry approaches further highlight the potential for integrating ecological functions with livelihood objectives, offering pathways to reconcile income generation with environmental conservation (Prabawani et al., 2024; De Groot et al., 2002). However, translating these insights into practice requires careful consideration of local constraints, market incentives, and governance conditions that shape farmer decision making (Aalders & Aitkenhead, 2006; Andriatsitohaina et al., 2020; Bell et al., 2023).

This study engages with these debates by examining the economic impacts of vanilla sector degradation in rural Madagascar, focusing on how market volatility, environmental stress, and institutional dynamics intersect to shape household livelihoods. By drawing on interdisciplinary scholarships and empirical evidence from vanilla producing regions, the study seeks to deepen understanding of the mechanisms through which global commodity dynamics translate into local vulnerability. The analysis aims to inform more integrated development strategies that address economic resilience, social equity, and environmental sustainability in regions where vanilla remains central to rural life.

Methodology

This study uses a qualitative dominant mixed design to examine the economic impacts of vanilla sector degradation in rural Madagascar. A case-based approach was used to capture the interactions between market dynamics, environmental stress, and livelihood strategies within major vanilla producing areas in the northeast of the country. The study design emphasizes contextual depth and analytical flexibility, allowing the study to document both structural patterns and specific experiences. By integrating qualitative and quantitative elements, the approach enabled a comprehensive understanding of how households and communities respond to price volatility, climatic disturbances, and institutional constraints affecting the vanilla sector.

The study population consisted primarily of smallholder vanilla farming households, complemented by actors involved in processing, collection, and local governance. A total of 20 informants were selected using purposive sampling to reflect variations in farm size, dependence on vanilla income, land use practices, and engagement with diversification strategies. Data collection combined household surveys, semi-structured interviews, and group discussions conducted at the community level. Survey instruments captured demographic characteristics, production data, income sources, food security conditions, and land management practices, while qualitative tools focused on perceptions of market change, environmental pressures, and social impacts. Data were recorded using structured questionnaires and digital audio devices suitable for field conditions, with instruments refined through pilot testing to ensure clarity and relevance.

Data analysis followed an iterative process integrating qualitative and quantitative techniques. Qualitative data were transcribed and coded thematically to identify recurring patterns related to livelihood vulnerability, adaptive strategies, and institutional challenges. Quantitative data were analyzed descriptively to examine trends in income variability, crop diversification, and household welfare indicators. Findings from different methods were regularly compared and cross validated to strengthen analytical rigor and reduce bias. This integrative approach allowed the study to generate a coherent and empirically grounded assessment of the socioeconomic consequences associated with the degradation of the vanilla sector in rural Madagascar.

Results and Discussion

Results

The empirical findings indicate that vanilla remains the dominant source of household cash income among the surveyed communities, but this dominance is

accompanied by high income concentration and vulnerability. As shown in Table 1, vanilla accounts for an average of 58 percent of annual household income among the 20 informants, far exceeding contributions from food crops, livestock, or off farm activities. Food crops contribute an average of 22 percent, while livestock and off farm activities together account for only 20 percent. This income structure demonstrates a strong dependence on a single export commodity, leaving households highly exposed to fluctuations in vanilla prices and production outcomes.

Table 1. Average household income composition

Income source	Average share of annual income (%)
Vanilla	58
Food crops	22
Livestock	12
Off farm activities	8

Food security outcomes closely follow these income patterns. During periods of high vanilla prices, households reported greater purchasing power and more diverse diets. However, during periods of price decline, dietary diversity decreases substantially. Figure 1 illustrates this shift, showing a reduction in the average number of food groups consumed per day from 5.1 during high price seasons to 3.6 during periods of price decline. This decline reflects reduced consumption of protein-rich foods and vegetables, with households prioritizing staple foods to manage constrained budgets. Survey responses further indicate that households with limited alternative income sources experienced more frequent food shortages than those with supplementary activities.

