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SUSTAINABILITY ANALYSIS OF TOBACCO PRODUCT EXCISE REVENUE SHARING FUNDS (DBHCHT) AND TOBACCO FARMERS' WELFARE IN JEMBER REGENCY

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ABSTRACT

Research Originality — Existing studies on tobacco excise predominantly examine its contribution to state revenue and broader fiscal performance, with limited attention to the sustainability of the Tobacco Product Excise Revenue Sharing Fund (DBHCHT) as a fiscal decentralization instrument. In particular, empirical investigations that assess the multidimensional sustainability of DBHCHT and its linkage to tobacco farmers' welfare at the local level remain scarce. This study addresses this gap by providing a comprehensive sustainability assessment of DBHCHT and examining its implications for farmers' welfare in Jember Regency.

Research Objectives — The objective of this study is to assess the sustainability status of DBHCHT across economic, social, and environmental dimensions, and to analyze its influence on the welfare of tobacco farmers in Jember Regency.

Research Methods — A quantitative descriptive research design was implemented. Multidimensional scaling (MDS) analysis was conducted using the Rapid Appraisal for DBHCHT approach to assess and quantify the sustainability status of DBHCHT across economic, social, and environmental dimensions.

Empirical Result — The findings show that the sustainability of DBHCHT in Jember Regency is at a moderate level, indicating that the program has not achieved optimal performance across economic, social, and environmental dimensions. Several key aspects require strategic improvement to strengthen program effectiveness and alignment with local needs. Despite the substantial allocation of DBHCHT funds in 2023, the results suggest that the distribution has not generated a meaningful improvement in the welfare of tobacco farmers.

Implications — This study provides policy recommendations for local governments, particularly regional financial management agencies and sectoral offices responsible for DBHCHT allocation, to redesign fund distribution mechanisms toward more targeted, transparent, and welfare-oriented programs. Strengthening monitoring, performance-based budgeting, and farmer-centered interventions is essential to ensure that DBHCHT effectively contributes to sustainable rural development.

Keywords: Public Policy; Negative Externalities; DBHCHT; Sustainability; Welfare; RAP-DBHCHT

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INTRODUCTION

Sustainability policy refers to the implementation of a series of regulations within associations, groups, and institutions to ensure that policies are implemented sustainably across economic, environmental, and social dimensions (Membrillo-Hernández et al., 2021). Effective implementation of sustainability policies has the potential to improve societal well-being across these three dimensions.

Sustainability policy refers to the implementation of a series of regulations within associations, groups, and institutions to ensure that policies are implemented sustainably across economic, environmental, and social dimensions (Membrillo-Hernández et al., 2021). Effective implementation of sustainability policies has the potential to improve societal well-being across these three dimensions. Welfare refers to an individual's ability to meet basic needs, including clothing, nutritious food, proper housing, clean water, and access to education. In addition, welfare is associated with improvements in quality of life and the ability of individuals to achieve a social standard comparable to that of others (Kurniasih & Anjani, 2025).

Data from the Central Statistics Agency (BPS) in 2019 reveal that 49.41% of poor households in Indonesia work in the agricultural sector. Therefore, improving farmers' welfare should become a policy priority (Nainggolan & Saragih, 2022). Welfare improvement can be measured through their purchasing power to meet their needs. An increase in farmers' exchange rate indicates an increase in their welfare. One commonly used indicator is the Nilai Tukar Petani (Farmer Exchange Rate), often referred to as NTP for short, where an increase in NTP reflects an improvement in farmers' welfare (Wahyuni & Dinaloni, 2021).

Tobacco is an important agricultural commodity that contributes significantly to Indonesia's economic development through tobacco excise revenue and employment generation. In 2023, total tobacco production in Indonesia reached 238,800 tons across 14 provinces (BPS, 2023). East Java Province ranked first in tobacco production, with a total output of 109,000 tons. According to data from the Food Crops, Horticulture, and Plantation Service of the Jember Regency Government (2023), Jember Regency recorded the highest tobacco production in East Java, reaching 18,633 tons. The region has long been known as the Tobacco City due to its large tobacco production and high-quality production (Fitri, 2025).

According to the Regulation of the Minister of Finance of the Republic of Indonesia Number 161/PMK.04/2022 concerning Notification of Excisable Goods, tobacco and its processed products are classified as excisable consumption goods. The concept of excise as a form of Pigouvian tax was first introduced by Arthur C. Pigou in the early 20th century and remains a reference in modern fiscal policy to address negative externalities (Banzhaf, 2021). Overall, excise tax collection serves as a compensation cost for parties negatively impacted by certain goods and a form of user accountability for the negative impacts caused by these goods (Sondayani, 2024).

Based on the Performance Report of the Directorate General of Customs and Excise (DJBC), total national excise revenue in 2023 reached IDR 286.2 trillion. According to 2023 data from the Directorate General of Customs and Excise (2024), East Java's contributions were significant, amounting to IDR 73.92 trillion through DJBC Jatim I and IDR 56.33 trillion through DJBC Jatim II. A report from Jember Customs and Excise (2024) shows that realized excise revenue reached IDR 135.84 billion, exceeding the target of IDR 130.6 billion. For three years (2021–2023), East Java's contribution to total national excise revenue ranged from 40% to 45%, reinforcing its role as a strategic excise-producing region. Jember Regency, as one of the largest tobacco-producing regions in East Java, plays a crucial role by supporting local tobacco production, which sustains the tobacco industry and strengthens the regional excise revenue base.

In addition to excise collection as a fiscal measure to mitigate negative externalities, the government also implemented a fiscal decentralization policy through the Tobacco Product Excise Revenue Sharing Fund (DBHCHT), allocated to provinces producing excise and tobacco products (Wirawan & Sinaga, 2021). The use of DBHCHT funds at the regional level is specifically regulated in Minister of Finance Regulation Number 215/PMK.07/2021, which governs the mechanism for fund use, monitoring, and evaluation. Paragraph 1 of Article 11 stipulates that 50% is allocated for public welfare, 40% for health, and 10% for law enforcement. This proportional provision constitutes a form of earmarking, a fiscal strategy that regulates all revenue from a levy to be allocated specifically for funding specific programs (Samuel, 2022).

