Strategy for developing tobacco farming to increase farmer income in Batu Belerang Village, Sinjai, Indonesia

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Abstract

Tobacco farming remains an important smallholder livelihood in Indonesia, but local evidence on management constraints and income-oriented development strategies in Sinjai is limited. This study characterized tobacco-farming management and formulated strategies for Batu Belerang Village. A descriptive mixed-methods case study was conducted in August 2025 with 20 active tobacco farmers and one agricultural extension officer. Data from field observations, structured questionnaires, interviews, and village documents were integrated through descriptive statistics, thematic analysis, and normalized Internal and External Factor Analysis Summary (IFAS-EFAS) matrices followed by a TOWS analysis. Farming relied on family labor, weather-dependent drying, collector-linked finance, and collector-dominated marketing. A representative cash-cost budget totaled Rp 3,515,000 per hectare per planting season, excluding imputed family labor, land, depreciation, and finance costs. The normalized IFAS and EFAS scores were 3.00 and 2.78, indicating a relatively strong internal position and a moderately favorable external environment. Priority strategies were collective input procurement and marketing, transparent price and grade information, improved drying and storage, farmer-field-school training in integrated pest management and biopesticides, and access to formal working capital. These strategies may strengthen earning capacity but do not demonstrate a causal income increase. The study supports SDG 1, SDG 2, SDG 8, and SDG 12.

Keywords: Batu Belerang; farmer income; IFAS-EFAS; SWOT; tobacco farming

Introduction

Indonesia produced 238,806 t of tobacco (*Nicotiana tabacum* L.) on 199,371 ha in 2023; 198,702 ha (99.7%) were smallholder plantations (Secretariat General, Ministry of Agriculture, 2025). In South Sulawesi, smallholder tobacco production was 1,263 t in 2023 (BPS-Statistics South Sulawesi Province, 2024). Although South Sulawesi contributes a small share of national output, tobacco remains a seasonal cash crop in several upland communities. The relevant development question is therefore not production growth alone, but whether farm management, marketing arrangements, and risk reduction can improve smallholder returns without increasing occupational and environmental harm.

Preliminary field discussions with farmers and the village agricultural extension officer in August 2025 identified three connected problems in Batu Belerang Village: reliance on collectors for credit and sales, limited access to transparent grade and price information, and uneven post-harvest quality because drying and storage depend on simple facilities. These observations formed the site-specific research problem and were subsequently examined through the farmer questionnaire, interviews, direct observation, and document review.

Income-oriented development must also account for occupational and environmental risks. Handling wet tobacco leaves can cause dermal nicotine exposure and green tobacco sickness, while poorly managed pesticides can increase health costs, lost workdays, and contamination risks (World Health Organization, n.d.; Tirtosastro & Murdiyati, 2011). These risks are directly relevant to farm income: a strategy that raises

chemical expenditure without improving safety or input efficiency may reduce rather than strengthen household returns.

A locally appropriate strategy should therefore combine production quality, cost control, safer pest management, post-harvest improvement, and stronger market institutions. Studies of Indonesian tobacco farming show that profitability depends on both technical performance and farmers' access to information, organizations, credit, and buyers (Munawaroh et al., 2017; Rokhani et al., 2021). This broader approach is more suitable for Batu Belerang than a recommendation to increase inputs without considering affordability, bargaining power, and risk.

Farm income is defined here as gross revenue minus production cost for one planting season. Gross revenue equals dried-leaf output multiplied by the farm-gate price. Production cost includes paid inputs, hired labor, transport, and drying expenses; a full economic-cost calculation should also include imputed family labor, land, depreciation, and financing costs. Distinguishing these concepts is essential because a high selling price does not necessarily produce a high net return (World Bank Group, 2017).

Evidence from tobacco-producing countries shows that cash-flow constraints and buyer-linked credit can make apparent revenue gains coexist with narrow or unstable margins (Magati et al., 2019; World Bank Group, 2017). For this reason, the present study treats the farm budget as descriptive evidence and does not infer household welfare from gross sales alone.

Market dependence is also shaped by the services that collectors provide, including rapid cash, transport, and a guaranteed outlet. Indonesian farmers may remain in tobacco even when returns are uncertain because alternative markets, finance, and crops are not equally accessible (Appau et al., 2019; Sahadewo et al., 2020). Development strategies must therefore replace useful services rather than simply instruct farmers to avoid collectors.