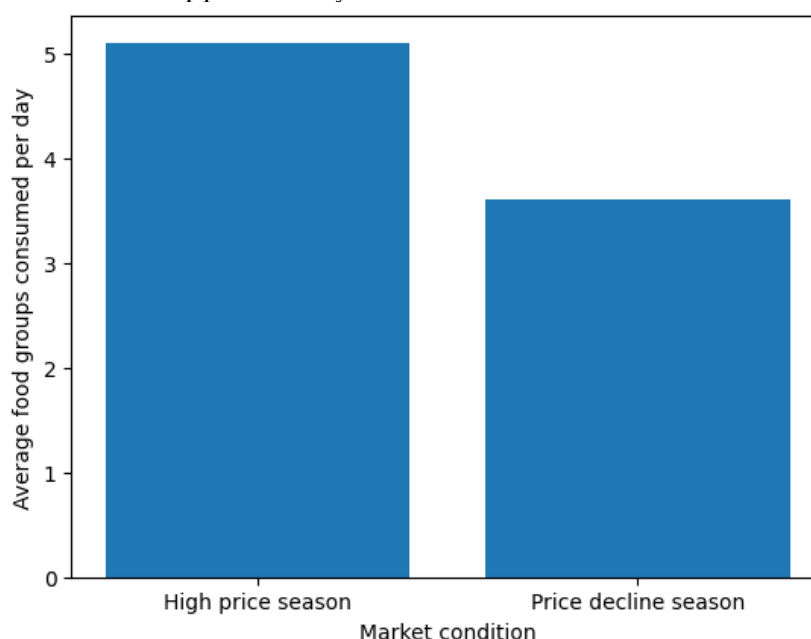


Figure 1. Changes in dietary diversity across price conditions

Labor and land use data reveal additional socioeconomic pressures linked to vanilla sector degradation. As presented in Figure 2, vanilla related activities absorb approximately 62 percent of total household labor during peak seasons, compared to 24 percent allocated to food crop production and 14 percent to other activities. This concentration of labor reduces time available for subsistence farming and other income generating activities, reinforcing dependence on vanilla despite declining returns. Informants consistently reported postponing food crop management during pollination and harvest periods, increasing reliance on purchased food.

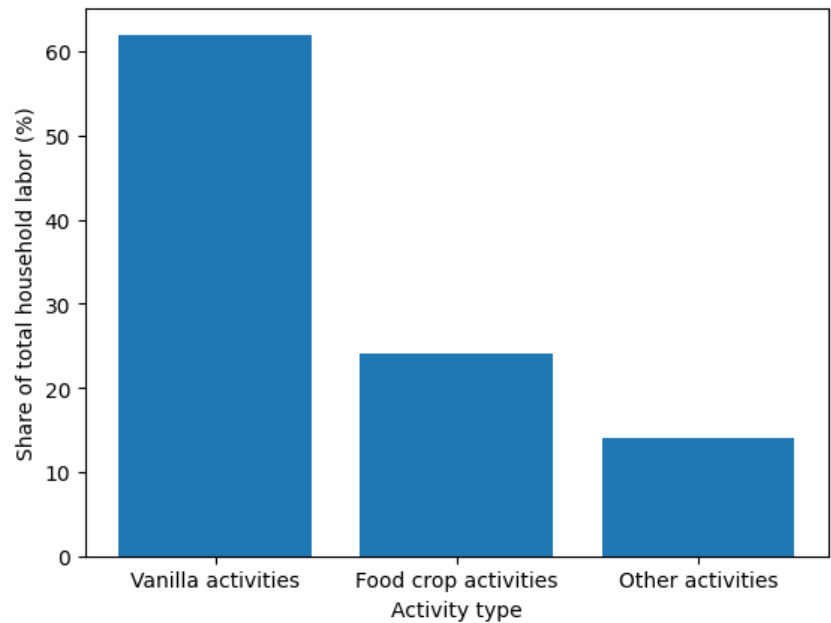


Figure 2. Seasonal household labor allocation

Land use patterns further reflect this specialization. Table 2 shows that vanilla plots occupy an average of 46 percent of total household land, while food crops account for 31 percent. Fallow land and forest adjacent plots together represent 23 percent, indicating continued pressure on surrounding landscapes. Informants described expanding cultivation during periods of favorable prices and abandoning or undermaintaining plots when prices fell, resulting in fluctuating land use rather than stable long-term investment.