According to the Regulation of the Minister of Finance of the Republic of Indonesia Number 3/PMK.07/2023, the total allocation of the DBHCHT for regions across Indonesia's 34 provinces in 2023 was IDR 5.47 trillion. East Java Province received the highest DBHCHT allocation in the country at IDR 3.07 trillion, while Jember Regency ranked fifth in the highest DBHCHT allocation category in East Java at IDR 109.2 billion.

IMPLEMENTATION IN PRACTICE

- The RAP-DBHCHT method is applied to determine the sustainability status of public policies, particularly the Tobacco Product Excise Revenue Sharing Fund (DBHCHT).
- Policies are optimized based on sensitive attributes within the economic, social, and environmental dimensions.
- Programs and policies related to non-sensitive attributes within each sustainability dimension are evaluated.
- A dedicated team or task force is established to manage and supervise the DBHCHT allocation program.
- Periodic monitoring and evaluation of DBHCHT allocations are conducted to assess their impact on the welfare of tobacco farmers across economic, social, and environmental dimensions.

The DBHCHT allocation is expected to serve as a useful funding source for improving the health and welfare of tobacco farm laborers, cigarette factory workers, and tobacco farmers, as parties contributing to excise revenue. Furthermore, the DBHCHT is also expected to optimize state revenue from the tobacco industry through programs to alleviate the circulation of illegal excisable goods (BKC) and encourage the establishment of tobacco industrial zones (KIHT) (Pratiwi et al., 2022).

According to Ahsan et al. (2021), the welfare of tobacco farmers in Jember Regency has declined in the past 5 to 10 years due to weather factors, the volatility of tobacco prices, the role played by middlemen in determining tobacco prices, and farmers' inability to repay their debts due to lean harvests. The allocation of DBHCHT in Jember Regency that year was not evenly distributed to tobacco farmers, but rather was channeled primarily to health and law enforcement, as well as to certain parties, such as officials from Jember Regency Government agencies. Furthermore, tobacco farmer groups and several officials from relevant agencies within the Jember Regency Government were not fully informed about the DBHCHT allocation programs. Without the financial support provided by DBHCHT, tobacco farmers are likely to shift to other livelihoods, which will undoubtedly have a negative impact on the tobacco industry and state revenues.

Cigarette is the second largest household expenditure among the poor in urban and rural areas after rice, prompting the government to increase excise taxes to control smoking in the community (Satria & Dawood, 2017). According to the Center for Social Security Studies, University of Indonesia (2020), the increase in tobacco excise taxes has had a positive impact on state revenue, which is mainly derived from excise revenues and regional revenue from DBHCHT allocations. However, tobacco farmers, as primary producers of raw materials, have not fully benefited from these allocations. Therefore, DBHCHT allocation should be prioritized to improve the quality of tobacco for local farmers through various programs, such as assistance for crop conversion, income diversification, provision of agricultural facilities and infrastructure, training and human resource development, and business capital.

Previous studies on tobacco excise generally focused on the fiscal contribution to state revenue, the effectiveness of consumption controls, and the impact of excise policies on public health (Satria & Dawood, 2017) (Ahsan et al., 2021). Meanwhile, studies on the DBHCHT have focused more on regulatory aspects, distribution mechanisms, and regional budget absorption (Wirawan & Sinaga, 2021) (Pratiwi et al., 2022).

However, a limited number of research have comprehensively analyzed the sustainability of the DBHCHT based on economic, social, and environmental dimensions by directly linking this issue to the welfare of tobacco farmers at the regional level. These limitations indicate a research gap in understanding whether fiscal decentralization instruments through the DBHCHT truly contribute to sustainable welfare development in tobacco-producing regions. Therefore, the novelty of this research lies in the use of a multidimensional sustainability approach through the Rapid Appraisal for DBHCHT (RAP-DBHCHT) method to assess the sustainability status of DBHCHT. Specifically, this study aims to analyze the sustainability status of DBHCHT in economic, social, and environmental aspects and evaluate its impact on the welfare of tobacco farmers.

LITERATURE REVIEW

Woodrow Wilson provided an early framework for public policy as a government statement and strategy in addressing specific issues (Meutia, 2017). However, in a more contemporary context, Thomas R. Dye (1992) outlines the public policy-making process as a series of systematic stages, starting from problem identification, agenda setting, formulation, ratification, implementation, to policy evaluation (Widodo, 2021). In addition, Dunn et al. (2018) emphasized that the involvement of policy actors, clear policy guidelines, and the broader public are essential elements within the policy cycle. Several previous studies have also examined DBHCHT policies in the context of budget utilization and the role of fiscal decentralization. Pratiwi et al. (2022) highlight the distributional aspects of the DBHCHT program in their research, while Mukhtianto & Diartho (2018) applied a rapid appraisal approach to assess the sustainability of tobacco commodities. However, research specifically analyzing the sustainability of the DBHCHT allocation for tobacco farmers' welfare using a multidimensional approach (economic, social, and environmental) at the regional level is limited.

Within public policy, fiscal instruments are government interventions designed to address social and economic problems. Fiscal policy functions not only as a tool for collecting state revenue but also as a corrective mechanism for market failures, including negative externalities arising from certain economic activities. Therefore, an understanding of public policy in a fiscal context needs to be linked to economic welfare theory, which posits the role of the state in internalizing the negative impacts of production and consumption activities. In the context of the tobacco industry, this approach is relevant for explaining the normative and economic basis of excise policy as an instrument of control and redistribution through the DBHCHT scheme.

Pigou (1920) defined excise as a form of tax on market transactions. This tax, often referred to as Pigouvian tax, creates negative externalities, imposing a cost of production onto parties who are not directly involved (Sitepu, 2016). Excise collection is a fiscal instrument to internalize these externalities. In Indonesia, the fiscal decentralization policy accommodates this through the DBHCHT scheme, particularly through the distribution of funds to provinces producing excise and tobacco. Based on Government Regulation of the Republic of Indonesia Number 37 of 2023 concerning Management of Transfers to Regions, revenue sharing

funds are a form of regional transfer allocated based on a certain percentage and performance, to reduce fiscal imbalances between the central and regional governments, as well as to overcome negative externalities. The use of DBHCHT is specifically regulated in paragraph 1 of Article 11 of PMK RI No. 215/PMK.07/2021, which stipulates that 50% of the fund should be allocated for community welfare. These include 20% for improving the quality of raw materials, industrial development, and the social environment, and 30% for direct assistance. The remaining 40% is allocated for the health sector, and 10% for law enforcement.

