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The Socio-Economic Dynamics of Tobacco Cultivation on Rural Livelihoods: A Case Study of Mardan District, Khyber Pakhtunkhwa, Pakistan

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Abstract
This study investigates the socio-economic dynamics of tobacco cultivation and its impact on rural livelihoods in Mardan District, Khyber Pakhtunkhwa, Pakistan. Based on a quantitative method approach, with 300 farming households, the research reveals a paradoxical system of short-term credit access leading to long-term entrapment. A structured questionnaire was employed to collect data on socio-demographics, financial practices, and perceived environmental impacts. Whereas, the data was analyzed using SPSS software for the descriptive and inferential statistics. Findings indicate an overwhelming reliance on contract farming (92%) and advance credit (87.3%), which initiates a debilitating cycle of debt, with 64.7% of farmers carrying over debt from previous seasons and 71.3% requiring additional loans for household sustenance. Crucially, the primary reason for cultivation was not profit but "Access to Credit/Inputs" (67%). The study further demonstrates significant environmental degradation, with a strong correlation ($\chi^2 = 95.42$, $p < 0.001$) between farming experience and severe soil fertility decline. Most tellingly, correlation analysis reveals a significant negative relationship between years in tobacco farming and livelihood satisfaction ($r = -0.421$), substantiating the concept of a "tobacco poverty trap." The study concludes that tobacco farming, while providing immediate liquidity, systematically undermines economic resilience, ecological sustainability, and human well-being, necessitating urgent policy interventions for crop diversification and regulatory reform of contract farming practices.
Keywords: Socio-economic Dynamics, Tobacco Cultivation, Rural livelihoods, KPK, Pakistan

Introduction

Tobacco farming represents a complex and often contentious component of the agricultural economy in many developing nations, presenting a paradoxical blend of immediate economic benefits and long-term socio-ecological vulnerabilities for rural households (Khoso et al., 2025). In the context of Pakistan's Khyber Pakhtunkhwa (KPK) province, particularly Mardan District, tobacco cultivation is a significant cash crop activity, promoted by transnational corporations and supported by state policies for its high revenue potential per unit of land and its contribution to formal tax revenues (WHO, 2025; Khoso et al., 2024). This introduction posits that while tobacco farming provides crucial short-term income, credit access through contract farming, and seasonal employment opportunities, its long-term

impact on rural livelihoods is often undermined by a pervasive cycle of debt, environmental degradation, health hazards, and the systematic erosion of agrarian autonomy, a pattern consistently corroborated by a global tapestry of case studies. For instance, research by Khoso et al. (2024) found that despite initial profitability, farmers faced significant economic exploitation through input-intensive contracts and price instability, leading to a net decline in their economic resilience compared to traditional crop growers. A parallel situation exists in Kenya, where a study revealed that smallholder farmers were ensnared in a debt trap with leaf-buying companies, which locked them into unfavorable contracts and diverted vital land and labour from essential food crops, thereby directly threatening household food security (Magati et al., 2019). The case of Malawi, one of the world's most tobacco-dependent economies, offers a stark national-level perspective; despite accounting for a substantial portion of export earnings (Milanzi, 2017), this reliance has entrenched poverty among smallholders, accelerated deforestation for curing barns, and fostered child labor, creating a "tobacco poverty trap" where the nation's primary cash crop fails to translate into widespread rural prosperity (Masikini, 2023; Kulik et al., 2017). In contrast, the experience of China, the world's largest tobacco producer, demonstrates a state-monopolized model where the China National Tobacco Corporation vertically integrates production, ensuring market stability for farmers but simultaneously creating a powerful institutional dependency that suppresses crop diversification and prioritizes corporate profit over farmer welfare and public health (Fang et al., 2017; He et al., 2013). Even in a developed context like the United States, a historical analysis of North Carolina reveals that despite technological advancements and government subsidies initially creating immense wealth, the industry eventually led to market consolidation, a dramatic decline in the number of farms, and severe environmental contamination from pesticide use, demonstrating that the sustainability of tobacco-dependent economies is precarious regardless of national income level (Crankshaw et al., 2009; & Billings, 2017). Drawing parallels, the situation in Mardan District is characterized by similar dynamics: farmers are often bound by advance contracts from companies, leading to a reliance on costly inputs and a mono-cropping system that depletes soil fertility and increases vulnerability to market fluctuations. Therefore, this study seeks to critically analyze this multifaceted impact on the rural livelihood of Mardan, assessing not only the direct financial returns but also the hidden costs on human health, environmental sustainability, and long-term food sovereignty, thereby contributing to a more nuanced understanding of the role of such cash crops in rural development and the powerful structural forces that shape agrarian destinies.