Farmer groups and cooperatives can pool purchases, disseminate price information, improve quality control, and aggregate leaf for marketing, but their effectiveness depends on member trust, service quality, and accountable management (Rokhani et al., 2021; Yang et al., 2014). Extension services can support this process by linking technical advice with farm records, market information, and safer production practices.

Despite this literature, site-specific evidence for Batu Belerang Village remains limited. No prior study has jointly documented its management practices, farm constraints, internal and external strategic factors, and practical pathways through which a development strategy could strengthen farmer earning capacity. This gap motivates a village-level case study rather than an unsupported claim of causal income growth.

Accordingly, this study aimed to: (1) characterize tobacco-farming management and constraints in Batu Belerang Village; (2) identify and quantify internal and external strategic factors using normalized IFAS and EFAS matrices; and (3) formulate SO, ST, WO, and WT strategies and discuss their plausible pathways to farmer income without claiming a causal impact.

Materials and Methods

Research design

This study used a descriptive mixed-methods case-study design that integrated qualitative evidence from observation and interviews with quantitative descriptions from the questionnaire, farm budget, and IFAS-EFAS scores (Creswell & Plano Clark, 2018; Sugiyono, 2022). The design was cross-sectional and intended to characterize conditions and formulate strategies; it was not designed to estimate a causal effect of the strategies on income.

Study site and period

The study was conducted in Batu Belerang Village, Sinjai Borong District, Sinjai Regency, South Sulawesi, Indonesia. The site was selected purposively because tobacco was an active seasonal farm enterprise and local farmers faced production, finance, post-harvest, and marketing constraints. Data collection took place in August 2025, and all production, price, and cost information referred to the 2025 tobacco planting season.

Data sources and research instruments

Primary data comprised farmer and extension-officer responses, field observations, and a representative farm budget. Secondary evidence comprised the 2025 village profile, extension records available at the site, official agricultural statistics, and relevant literature. The instruments were an observation checklist, a structured questionnaire, a semi-structured interview guide, and a document-review sheet.

Data collection

Data were collected through field observation, a farmer questionnaire, semi-structured interviews, and document review. Using several sources allowed statements about production, finance, marketing, and institutions to be compared rather than accepted from a single informant.

Field observation

Field observation documented land preparation, crop maintenance, pesticide handling, harvesting, drying, storage, transport, and marketing practices. Notes were entered on a standardized checklist and used to confirm or qualify statements made during interviews. No soil, rainfall, temperature, or pesticide-residue measurements were undertaken; agronomic descriptions are therefore reported as farmer and extension-worker perceptions unless an external source is cited.

Structured questionnaire

The questionnaire was administered in Indonesian and covered respondent and farm characteristics, production practices, input and credit access, post-harvest handling, marketing, farmer organizations, risk, and potential development actions. Categorical items described respondents and farms. SWOT items used four-point importance and response scales, where 1 represented the lowest importance or weakest response and 4 the highest importance or strongest response. Wording was checked with the extension officer for local clarity before administration. Because the instrument was not a latent psychometric scale, internal-consistency coefficients were not calculated and the scores are interpreted descriptively.

Semi-structured interviews

All 20 farmers were asked the same core questions on cropping decisions, paid and family labor, input purchases, credit, drying and storage, buyers, grade and price formation, farmer-group participation, risks, and preferred interventions. Follow-up questions clarified individual experiences. Responses were recorded on interview sheets rather than audio-recorded and were expanded immediately after each field visit. The extension officer was interviewed separately about village-level services, programs, and constraints.

Document review and triangulation

The village profile and available extension records were reviewed for location, population, farming, and program context. Farmer questionnaire results were compared with interview notes, direct observation, the extension-officer interview, and documentary evidence. A claim was retained as a study finding only when its source was identifiable; otherwise it was framed as a respondent perception or removed.

Unit of analysis

The primary unit of analysis was the individual tobacco farm enterprise managed by each participating farmer, including its production, cost, post-harvest, finance, and marketing decisions during the 2025 planting season. The agricultural extension officer was a key informant who supplied village-level context and was not treated as an additional farm enterprise in the strategic scoring.

Population and sampling

The accessible study population comprised 20 active tobacco farmers identified with the village extension officer at the time of fieldwork. Eligibility required residence in Batu Belerang Village, active tobacco cultivation during the 2025 season, direct involvement in production or marketing decisions, and willingness to participate. All 20 eligible farmers participated, and one agricultural extension officer was purposively included as a key informant. The case coverage was sufficient for describing the accessible local group and developing a contextual SWOT matrix, but it does not support statistical generalization beyond the village.