Several studies have examined the utilization of DBHCHT. Pratiwi et al. (2022) focused on the effectiveness of program distribution on community welfare, and Sondayani (2024) examined the relationship between fiscal policy and reducing externalities from tobacco excise. Meanwhile, Mukhtianto & Diartho (2018) applied the rapid appraisal method to evaluate the sustainability of tobacco commodities, but their analysis focused primarily on economic aspects.

This study fills this gap by exploring the sustainability of DBHCHT utilization in a multidimensional framework by incorporating economic, social, and environmental aspects, with an emphasis on the welfare of tobacco farmers, particularly in Jember Regency. Using the multidimensional scaling (MDS)-based RAP-DBHCHT method, this study not only examines the effectiveness of policies at the macro level but also addresses how the sustainability of DBHCHT allocations is implemented at the micro level and directly impacts farmer groups as the main actors in the tobacco production chain. This multidimensional approach sets our study apart from previous studies, which tended to focus on sectoral framework without fully integrating sustainability dimensions.

According to Haris (2000), the concept of sustainability encompasses three dimensions: economic, environmental, and social aspects as the main pillars. Economic sustainability emphasizes the ability of development to consistently produce goods and services without causing institutional imbalances, while environmental sustainability focuses on the preservation of natural resources, biodiversity, and ecosystem stability. Social sustainability aims to achieve justice and equality through the provision of services (Msengi et al., 2019). These three dimensions are commonly referred to as the 3Ps: profit, planet, and people. Achieving sustainable development requires balancing the 3Ps (Chin et al., 2023). An imbalance among these pillars may lead to economic disparities, environmental degradation, or social inequality. Several studies have applied sustainability concepts in the context of fiscal policy and commodity management. Mukhtianto & Diartho (2018), for example, examined tobacco sustainability from a local economic perspective using a rapid appraisal approach. Pratiwi et al. (2022) analyzed the effectiveness of DBHCHT programs in improving community welfare, but their study did not explicitly integrate social and environmental dimensions into the evaluation framework. Similarly, Sondayani (2024) discussed excise as a fiscal instrument but did not examine its implications for the long-term sustainability of tobacco farmers' welfare. These limitations indicate the need for a more integrated and multidimensional assessment.

By integrating economic, social, and environmental dimensions using the multidimensional scaling (MDS)-based RAP-DBHCHT method, this research offers a different perspective because it focuses on the sustainability of fiscal policy at the micro level, specifically how DBHCHT allocation impacts the welfare of tobacco farmers in Jember Regency in a sustainable manner. The sustainability of fiscal policy is ultimately inseparable from the normative goal of development, namely improving the welfare of the community as the primary beneficiaries of the policy. In the context of DBHCHT allocation, the economic, social, and environmental dimensions are not merely an evaluative framework but also instruments to ensure that fiscal distribution can produce sustainable improvements in the quality of life. Therefore, to assess the effectiveness of policy sustainability, a more comprehensive conceptual understanding of welfare as an indicator of the outcome of policy implementation is required.

Economists define the concept of welfare as a measure of the dynamics of individual income levels and societal purchasing power (Deaton, 2016). According to Stiglitz et al. (2011), welfare has various dimensions that can be measured through material living standards, health levels, education, political freedom, social interaction, and the condition of the environment, both from an economic and physical perspective (Panjaitan & Damanik, 2023). Todaro and Stephen C. Smith (2006) similarly explain that societal welfare is reflected in improvements in basic elements of life such as the distribution of basic necessities, income, education, as well as attention to cultural values, humanitarian principles, and expanding economic choices (Abubakar, 2019).

When compared to the operational definition in Indonesian fiscal policy, particularly under Minister of Finance Regulation Number 215/PMK.07/2021, welfare in the context of DBHCHT allocation is technically defined as activities or programs that enhance raw material quality, industrial development, and social environmental development by improving job skills and provide direct assistance to beneficiary communities. Thus, policy approaches must align with the multidimensional concept of welfare according to the literature. This study uses the definition of welfare as a combination of economic, social, and environmental indicators that aligns with the DBHCHT utilization structure specified in the Minister of Finance Regulation (PMK).

Previous research has addressed welfare in the DBHCHT context from various perspectives. Pratiwi et al. (2022) examined the general impact of DBHCHT distribution on community welfare, while Ahsan et al. (2021)

discussed strategies to improve the welfare of farm laborers and cigarette workers without specifically focusing on tobacco farmers through a multidimensional framework. Wahyuni & Dinaloni (2021) analyzed farmer welfare during the COVID-19 pandemic but did not explore its relationship with DBHCHT allocation. Accordingly, this study evaluates the welfare of tobacco farmers as direct beneficiaries of DBHCHT using a multidimensional approach that integrates economic, social, and environmental dimensions, in line with the policy framework established under PMK 215/PMK.07/2021.

METHODS

This research used a quantitative descriptive method and was conducted in 2023. The research location was determined using purposive sampling, with Jember Regency selected as the research area. This region ranks first in terms of total tobacco production in East Java. This research used probability sampling and a proportionate cluster random sampling approach. The research population consisted of 81,857 tobacco farmers in Jember Regency. Sampling was based on the type of tobacco planted. The tobacco type with the highest productivity in Jember Regency is VO Kasturi, which is mainly cultivated in northern Jember, followed by Na-Oogst tobacco, commonly cultivated in southern Jember.

To determine the sample size, the Slovin's formula was applied, as it is commonly used to estimate representative sample sizes from large populations (Nyimbili & Nyimbili, 2024).

$$n = \frac{N}{1 + N_e^2}$$

Using the Slovin's formula with a margin of error of 10%, a sample size of 100 respondents (rounded) was derived from the total population of 81,857. Because the population is clustered within a group, the sample must also be clustered within a group. The sample size for each cluster is presented in Table 1.

Table 1 Tobacco Farmer Sample Size in Jember Regency

Criteria	Cluster	Population	Sample
Tobacco farmers	VO Kasturi tobacco	55,478 farmers	68 farmers
	Na-Oogst tobacco	26,379 farmers	32 farmers
Total		81,857 farmers	100 farmers

Source: Food Crops, Horticulture, and Plantation Service of Jember Regency (2019)

The data used in this study comprises primary and secondary data. Primary data was obtained directly from respondents, namely tobacco farmers in Jember Regency. Secondary data was obtained from the Food Crops, Horticulture, and Plantation Service of Jember Regency, the Central Statistics Agency, Ministry of the Republic of Indonesia Regulations, Jember Customs and Excise, and literature from books, journals, and theses. Data was collected via observation, interviews, and literature review.