Research Methodology

This study employed a mixed-methods research design to comprehensively investigate the socio-economic dynamics of tobacco cultivation in Mardan District. The sequential explanatory design prioritized quantitative data collection and analysis, which is presented in this paper, while qualitative interviews were concurrently conducted to provide contextual depth and elucidate the mechanisms behind the statistical trends; these qualitative findings will be reported in a subsequent publication.

Study Area and Sampling

The research was conducted in Mardan District, Khyber Pakhtunkhwa, a major tobacco-growing region in Pakistan. A multi-stage stratified random sampling technique was utilized to ensure a representative sample. In the first stage, four major tobacco-producing tehsils (sub-districts) in Mardan were selected. In the second stage, a proportionate number of villages were randomly chosen from each tehsil. Finally, from a comprehensive list of tobacco-farming households provided by local agricultural extension offices, 300 households were selected using a simple random sampling method. This sample size was determined to be sufficient for robust statistical analysis, providing a confidence level of 95% and a margin of error of ±5%.

Data Collection Instrument and Variables

Primary data was collected through a structured questionnaire, pre-tested and refined in a pilot study. The instrument was administered in Urdu by trained enumerators. The questionnaire was divided into several sections to capture data on:

Socio-Demographic Characteristics: Including age, gender, education level, and landholding size.

Tobacco Farming Practices: Variables included type of farming (contract/independent), years of experience, proportion of land dedicated to tobacco, and primary reason for cultivation.

Economic and Financial Dimensions: This section gathered data on access to advance credit, annual income from tobacco, the presence and amount of carry-over debt, and the need for additional household loans.

Socio-Ecological and Health Perceptions: Farmers were asked to report on perceived changes in soil fertility over time and the incidence of health issues experienced during the farming cycle.

Data Analysis

The quantitative data from the 300 completed questionnaires were coded, entered, and analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. The analysis employed both descriptive and inferential statistics. Descriptive statistics, including frequencies and percentages, were used to summarize the profile of the respondents and their farming practices. Inferential statistics were applied to explore relationships between variables: Chi-square tests were used to assess the association between categorical variables (e.g., farming experience and perceived soil fertility change), while Pearson's correlation coefficient was utilized to examine the strength and direction of linear relationships between continuous variables (e.g., years in farming, landholding size, debt, and livelihood satisfaction). The threshold for statistical significance was set at $p < 0.05$.

Ethical Considerations

Informed consent was obtained from all participants prior to the interview. They were assured of the confidentiality of their responses and their right to withdraw from the study at any point. The research protocol received approval from the university's institutional review board.