Data analysis

Respondent characteristics and the farm budget were summarized using counts, ranges, and arithmetic checks. Interview and observation notes were coded deductively into technical, financial, post-harvest, marketing, institutional, health, and environmental themes, with additional codes added when needed. Recurring themes generated candidate strengths, weaknesses, opportunities, and threats (Helms & Nixon, 2010). The 20 farmers rated factor importance and the current response on four-point scales. Mean importance values were normalized across the eight internal factors and separately across the eight external factors so that each matrix summed to 1.00. Mean response ratings were rounded to the nearest whole category, and each weighted score was calculated as weight multiplied by rating. Farmer scores were

aggregated independently and then triangulated with observation and the extension interview to reduce single-informant bias. The TOWS matrix cross-matched SO, ST, WO, and WT factors; strategies were prioritized by feasibility, expected income pathway, cost, safety, and responsible actor.

Result and Discussion

Research-area context

The 2025 village profile reported that Batu Belerang Village covers 1,493.7 ha and contains four hamlets, six community units, and 13 neighborhood units. The population was 2,145 people in 688 households. Agriculture was a major livelihood, while the village's distance from larger trading and processing centers affected input procurement and crop marketing. These characteristics are relevant to tobacco-farm organization; unrelated demographic-program descriptions were excluded.

Respondent characteristics

The study involved 21 informants: 20 active tobacco farmers and one agricultural extension officer. The extension officer provided contextual information, whereas farmer questionnaires supplied the farm and SWOT-scoring data. Table 1 describes all informants using the categories recorded in the original survey.

Table 1. Characteristics of study informants

No	Characteristics	Items	Number
1	Gender	Male	5
		Female	16
Sub Total			**21**
2	Age (years)	41-50	5
		30-40	10
		27-28	6
Sub Total			**21**
3.	Education	Senior High School	5
		Junior High School	3
		Elementary School	8
		College	5
Sub Total			**21**
4	Role		
		Farmers	20
		Agricultural extension officer	1
Sub Total			**21**
5	Cultivated land area	1.5 ha	10
		1.0 ha	5
		0.25 ha	6
Sub Total			**21**

Table 1 shows that 16 informants were women and five were men; therefore, women formed the majority of the study informants. Ten informants were 30-40 years old, six were 27-28 years old, and five were 41-50 years old. These distributions describe the selected cases and should not be interpreted as the sex or age structure of every tobacco farmer in Sinjai.

Educational attainment ranged from elementary school (eight informants) to college (five informants), with three completing junior high school and five completing senior high school. Land-area categories were recorded for all 21 informants, including the extension officer: 1.5 ha for 10, 1.0 ha for five, and 0.25 ha for six. They are therefore not a 20-farmer frequency distribution.

The sample composition kept the roles of the 20 farmers and one extension officer analytically distinct. Farmer experience supplied practice-based information on production and marketing, while the single extension interview supplied institutional context. Extension-level statements were not counted as farmer responses.

Farmers and the extension officer perceived local land and seasonal conditions as generally suitable for tobacco, but this study did not measure soil texture, pH, elevation, rainfall, or temperature. These statements

are therefore treated as local perceptions, not measured agronomic findings. This distinction is important because tobacco yield and quality can respond strongly to climatic variation (Harlianingtyas et al., 2021).

Tobacco-farming management conditions

Interviews and observation indicated that tobacco farming relied largely on inherited cultivation knowledge, family labor, simple equipment, and weather-dependent drying. Farmers carried out land preparation, planting, crop care, harvest, curing, and sale as one seasonal farm enterprise, but formal cost records and written grade-price agreements were limited.

The constraints were connected across stages. Technically, fertilizer and pesticide decisions were based more on customary practice than on recorded dose and field monitoring. Financially, limited working capital encouraged reliance on collector-linked advances. Post-harvest quality depended on drying weather and basic storage. In marketing, collectors provided a convenient outlet but also held greater information and price-setting power.

Overall, management in Batu Belerang Village combined strong practical experience and mutual assistance with weaknesses in records, working capital, drying and storage, market information, and bargaining power. The same constraints appeared across the questionnaire, interviews, and field observations, supporting their inclusion in the IFAS and EFAS matrices.