This study applied the RAP-DBHCHT method with a multidimensional scaling (MDS) approach. Sustainability was measured across economic, social, and environmental dimensions. Each dimension was analyzed through a series of attributes determined based on interviews and field observations. These attributes were first identified and defined to ensure their suitability to the context of DBHCHT implementation in the study area.

Sustainability status was assessed by assigning a score to each attribute on a scale from 0 to 3, representing categories ranging from poor to good. The scores from 100 tobacco farmer respondents were then analyzed using the MDS-based RAP-DBHCHT ordination technique to determine the sustainability index for each dimension and the multidimensional scale. The resulting sustainability index value ranges from 0 to 100, which is then used to classify the sustainability status of DBHCHT in Jember Regency (Heffiana et al., 2022).

Table 2 Sustainability Status Categories of DBHCHT Based on Index Values from RAP-DBHCHT Ordination Analysis Using the MDS Technique

Index Value	Sustainability Status
0.00 – 25.00	Poor (Unsustainable)
25.01 – 50.00	Less Sustainable
50.01 – 75.00	Moderately Sustainable
75.01 – 100.00	Highly Sustainable

Source: Sulaksana et al. (2025)

The analysis in this study was conducted using the RAP-DBHCHT application, which is integrated as an add-in in Microsoft Excel. The application consists of three main procedures: Run RAP-DBHCHT, Run Leverage, and Run Monte Carlo (Muktianto & Diartho, 2018). These procedures are applied systematically to assess sustainability status and evaluate the sensitivity and stability of the analytical results. The Run RAP-DBHCHT procedure is used to determine the sustainability status for each dimension as well as the overall multidimensional sustainability index. The assessment is based on two reference points, namely "good" and "bad" conditions, which function as anchors in the ordination process. The quality of the analysis is indicated

by the stress value and the coefficient of determination (R^2). A stress value below 0.25 indicates an acceptable level of model fit, while an R^2 value approaching 1 (or 100%) suggests that the selected attributes adequately represent the model.

The Run Leverage procedure is used to identify attributes that are sensitive to changes in the sustainability index. This analysis is based on the change in the root mean square (RMS) value on the ordination axis. An attribute is considered sensitive when its RMS value is $\geq 2\%$, indicating a significant contribution to changes in the sustainability score. This threshold follows the rapid appraisal (RAP) approach, in which an RMS change greater than 2% reflects the substantial influence of an attribute on multidimensional ordination results (Muktianto & Diartho, 2018). The results of the leverage analysis serve as the basis for formulating policy recommendations to strengthen the sustainability of DBHCHT implementation.

The Run Monte Carlo procedure is conducted to test the stability and uncertainty of the analysis results. The evaluation is performed at a 95% confidence level to detect potential errors arising from attribute scoring, variations in respondent perceptions, or inaccuracies during the data input. Overall, the Monte Carlo test functions as a validation mechanism to ensure the reliability of the ordination results.

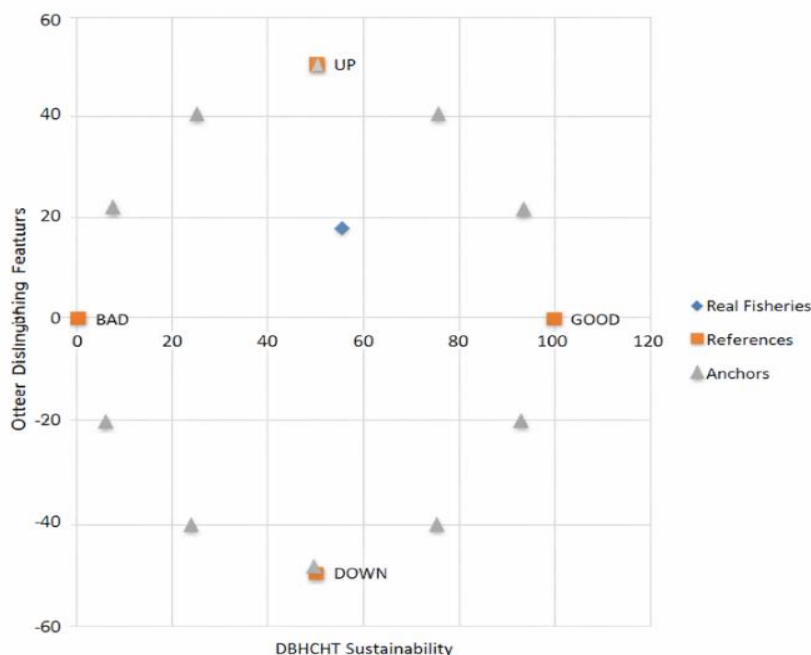
This study analyzes the sustainability of DBHCHT using economic, social, and environmental dimensions. These dimensions represent a multidimensional framework for evaluating fiscal policy sustainability, particularly in the context of DBHCHT allocation to tobacco farmers in Jember Regency.

The economic dimension measures the extent to which DBHCHT allocations contribute to improving the economic welfare of tobacco farmers. The attributes within this dimension include the amount of DBHCHT allocation, agricultural productivity improvement programs, tobacco price stability, production cost efficiency, access to financial resources, and income diversification. These attributes reflect the policy's capacity to strengthen farmers' economic resilience in a sustainable manner.

The social dimension evaluates the role of DBHCHT allocations in improving the social welfare of tobacco farmers and supporting socio-cultural development in tobacco-producing regions. The analyzed attributes include community participation levels, educational programs to improve agricultural productivity, farmer health improvement programs, housing improvement programs, gender equality initiatives, and programs for preserving local cultural values. This dimension represents human development and social cohesion as essential components of sustainability.

The environmental dimension assesses the contribution of DBHCHT allocations to environmental protection and sustainable agricultural practices in Jember Regency. The attributes include the implementation of sustainable farming practices, water resource management, soil conservation programs, biodiversity protection, waste management, and efforts to control land-use change. This dimension highlights that fiscal policy sustainability must also support the preservation of agricultural ecosystems. The selection of attributes used in the RAP-DBHCHT analysis is based on interviews, field observations, and responses from tobacco farmer respondents in Jember Regency. These attributes are designed to reflect current issues related to farmers' welfare and the sustainability of tobacco farming.