Results and Discussions

Table 1: Socio-Demographic Profile of Respondents (N=300)

Characteristic	Category	Frequency (n)	Percentage (%)
Age	18-35 years	89	29.7
	36-50 years	142	47.3
	Over 50 years	69	23.0
Gender	Male	288	96.0
	Female	12	4.0
Education Level	No Formal Schooling	112	37.3
	Primary (1-5 years)	98	32.7
	Secondary (6-10 years)	78	26.0
	Higher Secondary+	12	4.0
Landholding Size	Marginal (<1 hectare)	167	55.7
	Small (1-2 hectares)	102	34.0
	Medium (>2 hectares)	31	10.3

Table 1 provides a foundational overview of the 300 tobacco farmers surveyed in Mardan District, revealing a population with specific vulnerabilities. The data shows that the majority of farmers

(47.3%) are in the middle-aged bracket (36-50 years), with a significant portion (23%) being over 50, indicating an aging workforce. The farming community is predominantly male (96%), reflecting gendered agricultural roles in the region. A critical finding is the low level of formal education, with 70% of respondents having only primary-level schooling or no formal education at all, which can limit their ability to understand complex contracts or explore alternative livelihoods. Furthermore, over half of the farmers (55.7%) are marginal landowners with holdings of less than one hectare, and another 34% are smallholders, painting a picture of a community comprised primarily of small-scale, resource-poor farmers who are likely highly dependent on their land for survival and thus more susceptible to economic pressures from cash crops like tobacco.

Economic Reliance and Financial Entanglement

Table 2: Patterns of Tobacco Cultivation and Finance (N=300)

Variable	Category	Frequency (n)	Percentage (%)
Type of Farming	Contract Farming	276	92.0
	Independent Farming	24	8.0
Relies on Advance Credit	Yes	262	87.3
	No	38	12.7
Carry Over Debt	Yes, from previous season	194	64.7
	No	106	35.3
Additional Loans for Household	Yes	214	71.3
	No	86	28.7
Primary Reason for Growing Tobacco	High/Guaranteed Return	45	15.0
	Access to Credit/Inputs	201	67.0
	Lack of Alternative	54	18.0

Table 2 unveils the core economic mechanisms that bind farmers to tobacco cultivation, highlighting a system of dependency and debt. An overwhelming 92% of farmers are engaged in contract farming, and 87.3% rely on the advance credit provided by these contracts, underscoring this system's role as the primary enabler of tobacco production. However, this initial benefit leads to a cycle of financial entrapment, as 64.7% of farmers reported being unable to pay off their debts from the previous season, forcing them to renew contracts to access new credit. Consequently, 71.3% of households still required additional loans for basic household expenses, indicating that tobacco income is insufficient for year-round sustenance. The primary reason for growing tobacco for 67% of respondents is not high returns but "Access to Credit/Inputs," confirming that farmers are less motivated by profit and more by the necessity of survival within a system that offers few alternatives.

Socio-Ecological and Health Impacts

Table 3: Cross-Tabulation: Farming Experience vs. Perceived Soil Fertility Change

Farming Experience	**Significant Decrease**	**Slight Decrease**	**No Change**	**Total**
< 5 years (n=70)	15 (21.4%)	35 (50.0%)	20 (28.6%)	70 (100%)
5-10 years (n=115)	65 (56.5%)	45 (39.1%)	5 (4.3%)	115 (100%)
> 10 years (n=115)	102 (88.6%)	13 (11.4%)	0 (0%)	115 (100%)
Total (N=300)	182 (60.7%)	93 (31.0%)	25 (8.3%)	300 (100%)
Chi-Square Test: $\chi^2 = 95.42$, df = 4, $p < 0.001$				

Table 3 demonstrates a clear and statistically significant relationship between the duration of tobacco farming and the degradation of a key natural asset: soil fertility. The Chi-Square test result ($\chi^2 = 95.42$, $p < 0.001$) confirms that this association is not due to chance. The data reveals a powerful trend: as farming experience increases, so does the perception of severe soil degradation. Only 21.4% of newer farmers (less than 5 years) reported a "Significant Decrease" in fertility, but this figure rises dramatically to 56.5% for those with 5-10 years of experience and soars to 88.6% for veterans with over 10 years in tobacco farming. Notably, no long-term farmer reported "No Change" in soil quality. This provides strong empirical evidence that tobacco cultivation, likely due to its intensive mono-cropping and high nutrient demands, has a cumulative and severely detrimental impact on the land, threatening the long-term sustainability of agriculture in the region.