Table 2 summarizes the cash variable-cost budget recorded in a representative questionnaire for one hectare and one 2025 planting season. The reported total of Rp 3,515,000 is the arithmetic sum of Rp 815,000 for inputs, Rp 2,500,000 for hired labor, and Rp 200,000 for transport and drying. It excludes imputed family labor, land rent, depreciation, storage investment, and financing costs, so it is not a full economic cost or a sample mean. Unit prices were rounded to the nearest rupiah, while row totals retain the questionnaire amounts.

Table 2. Reported cash variable costs of tobacco farming per hectare in the 2025 planting season

Component	Quantity	Unit	Unit cost (Rp)	Total cost (Rp)
1. Production inputs				
Tobacco seedlings	1,000	seedlings	25	25,000
Urea fertilizer	3	50-kg sacks	83,333	250,000
ZA fertilizer	3	50-kg sacks	90,000	270,000
Manure	3	50-kg sacks	33,333	100,000
Liquid pesticides and insecticides	3	800-mL bottles	56,667	170,000
2. Hired labor	**Person-days**	**Work unit**	Cost/person-day (Rp)	Total cost (Rp)
Land preparation	5	person-days	150,000	750,000
Planting	5	person-days	50,000	250,000
Maintenance and spraying	5	person-days	100,000	500,000
Harvest and handling	10	person-days	100,000	1,000,000
3. Transport and drying	**Quantity**	**Unit**	**Unit cost (Rp)**	**Total cost (Rp)**
Transportation				
1. Car	1	trip	100,000	100,000
2. Motorcycle	1	trip	50,000	50,000
Drying	1	batch	50,000	50,000
			Total recorded cash cost	**3,515,000**

The SWOT factors were generated from the coded field evidence and then quantified through normalized IFAS and EFAS matrices. The analysis distinguishes internal conditions that farmers can influence from external conditions that require adaptation or collaboration. This separation makes the resulting strategies traceable to the observed management problems.

The normalized IFAS score was 3.00 and the EFAS score was 2.78. The internal score reflected farmer experience, established leaf-handling knowledge, and mutual assistance, offset by capital constraints, simple

drying and storage, weak market records, and collector-dominated price setting. The external score reflected market demand, extension support, buyer-partnership potential, and digital price information, offset by price volatility, weather, pests and diseases, and tobacco regulation.

Because both scores exceeded the 2.50 midpoint, the strategic position supports a growth-oriented response that uses existing experience and collective action to capture feasible opportunities. This does not eliminate WO and WT needs: access to working capital, market information, safer pest management, and risk reduction remain necessary for an income-oriented strategy.

Table 3. TOWS strategy matrix for tobacco farming in Batu Belerang Village

Opportunity-linked strategies	Threat-linked strategies
SO strategies	**ST strategies**
1. Standardize leaf grading and post-harvest quality using farmer experience.	1. Adjust planting and drying decisions to seasonal weather information.
2. Aggregate volume through a marketing group and approach licensed buyers.	2. Use IPM, sanitation, monitoring, and selective safer inputs.
3. Use extension programs for cost recording and quality control.	3. Improve drying and storage to protect quality during wet weather.
4. Pilot written purchase agreements with transparent grade-price schedules.	4. Compare buyers and stagger sales where safe storage permits.
WO strategies	**WT strategies**
1. Use collective input purchasing and formal credit to address cash constraints.	1. Reduce collector-linked debt through group savings or formal credit.
2. Demonstrate efficient fertilizer use, IPM, and evaluated biopesticides.	2. Use written weighing, grading, price, and payment records.
3. Introduce mobile price information and farm recordkeeping.	3. Diversify crops, household income, and verified buyer channels.
4. Develop low-cost shared drying or storage after feasibility assessment.	4. Use protective equipment and safe pesticide and wet-leaf handling.

Prioritized TOWS strategies

Table 3 completes the cross-quadrant analysis. SO actions use farmer experience and cooperation to improve quality and collective marketing; ST actions protect quality against price, climate, and pest risk; WO actions use extension, formal finance, price information, and shared facilities to address capital and technology gaps; and WT actions reduce collector-linked debt, unsafe practices, and market dependence. The first priority is a low-cost package of farm records, group input purchasing, IPM training, transparent grading, and collective price discovery because it can begin without major fixed investment. Shared drying or storage should follow only after a documented feasibility and management agreement.