Figure 1 DBHCHT Sustainability Index on Tobacco Farmers' Welfare in the Economic Dimension

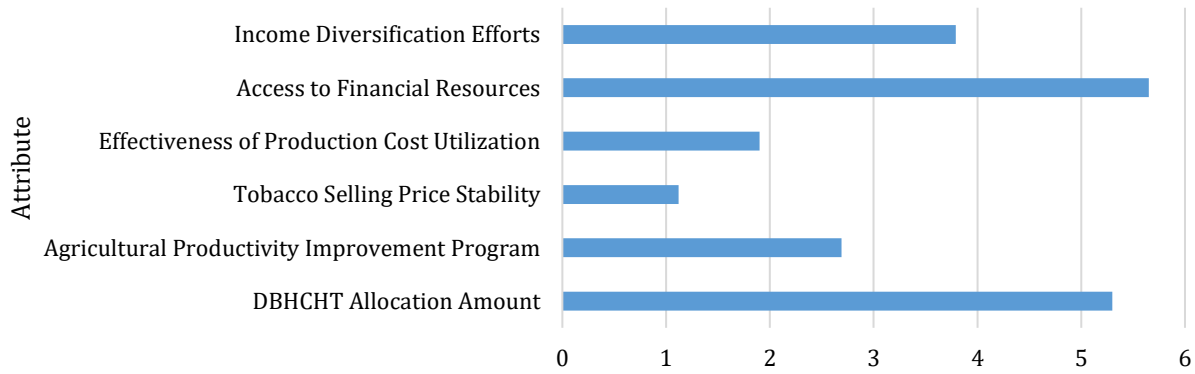


Source: Processed by the authors

RESULT AND DISCUSSION

Figure 1 shows the results of the RAP-DBHCHT ordination analysis for the economic dimension. The RAP-DBHCHT ordination showed a DBHCHT sustainability index value of 55.32, positioned on the ordination scale between 50.01 and 75.00, thus categorizing it as moderately sustainable. A stress value between 0.15 and 0.25 indicates that the analysis results align well with field conditions. The R2 value of 0.94 indicates that the selected attribute explains 94% of the model. Therefore, the existing indicators adequately represent the sustainability model.

Figure 2 Leverage Attributes Analysis in the Economic Dimension



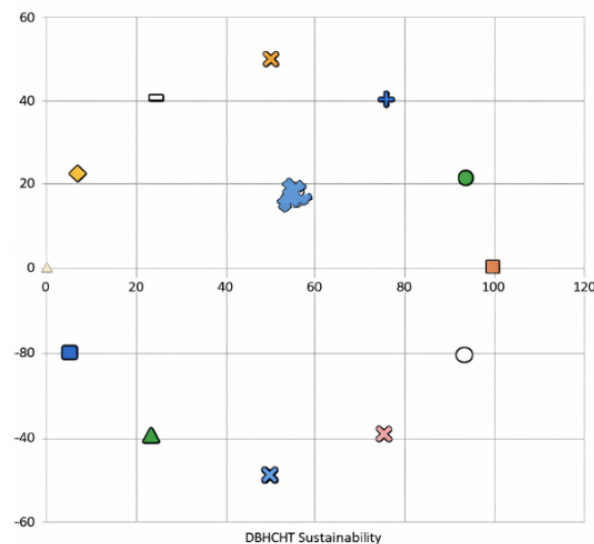
Source: Processed by the authors

Table 3 Root Mean Square (RMS) Values for Leverage Attributes in the Economic Dimension

No	Indicators	RMS %	Description
1	DBHCHT Allocation Amount	5.30 %	Sensitive
2	Agricultural Productivity Improvement Program	2.69 %	Sensitive
3	Tobacco Selling Price Stability	1.12 %	Not Sensitive
4	Effectiveness of Production Cost Utilization	1.9 %	Not Sensitive
5	Access to Financial Resources	5.65 %	Sensitive
6	Income Diversification Efforts	3.79 %	Sensitive

Source: Processed by the authors

Figure 3 Monte Carlo Analysis of DBHCHT Sustainability in the Economic Dimension



Source: Processed by the authors

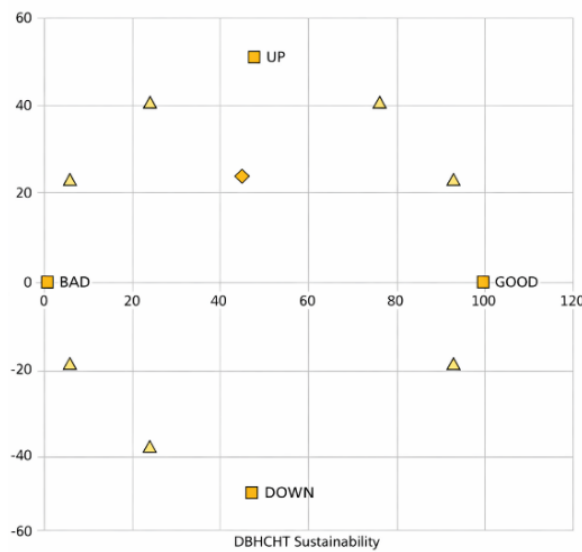
Figure 2 illustrates the attributes in the economic dimension that significantly influence DBHCHT sustainability for tobacco farmers' welfare in Jember Regency. The RMS value for each attribute is presented in Table 3. Figure 2 and Table 3 show the results of the leverage analysis of attributes in the economic dimension. As shown in Figure 2 and Table 3, several attributes have RMS values greater than 2%, indicating that they are sensitive attributes that significantly influence the sustainability index. These attributes include DBHCHT allocation amount (RMS 5.30%), agricultural productivity improvement programs (RMS 2.69%), access to financial resources (RMS 5.65%), and income diversification efforts (RMS 3.79%). Among these variables,

access to financial resources has the highest RMS value, indicating that it has the strongest influence on the sustainability status of DBHCHT in the economic dimension.

Monte Carlo analysis was used to determine the impact of random errors for each attribute to assess the sustainability status of DBHCHT on the welfare of tobacco farmers in Jember Regency. As shown in Figure 3, the Monte Carlo analysis results show that the attributes in the economic dimension do not have significant errors, as indicated by the clustering of MDS iteration points between 53.14 and 58.34, located in close proximity. This position indicates that there are no errors in the scoring of each attribute, thus preventing data entry errors (Muktianto & Diartho, 2018).