Correlation Analysis of Key Variables

Table 4: Correlation Matrix of Selected Variables (N=300)

Variable	1	2	3	4	5
1. Years in Tobacco Farming	1				
2. Landholding Size (Hectares)	.187**	1			
3. Tobacco Land as % of Total Land	.324**	.045	1		
4. Amount of Outstanding Debt (PKR)	.295**	.382**	.411**	1	
5. Livelihood Satisfaction (Scale 1-5)	**-.421**	-.104	-.267**	-.338**	1
**p < 0.01 level (2-tailed).					

Table 4 uses Pearson's correlation to reveal the interconnections between key variables shaping the farmers' livelihoods. The analysis shows that more **Years in Tobacco Farming** is significantly correlated with a larger **Percentage of Land Dedicated to Tobacco** ($r = .324$) and higher **Outstanding Debt** ($r = .295$), suggesting a deepening commitment to and entanglement in the crop over time. Most critically, there is a strong negative correlation between years of farming and **Livelihood Satisfaction** ($r = -.421$), meaning the longer a farmer grows tobacco, the less satisfied they become, powerfully supporting the concept of a "tobacco poverty trap." Furthermore, both the amount of **Debt** and the **Percentage of Land for Tobacco** are negatively correlated with satisfaction ($r = -.338$ and $r = -.267$, respectively), indicating that financial burden and lack of crop diversification are key drivers of this dissatisfaction. The positive correlation between **Debt** and **Landholding Size** ($r = .382$) also reveals that even larger farmers are not immune to this cycle of debt, challenging the notion that scaling up offers a pathway out of poverty.

Discussion

This study provides a granular analysis of the socio-economic dynamics underpinning tobacco cultivation in Mardan District, KPK, and the findings resonate powerfully with a global body of evidence that critiques the sustainability of tobacco as a pro-poor development crop. The results collectively paint a picture of a vulnerable agrarian community ensnared in a system that offers short-term liquidity at the cost of long-term debt, environmental degradation, and declining well-being.

The socio-demographic profile of the farmers (Table 1) characterized by small landholdings, low education levels, and an aging workforce establishes a baseline of pre-existing vulnerability. This profile is a common denominator in tobacco-growing regions across the Global South, as such populations often have limited bargaining power and fewer economic alternatives (Krishnamoorthy et al., 2020; Roy and Mustafa, 2024; WHO, 2025). The high prevalence of contract farming (92%) and reliance on advance credit (87.3%) in Mardan (Table 2) mirrors a global corporate strategy to shift production risks onto farmers while ensuring a steady supply of leaf. This finding aligns with studies from **Kenya** and **Bangladesh**, where contract farming was similarly identified as the primary

mechanism for creating debt dependency and locking smallholders into unfavorable terms (Kuloba, 2017; Barkat et al., 2012; Pandey et al., 2025). The high rate of carry-over debt (64.7%) and the need for additional household loans (71.3%) demonstrate that the initial cash injection is insufficient to break the cycle of poverty. This is a hallmark of the "tobacco poverty trap," a phenomenon starkly evident in **Ghana**, where despite decades of cultivation, a majority of farming households remain in poverty, with debt perpetuating their engagement with the crop (Apanga, 2021). Crucially, the primary reason for cultivation being "Access to Credit/Inputs" (67%) rather than "High Returns" underscores that farmers are not participating out of prosperity but out of necessity, a sentiment echoed by smallholders in **Brazil**, where tobacco is often the only viable source of credit for small family farms (Chingosho et al., 2021; Geist et al., 2009).