Table 4. External Factor Analysis Summary (EFAS)

External strategic factors	Weight	Rating	Weighted score
Opportunities			
1. Continued demand for tobacco leaf	0.16	4	0.64
2. Government extension and farmer-training services	0.11	3	0.33
3. Potential transparent partnerships with licensed buyers	0.13	4	0.52
4. Digital price information and collective marketing	0.09	3	0.27
Threats			
1. Tobacco-price volatility	0.16	2	0.32
2. Climate variability and extreme weather	0.13	2	0.26
3. Pest and disease pressure	0.11	2	0.22
4. Tobacco-control and product regulations	0.11	2	0.22
Total	**1.00**		**2.78**

Notes:

Weight is the normalized relative importance of each factor (0.00-1.00), with all external weights summing to 1.00. Rating describes the current farmer response (1 = poor, 2 = weak, 3 = adequate, 4 = strong). Weighted score = weight x rating.

The EFAS score is 2.78. The result indicates a moderately favorable external environment, but the score is descriptive rather than predictive. Market demand and potential buyer partnerships cannot improve returns unless farmers can manage price, weather, pest, regulatory, and quality risks.

Table 5. Internal Factor Analysis Summary (IFAS)

Internal strategic factors	Weight	Rating	Weighted score
Strengths			
1. Farmer experience in tobacco cultivation	0.17	4	0.68
2. Land availability and farmer-perceived suitability	0.11	4	0.44
3. Established leaf-handling knowledge	0.13	4	0.52
4. Mutual assistance among farmers	0.09	3	0.27
Weaknesses			
1. Limited working capital and dependence on collectors	0.17	2	0.34
2. Simple drying and storage technology	0.13	2	0.26
3. Limited market information and recordkeeping	0.11	2	0.22
4. Collector-dominated price setting	0.09	3	0.27
Total	**1.00**		**3.00**

Notes:
Weight is the normalized relative importance of each factor (0.00-1.00), with all internal weights summing to 1.00.
Rating describes the current position (1 = very weak, 2 = weak, 3 = adequate, 4 = strong).
Weighted score = weight x rating.
The IFAS score is 3.00. Batu Belerang farmers therefore have a relatively strong internal base in experience, practical knowledge, and mutual assistance, but capital, drying and storage, market records, and collector-dominated pricing remain material weaknesses.

Interpretation of strategic factors

The strategic evidence is strongest when expressed as farmer-reported conditions rather than as unmeasured agronomic or market claims. The following interpretation therefore links each factor to the questionnaire, interviews, observation, or documented context and avoids assuming direct factory access, export demand, or measured soil suitability.

Land and production resources

Farmers described their land and seasonal environment as suitable for tobacco and viewed their practical knowledge as a production strength. Because no laboratory soil data or official site-level climate series were analyzed, the strategy does not rely on unverified claims about soil fertility, pH, elevation, or rainfall. Instead, it prioritizes field records and extension-supported trials to test which practices improve yield and leaf quality under local conditions.

Farmer experience and collective action

Interview narratives showed that farmers possessed multi-season knowledge of planting, maintenance, harvest, and drying. Mutual assistance was also identified as an internal strength. These assets can support farmer-to-farmer learning, group purchasing, field demonstrations, and collective marketing, provided responsibilities and financial records are transparent.

Cash-cost structure and income sensitivity

Paid labor represented Rp 2,500,000, or 71.1%, of the reported Rp 3,515,000 cash budget, while purchased inputs represented Rp 815,000 (23.2%) and transport and drying Rp 200,000 (5.7%). This structure shows why labor organization, input efficiency, and quality-preserving post-harvest practices are central to the income pathway. It also confirms that the budget cannot be interpreted as full net income because family labor and fixed costs were not valued.

Market access and bargaining

Farmers reported selling through local collectors, who provided a rapid outlet and sometimes working capital. The study did not verify direct sales to named cigarette factories or export buyers. Therefore, the opportunity is framed as developing transparent relationships with licensed buyers, comparing multiple quotations, and aggregating leaf through a farmer group rather than assuming guaranteed demand.

Extension and institutional support

The extension officer provided technical and program information, but the study did not collect verified values for fertilizer subsidies, insurance benefits, or other transfers received by each farmer. Such programs are therefore treated as potential support mechanisms, not as demonstrated causes of higher income. Their value should be evaluated through farmer access records, cost savings, and adoption outcomes.