In terms of the social dimension, the analysis of the sustainability of tobacco excise revenue sharing funds as presented in Figure 4, highlighting the RAP-DBHCHT ordination analysis, yields a DBHCHT sustainability index value of 45.41 for the social dimension, which is classified as less sustainable. A stress value of $0.15 < 0.25$ indicates that the results are quite consistent with field conditions. An R2 value of 0.94 indicates that the selected attributes represent 94% of the model.

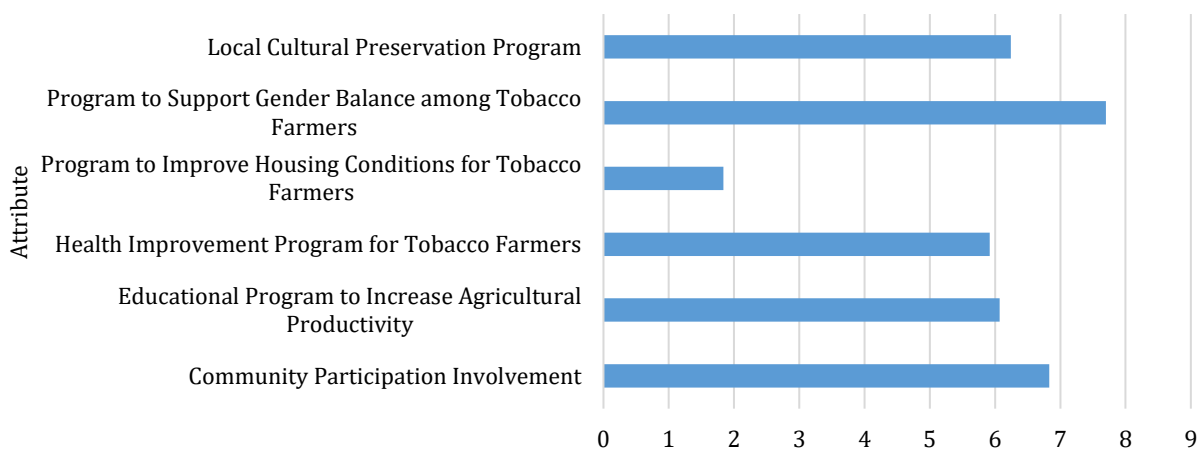
Figure 4 DBHCHT Sustainability Index on Tobacco Farmers' Welfare in the Social Dimension



Source: Processed by the authors

The leverage attribute analysis in the social dimension indicates that several attributes have a significant influence (Figure 5). The RMS values for each attribute in the social dimension are presented in Table 4. The results indicate that the program supporting gender balance among tobacco farmers has the highest RMS (RMS 7.70%), which will significantly impact on the sustainability of the DBHCHT.

Figure 5 Leverage Analysis of Attributes in the Social Dimension



Source: Processed by the authors

Monte Carlo analysis (Figure 6) was used to determine the impact of random error on each attribute to assess the sustainability status of the DBHCHT on the welfare of tobacco farmers in Jember Regency. As portrayed in Figure 6, the attributes in the social dimension performed quite well, with no significant errors,

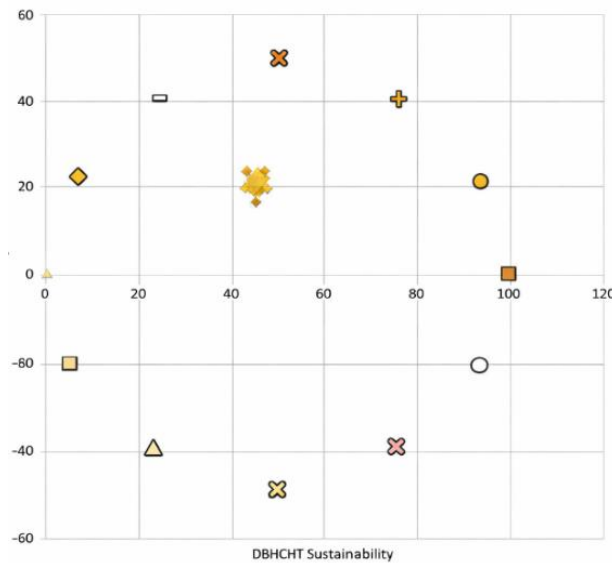
as evidenced by MDS iteration results between 43.16 and 48.16, indicating stable ordination with minimal scoring errors.

Table 4 Root Mean Square (RMS) Values for Leverage Analysis of Attributes in the Social Dimension

No	Indicators	RMS %	Description
1	Community Participation Involvement	6.83 %	Sensitive
2	Educational Program to Increase Agricultural Productivity	6.07 %	Sensitive
3	Health Improvement Program for Tobacco Farmers	5.92 %	Sensitive
4	Programs to Improve Housing Conditions for Tobacco Farmers	1.84 %	Not Sensitive
5	Programs to Support Gender Balance among Tobacco Farmers	7.70 %	Sensitive
6	Local Cultural Preservation Program	6.24 %	Sensitive

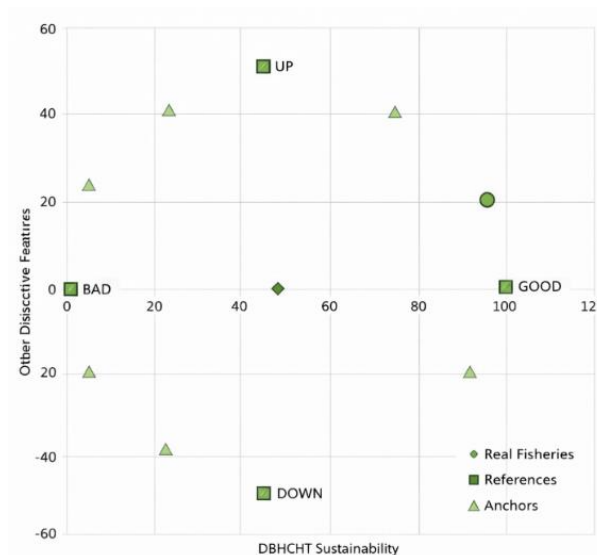
Source: Processed by the authors

Figure 6 Monte Carlo Analysis of DBHCHT Sustainability in the Social Dimension



Source: Processed by the authors

Figure 7 DBHCHT Sustainability Index on Tobacco Farmers' Welfare in Jember Regency in the Environmental Dimension