Table 2. Average household land use allocation

Land use category	Average share of household land (%)
Vanilla plots	46
Food crops	31
Fallow land	15
Forest adjacent plots	8

These results demonstrate that degradation of the vanilla sector manifests through interconnected economic, food security, labor, and land use outcomes. Income instability directly affects dietary diversity, while labor and land allocation patterns reinforce dependence on a volatile commodity, amplifying household vulnerability across multiple dimensions.

Discussion

The findings of this study contribute new empirical depth to ongoing debates on export crop dependence, livelihood vulnerability, and environmental stress in rural Madagascar by demonstrating how degradation of the vanilla sector manifests simultaneously through income instability, food insecurity, labor pressure, and land use change. Previous study has established vanilla as a central pillar of rural economies, yet the findings of this study demonstrate that shocks affecting the sector generate cumulative and mutually reinforcing effects. Economic instability does not remain limited to income loss but extends into everyday consumption patterns, household labor allocation, and patterns of interaction with surrounding landscapes. This multidimensional pattern echoes broader analyzes of commodity dependent rural systems, where specialization increases exposure to external shocks while constraining adaptive capacity at the household level (Zhu, 2018; Celio et al., 2023; Kalemile et al., 2024).

The strong concentration of household income in vanilla production observed in this study aligns with earlier evidence that export-oriented agriculture in northeastern Madagascar generates high returns during favorable market conditions but leaves households acutely vulnerable during downturns. Similar income structures have been reported among vanilla farmers engaged in global value chains, where price volatility translates into abrupt shifts in purchasing power and investment capacity (De Vasconcelos et al., 2025; Aripnanata et al., 2025; Fleming et al., 2025). What distinguishes the present findings is the explicit linkage between income instability and short-term livelihood adjustments, particularly reductions in food quality and delays in essential expenditures. This reinforces the argument that monetary gains from export crops do not automatically translate into sustained welfare improvements when markets remain unstable and institutional safeguards are weak (BIRTHAL & HAZRANA, 2019; Bell et al., 2023).

Food security outcomes observed in this study are consistent with studies showing that cash crop dependence can undermine dietary diversity when income flows are disrupted. Previous work among Malagasy vanilla farmers has demonstrated that reliance on purchased food increases exposure to market price fluctuations, particularly during periods of declining export revenues (Andriamparany et al., 2021; Rakoto Harison et al., 2024). The present study extends this literature by empirically documenting how dietary simplification occurs alongside reductions in labor availability for subsistence farming, creating a dual pathway to food insecurity. Comparable dynamics have been identified in other export oriented agricultural systems, where households prioritize cash crop labor at the expense of food production, increasing vulnerability during economic shocks (Kunz et al., 2020; De Pinto et al., 2020; Rasmussen et al., 2024).

Labor allocation patterns emerging from the findings further underscore the structural constraints faced by smallholder vanilla farmers. The concentration of household labor in vanilla activities during peak seasons reflects the crop's biological requirements and labor-intensive nature, as documented in studies on vanilla production systems (Gallage et al., 2018; Banerjee & Chattopadhyay, 2019; Watteyn et al., 2022). However, the results show that even when returns decline, households continue to prioritize vanilla labor, suggesting a form of path dependency reinforced by sunk labor investments and limited livelihood alternatives. This behavior aligns with broader evidence that farmers in high-risk environments often remain locked into dominant production systems despite declining profitability, particularly when access to capital, land, or institutional support for transition is constrained (Dale, 2020; Rakotonarivo et al., 2021).