Risk reduction and diversification

Diversification should reduce household exposure to tobacco price and weather risk. The present evidence supports complementary food crops, alternative seasonal enterprises, and additional buyers; it does not support unqualified recommendations to manufacture cigarettes, herbal tobacco products, or other derivatives. Any processed tobacco product would require separate legal, health, quality-control, and market-feasibility assessment.

Priority constraints

Five connected constraints explain the selected strategies. Each can be monitored with a practical farm or group indicator rather than a broad claim about development.

1. Working capital and cash flow: limited pre-season cash encourages advance financing from collectors; the relevant indicators are source, cost, and repayment terms of credit.
2. Post-harvest technology: simple drying and storage expose leaf quality to weather; indicators include drying time, rejected leaf, moisture-related loss, and grade received.
3. Climate, pest, and health risk: weather variability, pest and disease pressure, and pesticide exposure can raise costs and reduce work capacity; indicators include monitoring records, pesticide applications, crop loss, protective-equipment use, and illness-related workdays.
4. Market access: reliance on one collector limits price comparison; indicators include the number of buyer quotations, transaction records, grade-price schedules, and collectively marketed volume.
5. Price volatility: seasonal price changes make revenue uncertain; indicators include farm-gate price by grade, timing of sale, and gross margin per hectare.

Marketing constraints

Marketing determined how production quality was converted into cash revenue. Field evidence identified four issues: collector dependence, price volatility, nontransparent grading, and limited access to alternative buyers. These issues are discussed as observed constraints, not as evidence of direct access to national factories or export markets.

Interview narratives consistently described collectors as the practical first buyer because they offered fast transactions, transport coordination, and, in some cases, advance capital. The same arrangement reduced farmers' ability to compare offers when credit and sale were linked. A viable alternative must therefore provide comparable transaction speed, logistics, and finance.

Respondents reported dried-leaf prices of Rp 30,000–Rp 45,000 kg^{-1}, depending on quality and market conditions. Because the survey did not maintain a complete grade-by-buyer transaction series, this range is used for sensitivity analysis rather than as a village mean. Recording buyer, grade, weight, moisture condition, price, and payment terms would make future price comparisons more reliable.

Drying, sorting, and storage influence leaf grade, but farmers lacked a shared written standard linking specific quality attributes to prices. Extension-supported grading demonstrations and moisture checks could reduce disputes, while collective quality control could help a farmer group offer more consistent lots to prospective buyers.

Distance from larger trading and processing centers increased the importance of local logistics. Rather than requiring each farmer to transport a small lot, aggregation can spread transport cost across a larger volume. Before investing, the group should compare the transport saving with handling, storage, and management costs.

These findings are consistent with value-chain research showing that buyer-linked credit and information asymmetry can restrict farmers' options, while effective organizations can provide information and brokerage services (Appau et al., 2019; World Bank Group, 2017; Yang et al., 2014). For Batu Belerang, the immediate objective is not to remove intermediaries by decree, but to make transactions contestable, documented, and transparent.

Technical, financial, and structural constraints

Technical constraints concerned input selection and dose, pest and disease monitoring, weather-dependent drying, and basic storage. These issues directly affect cost, crop loss, leaf quality, and occupational safety. Practical responses include field records, IPM demonstrations, safe handling, and low-cost quality checks before major technology investment.

Financial and structural constraints were distinct but connected. Financial constraints concerned working capital, credit terms, cash flow, and rising input costs. Structural constraints concerned farmer-group capacity, market information, buyer concentration, grading rules, transport, and access to public

services. Addressing only production technology would leave the underlying bargaining problem unchanged.

The constraints were grouped as follows:

1. Technical: climate variability; pest and disease pressure; inefficient or unsafe input use; limited drying, storage, grading, and farm records.
2. Financial: limited working capital; dependence on advance credit; uncertain cash flow; input-price increases; and unrecorded family-labor and financing costs.
3. Structural: weak price information; collector-dominated transactions; limited buyer choice; uneven farmer-group services; transport constraints; and nontransparent grade-price relationships.

Implementation pathway

Short term (0-6 months): the extension officer and farmer group should introduce simple farm-cost and sale records, map input and buyer prices, organize collective purchasing, and run a farmer field school on IPM and safe pesticide handling. Required resources are record sheets, demonstration plots, extension time, and group coordination. Indicators are participating farmers, complete cost records, group-purchased input volume, monitoring frequency, and pesticide expenditure per hectare.