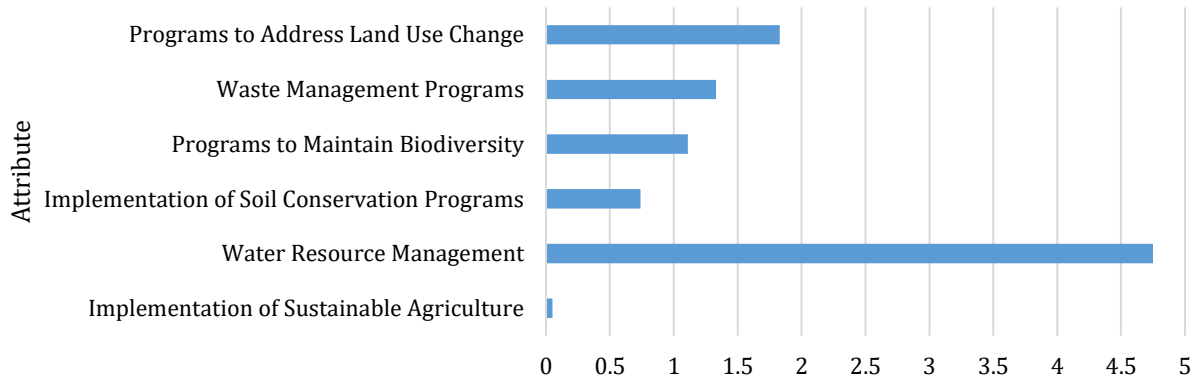


Source: Processed by the authors

Figure 7 shows the results of the RAP-DBHCHT ordination for the environmental dimension, with a DBHCHT sustainability score of 52.84, indicating a moderately sustainable status. The stress value of 0.15 is lower than 0.25, indicating that the results align fairly well with the observed field conditions. The R2 value of 0.94 indicates that the selected attributes represent 94% of the model used.

The leverage attribute analysis for the environmental dimension reveals that the attributes in the environmental dimension significantly influence the sustainability of DBHCHT for tobacco farmers' welfare in Jember Regency. The results of the attribute leverage analysis for the environmental dimension are portrayed in Figure 8, while the RMS values for each attribute in the same dimension are presented in Table 5. The results indicate that water resource management is the attribute with the highest RMS (RMS 4.75%), suggesting that this attribute significantly impacts the sustainability of the DBHCHT.

Figure 8 Leverage Attribute Analysis in the Environmental Dimension



Source: Processed by the authors

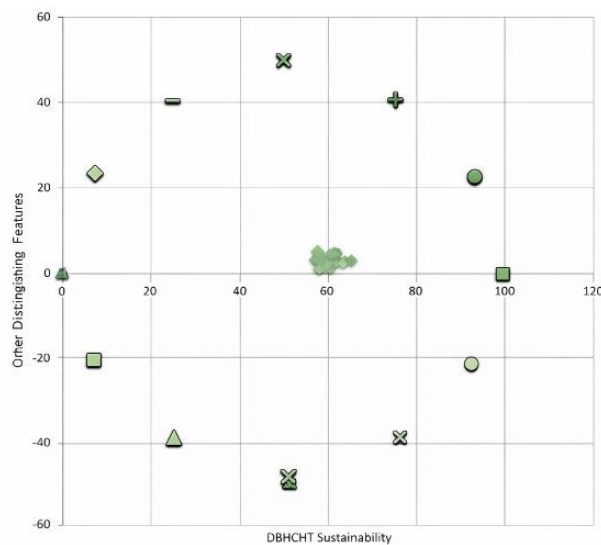
Table 5 Root Mean Square (RMS) Values for Leverage Attributes in the Environmental Dimension

No	Indicators	RMS %	Description
1	Implementation of Sustainable Agriculture	0.05 %	Not Sensitive
2	Water Resource Management	4.75 %	Sensitive
3	Implementation of Soil Conservation Programs	0.74 %	Not Sensitive
4	Programs to Maintain Biodiversity	1.11 %	Not Sensitive
5	Waste Management Programs	1.33 %	Not Sensitive
6	Programs to Address Land Use Change	1.83 %	Not Sensitive

Source: Processed by the authors

A Monte Carlo analysis was also conducted to determine the impact of random error for each attribute to assess the sustainability status of DBHCHT on the welfare of tobacco farmers in Jember Regency. As shown in Figure 9, the results for the environmental dimension are categorized as fairly good with zero error range. This is evidenced by the collected MDS iteration results in the range of 57.77–65.58.

Figure 9 Monte Carlo Analysis of DBHCHT Sustainability in the Environmental Dimension

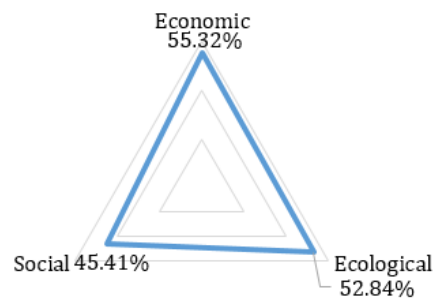


Source: Processed by the authors

The analysis of DBHCHT sustainability on the welfare of tobacco farmers in Jember Regency was conducted using the multidimensional scaling method across the economic, social, and environmental dimensions. The results showed that the economic dimension yielded a RAP-DBHCHT ordinance value of 55.32,

which is classified as fairly sustainable. Four attributes were sensitive, and two were insensitive. Meanwhile, the social dimension yielded a RAP-DBHCHT ordinance value of 45.41, indicating that this dimension is in the less sustainable ordination scale. In this dimension, five attributes were sensitive, and one was insensitive. The environmental dimension recorded a RAP-DBHCHT ordinance value of 52.84, categorized as fairly sustainable. This dimension obtained one sensitive attribute and five insensitive attributes. The results of the multidimensional sustainability analysis show that DBHCHT has a moderately sustainable status with an index value of 51.19, which is classified as moderately sustainable (Figure 10). This result suggests that the sustainability status can be improved through program optimization for sensitive attributes and program evaluation for non-sensitive attributes in each dimension.

Figure 10 Multidimensional Sustainability Index Values in a Flyover Diagram



Source: Processed by the authors

The economic sustainability of the DBHCHT program in Jember Regency is categorized as moderately sustainable, with an index value of 55.32. This result indicates that the economic aspects of the DBHCHT allocation have a significant positive impact on the welfare of tobacco farmers. Out of six attributes in this dimension, four are classified as sensitive: the amount of DBHCHT allocation, agricultural productivity improvement programs, access to financial resources, and income diversification. Access to financial resources is the most sensitive attribute (RMS 5.65%), indicating that the availability of capital and easy access to credit are crucial in strengthening farmers' production capacity and economic resilience.