The strong, statistically significant association between farming experience and perceived soil degradation (Table 3) provides compelling evidence of the environmental unsustainability of tobacco mono-cropping. The cumulative negative impact, with 88.6% of long-term farmers reporting significant soil fertility decline, is a direct consequence of tobacco's high nutrient extraction and intensive use of agrochemicals. This pattern is consistent with research from **Tanzania** and **India**, where soil nutrient mining and declining organic matter have been documented as major long-term costs of tobacco cultivation, threatening future agricultural productivity (Kalonga et al., 2024; Punia & Bharti, 2023). This degradation of the natural capital base poses a fundamental threat to rural food sovereignty and resilience.

The correlation analysis (Table 4) weaves these threads together into a coherent narrative of entrapment and dissatisfaction. The positive correlation between years in farming and both debt level and the proportion of land dedicated to tobacco suggests a process of progressive, rather than progressive, commitment to a failing system. Most telling is the strong negative correlation between years in tobacco farming and livelihood satisfaction ($r = -0.421$). This finding powerfully substantiates the qualitative accounts of farmer distress from **Sri Lanka** and the **Philippines**, where despite economic reliance on the crop, farmers express a desire to exit due to health concerns, market frustrations, and the sheer physical burden (WHO, 2024). It challenges the very notion of tobacco as a vehicle for rural development. Furthermore, the positive correlation between landholding size and debt ($r = 0.382$) dismantles the argument that economies of scale provide an escape route, a finding that finds support in the historical consolidation and eventual decline of smallholder tobacco farms in the **United States** (WHO, 2018).

Conclusion

This study conclusively demonstrates that tobacco cultivation in Mardan District, while providing an essential short-term credit facility for a vulnerable agrarian community, ultimately functions as a mechanism of socio-economic entrapment and ecological degradation. The empirical evidence reveals a pervasive cycle where contract farming and advance credit, initially attractive, lead to enduring debt, insufficient household income, and a declining natural resource base. The strong correlations between longer engagement in tobacco farming and increased debt, greater land dedication to the crop, and significantly lower livelihood satisfaction powerfully substantiate the existence of a local "tobacco poverty trap." This trap is further cemented by the clear and progressive deterioration of soil fertility, the primary asset for these smallholder farmers. Therefore, the narrative of tobacco as a reliable vehicle for rural prosperity is fundamentally challenged; instead, it emerges as a system that undermines long-term resilience, food sovereignty, and human well-being for transient economic gains, mirroring a destructive pattern observed in tobacco-growing regions across the globe.

Recommendations

Based on the findings, a multi-pronged policy and intervention strategy is urgently required. Firstly, the government and agricultural extension services must develop and promote viable alternative livelihood and crop diversification programs. These initiatives should be designed to address the core drivers of tobacco dependency by providing accessible micro-credit facilities without usurious terms,

ensuring guaranteed market access for alternative crops, and offering training in sustainable agricultural practices to rehabilitate degraded land. Secondly, there is a critical need for regulatory oversight of the contract farming system to ensure transparency, fair pricing, and the protection of farmers from predatory lending practices. This could include standardizing contracts and establishing a grievance redressed mechanism. Finally, public health campaigns should be initiated within these rural communities to raise awareness about the health risks associated with tobacco cultivation, such as Green Tobacco Sickness, thereby empowering farmers with full knowledge of the costs associated with this crop.

Limitations of the Study

While this study provides valuable insights, several limitations should be acknowledged. Firstly, the cross-sectional nature of the research captures a snapshot in time, which, while revealing strong associations, cannot definitively establish causality between variables. Secondly, the reliance on self-reported data for sensitive issues like debt, income, and health perceptions may be subject to social desirability or recall bias. Thirdly, the study was geographically confined to Mardan District, which may limit the generalizability of the findings to other tobacco-growing regions of Pakistan with different agro-climatic or socio-cultural contexts. Future research would benefit from a longitudinal design to track changes over time, incorporate objective biometric and soil health measurements to complement survey data, and expand the scope to include a comparative analysis across multiple districts.

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