Medium term (6-12 months): farmers should establish a shared grading protocol, compare written offers from several licensed buyers, pilot collective transport and marketing, and test low-cost drying or storage improvements. Responsible actors are the farmer group, extension service, village government, and buyers. Indicators are lots graded collectively, drying loss, number of buyer quotations, marketed volume, and farm-gate price by grade.

Longer term (12-24 months): after demonstrating accountable group management, farmers may pursue formal working capital, a buyer agreement with transparent specifications, and complementary crop or household enterprises. Any shared facility should have a feasibility study, ownership rules, maintenance funding, and audited records. Indicators are formal-credit uptake, repayment performance, contracted volume, gross margin per hectare, and the share of household income from complementary activities.

Role of extension services and farmer organizations

The extension interview showed that advisory services were the principal local channel for technical and program information. The most relevant future topics are farm records, efficient fertilizer use, pest monitoring, safe pesticide handling, drying, grading, and market information. Adoption should be recorded by practice and farmer rather than assumed from attendance at an extension meeting.

Farmer organizations can lower transaction costs through group purchasing, shared learning, price comparison, quality control, and lot aggregation. These benefits require transparent membership rules, separate financial records, agreed service fees, and regular reporting. The strategy therefore strengthens governance at the same time as it expands group activities.

Pest management should not depend on simply purchasing more conventional pesticides. An IPM program should combine field monitoring, thresholds where available, sanitation, crop and habitat management, conservation of natural enemies, and selective use of legally registered products. Locally available botanical or microbial biopesticides may be evaluated in supervised field demonstrations for efficacy, cost, crop safety, and user safety before adoption (Food and Agriculture Organization, n.d.; Souto et al., 2021). Gloves, protective clothing, hygiene, and avoidance of wet-leaf contact also address green tobacco sickness and pesticide exposure (World Health Organization, n.d.).

Income analysis and limitations

The questionnaire reported a dried-leaf yield range of 600–1,000 kg ha^{-1} and a farm-gate price range of Rp 30,000–Rp 45,000 kg^{-1}. Combining the lower yield with the lower price gives gross revenue of Rp 18,000,000 ha^{-1}, while the upper combination gives Rp 45,000,000 ha^{-1}. Subtracting the reported cash cost of Rp 3,515,000 gives an illustrative cash margin of Rp 14,485,000–Rp 41,485,000 ha^{-1} and a cash-cost R/C ratio of 5.12–12.80. These figures are scenarios, not mean net household income, because the budget excludes family labor, land, depreciation, storage investment, and financing costs.

A 10% decline in leaf price would reduce the illustrative margin by Rp 1,800,000 at the lower-yield scenario and Rp 4,500,000 at the upper-yield scenario; a 10% increase in the recorded cash cost would reduce margin by Rp 351,500 ha^{-1}. The strategy therefore targets both sides of the margin: quality and collective marketing to support realized price, and record-based input, labor, IPM, and logistics management to control cost. The study did not measure before-after income, subsidy receipt, insurance benefits, or a comparison group, so no causal policy or income effect is claimed.

Conclusion

Tobacco farming in Batu Belerang Village was characterized by practical farmer experience, family labor, weather-dependent drying, limited formal records, collector-linked finance, and collector-dominated sales. The representative questionnaire budget contained Rp 3,515,000 ha^{-1} in recorded cash variable costs, of which hired labor accounted for 71.1%; it did not constitute a complete economic-cost estimate.

The normalized IFAS and EFAS scores were 3.00 and 2.78. The resulting TOWS analysis prioritizes collective input purchasing and marketing, transparent grading and price information, improved drying and storage, farmer-field-school training in recordkeeping and IPM, safer pesticide practices, and access to formal working capital. The strategy includes SO, ST, WO, and WT actions rather than relying only on an SO quadrant.

The reported yield and price ranges generated an illustrative cash margin of Rp 14,485,000–Rp 41,485,000 ha^{-1} and a cash-cost R/C ratio of 5.12–12.80. Because family labor, land, depreciation, finance, and complete farm-level transaction records were unavailable, these scenarios indicate possible income pathways and sensitivity, not a demonstrated increase in farmer income.

Implementation should begin with low-cost records, collective price discovery, IPM and safety training, and accountable farmer-group services, followed by shared facilities or formal buyer agreements only after feasibility assessment. Future research should collect complete farm ledgers, grade-specific prices, family labor values, and before-after or comparison data to evaluate actual income change.

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