Aligns with Haris' (2000) concept of economic sustainability, which emphasizes that sustainable development must generate a consistent production process for goods and services without creating institutional imbalances (Msengi et al., 2019). Furthermore, Todaro & Smith (2006) state that economic well-being is assessed not only by income but also by access to new economic opportunities and farmers' adaptive capacity (Abubakar, 2019). In this context, the DBHCHT program needs to be optimized through the development of cooperative-based microfinance schemes, farmer entrepreneurship training, and financial assistance programs.

Conversely, two insensitive attributes, production cost effectiveness and tobacco selling price stability, indicate that current interventions have not succeeded in changing the underlying cost structure and market prices. Research by Pratiwi et al. (2022) supports this finding, showing that DBHCHT allocation does not have a significant effect on price stability. In addition to these factors, the two insensitive attributes can also be influenced by other economic conditions, such as inflation. Therefore, a thorough evaluation of the program's distribution mechanisms, price information transparency, and farmer integration into the industrial supply chain are necessary to improve the effectiveness of these attributes.

Regarding the social dimension of DBHCHT sustainability, the analysis shows that DBHCHT is classified as less sustainable, with an index score of 45.41. Five of the six attributes fall into the sensitive category, indicating that DBHCHT's social impact on farmer welfare is suboptimal. The attribute with the highest RMS score was programs supporting gender equality (7.70%), followed by education programs, community participation, health improvement, and local cultural preservation. The high level of sensitivity indicates that community perceptions of social sustainability are significantly influenced by their direct and equitable involvement in program implementation.

According to Haris's (2000) theory, social sustainability hinges on equitable access to basic services, active participation, and recognition of local cultural values (Msengi et al., 2019). Similarly, S tiglitz et al. (2011) also emphasize that the social dimension of well-being involves participatory freedom, equality, and social solidarity (Panjaitan & Damanik, 2023). Therefore, DBHCHT-based programs need to be improved through gender equality outreach, provision of training for female farmer groups, and strengthening farmer community organizations to ensure more inclusive representation.

One insensitive attribute, improved housing affordability, indicates that the program has not produced tangible changes in farmer's housing. This may be due to mistargeting or inadequate budget allocation. Research by Ahsan et al. (2021) also noted low farmer involvement in program priority setting. Therefore,

housing programs need to be evaluated in terms of effectiveness, scalability, and relevance to needs, and reviewed based on community involvement in policy design.

The environmental dimension achieved a sustainability index of 52.84, which is also considered fairly sustainable. However, only one attribute, water resource management (RMS 4.75%), was classified as sensitive, while the other five attributes, including soil conservation, biodiversity, and waste management, were considered insensitive.

The water management attribute is crucial because tobacco is a crop that requires large amounts of water, and irrigation quality directly impacts land productivity. This aligns with Haris's (2000) finding, which shows that environmental sustainability is achieved through the preservation of natural resources and ecosystem stability (Msengi et al., 2019).

Therefore, DBHCHT support should be directed towards programs designed to strengthen environmental sustainability, such as improving infrastructure, rehabilitating watershed, and providing training on environmentally friendly agricultural techniques. Research by Muktianto & Diartho (2018) underscores the importance of implementing sustainable agricultural principles in tobacco farming, but it is important to note that their implementation remains limited at the micro level. Meanwhile, the insensitive attributes indicate that current environmental programs have not reached or significantly benefited farmers. Therefore, it is necessary to evaluate and reformulate environmental programs, including intensifying environmental education, providing conservation incentives for farmers, and integrating local ecotourism activities based on tobacco culture as a form of benefit diversification.

From a multidimensional perspective, the sustainability of the DBHCHT program for the welfare of tobacco farmers in Jember Regency is categorized as moderately sustainable, with an index value of 51.19. Leverage analysis indicates 10 sensitive attributes requiring optimization and 8 insensitive attributes that should be evaluated. According to Dye's (1992) public policy theory, as cited in Widodo (2021) and Dunn et al. (2018), the effectiveness of policy implementation depends on a comprehensive cycle, including an evidence-based and participatory evaluation process. When DBHCHT is used as a development instrument, not just a fiscal one, an integrative approach across the three dimensions of sustainability (economic, social, and environmental) becomes crucial.

Therefore, for sensitive attributes, program interventions, budget increases, and more intensive technical assistance in each affected sector are needed. For non-sensitive attributes, a comprehensive program evaluation is needed to inform decisions regarding maintenance, improvement, or replacement with a new, more relevant program. This strategy can be supported by multi-stakeholder engagement, such as farmer associations, village administrations, academics, and local leaders through focus group discussions (FGDs). With this strategic approach, the DBHCHT will be able to holistically address challenges of sustainable development and empower farmers as key actors of change.

CONCLUSION

The sustainability of the DBHCHT program and the welfare of tobacco farmers are interconnected. The DBHCHT sustainability index is multidimensionally linked to 51.19% (moderately sustainable). Based on the leverage analysis in the RAP-DBHCHT software, 10 attributes are sensitive and 8 are insensitive across the economic, social, and environmental dimensions. Sensitive attributes require policy strengthening and intensive programs. However, non-sensitive attributes should be prioritized for evaluation and policy reformulation.

The success of the DBHCHT program's sustainability in supporting tobacco farmer welfare depends heavily on the ability of local governments and policymakers to adapt program design to actual needs on the ground, based on a participatory and data-driven approach. Therefore, the government should establish a dedicated DBHCHT team or task force to oversee the planning, monitoring, and evaluating the program periodically. DBHCHT policies also need to be integrated with a sustainable development framework and cross-sectoral synergy. This is to ensure that its impact go beyond economic gains and also strengthens social aspects and environmental sustainability.

Further research should address the cigarette tax along with the DBHCHT program. Both taxes have similar earmarking mechanisms, allowing local governments to allocate funds specifically for certain programs. Furthermore, further research could include other dimensions, such as institutional dimensions, expand the research focus to regions receiving DBHCHT allocations, increase participation from various stakeholders and academics, and use more comprehensive analytical methods to formulate sustainable policy strategies.

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