Land use dynamics identified in this study resonate strongly with existing study on deforestation and agricultural expansion in Madagascar. The observed pattern of expansion into forest adjacent areas during favorable price periods, followed by partial abandonment when prices fall, reflects cyclical land use responses driven by market signals rather than long term planning. Similar dynamics have been documented in analyzes of land cover change in northeastern Madagascar, where commodity booms contribute to rapid but unstable agricultural expansion (Zaehring et al., 2015; Gardner et al., 2018; Scales, 2014). By linking these spatial patterns directly to household income volatility and labor constraints, the present study provides additional insight into how environmental degradation and livelihood insecurity reinforce one another within the vanilla sector.

These findings also align with broader theoretical perspectives on telecoupling and distant market influence, which emphasize how global demand reshapes local land use decisions in ways that may undermine sustainability (Andriamihaja et al., 2019; Piquer Rodríguez et al., 2018; Levers et al., 2016). The short-term expansion and contraction of cultivated areas observed in this study suggests that market driven land use lacks the stability required for ecological recovery or long-term productivity. This pattern challenges the assumption that export crop intensification necessarily leads to improved land

management, instead highlighting the risk of environmental degradation under conditions of price volatility and weak governance.

Climate related stressors further intensify these vulnerabilities, as evidenced by informant accounts of declining yields and increased production uncertainty. The interaction between climatic shocks and market downturns observed in this study mirrors findings from recent study on compounded crises affecting Malagasy vanilla farmers, where cyclones, rainfall variability, and price crashes intersect to erode household resilience (Rakoto Harison et al., 2024; Van Versendaal & Schickhoff, 2025). Similar patterns have been observed in other regions facing environmental stress, where livelihoods dependent on climate sensitive crops experience heightened instability in the absence of adaptive support mechanisms (Bhagyanathan & Dhayanithy, 2023; Elhini et al., 2024). The present findings reinforce the need to consider climate and market risks jointly rather than as separate challenges.

Governance and institutional conditions emerge as critical underlying factors shaping the outcomes observed in this study. Weak coordination within the vanilla supply chain, limited regulatory enforcement, and uneven access to market arrangements contribute to unequal distribution of risks and benefits among producers. Previous study has highlighted how power asymmetries within commodity chains constrain smallholder agencies and limit the effectiveness of incentive-based interventions (Zhu, 2018; Watteyn et al., 2022). The present findings suggest that these institutional deficiencies not only affect income outcomes but also influence land use and labor decisions, reinforcing patterns of vulnerability at the household level. Broader challenges related to decentralization and governance capacity in Madagascar further complicate efforts to implement coherent rural development strategies, particularly in remote regions where state presence remains limited (Emynorane et al., 2025).

The implications of these findings extend to debates on diversification and agroecological transitions as pathways toward resilience. While numerous studies advocate crop diversification and agroforestry as means of reducing vulnerability and enhancing ecosystem services, the results of this study indicate that structural barriers limit adoption among vanilla dependent households (Birthal & Hazrana, 2019; Prabawani et al., 2024; Rasmussen et al., 2024). Limited land availability, labor constraints, and immediate income needs reduce the feasibility of diversification strategies, particularly for households already experiencing economic stress. This supports the argument that diversification requires enabling conditions, including access to resources, knowledge, and supportive institutions, rather than relying solely on individual household decision making (De Groot et al., 2002; Aalders & Aitkenhead, 2006).

Conclusion

This study demonstrates that degradation of the vanilla sector in rural Madagascar produces interconnected economic consequences that extend beyond income instability to affect food security, labor organization, and land use decisions. The findings reveal that heavy dependence on vanilla amplifies household vulnerability when market and environmental shocks occur, adaptively limiting capacity and reinforcing structural fragilities. By linking economic volatility with social and ecological pressures, the study highlights the limits of single commodity-based development pathways and underscores the need for more resilient livelihood strategies grounded in diversification, institutional support, and sustainable resource management.

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