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Sustainable Management Strategy for Shifting Livelihoods from Charcoal Producer Communities to Coffee Farmers in Jatiarjo Village, Prigen District, Pasuruan Regency

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Abstract: Communities at the foot of Mount Arjuno not only have the potential for coffee cultivation but also cattle rearing. Indirectly, the forest fires that occurred were the cause of the reduction in supporting materials to meet their livestock needs. However, this change brings a number of problems that need to be addressed. The SWOT method is used to understand in depth the internal and external factors that influence job transitions. AHP method is used to measure and assess the relative weight of each factor identified through SWOT analysis. The research results show that the management of the socio-economic impact of changing the behavior of charcoal makers to coffee farmers in Jatiarjo Village shows that this village has great potential to utilize supporting natural resources and rich local knowledge in coffee cultivation. The threat of climate change and fluctuations in coffee market prices must be anticipated with appropriate adaptation strategies. The AHP results show that human resource (HR) capacity development has the highest weight in strategic priorities, followed by socio-economic impacts, policy, market access, and the environment.

Keywords: AHP; Communities development; Strategy SWOT

Introduction

The increasingly growing and developing industrialization has an impact on changes in social and economic behavior patterns in people's lives. The increasingly rapid socio-economic conditions in their development are increasingly narrowing the movement of rural communities, especially forest village communities whose majority earn a living in the agricultural sector (Gauchan & Shrestha, 2021). Especially in social and economic behavior patterns because they do not have agricultural land and rely on other people's land. Land ownership that is not large enough or even does not have land or only has agricultural land management rights from the forestry service, is the basis for the lack of human resources for forest village communities to develop. The increasingly narrow agricultural land indirectly also narrows the opportunities for farmers to increase their income.

Forests are an integral and inseparable part of the lives of the people living around them ((Ritter & Dauksta, 2013; Santika et al., 2017). The interaction between forest village communities and the surrounding natural environment has been going on for centuries across generations within the framework of the balance of the cosmos. Management and utilization of forest resources in each forest village community has its own characteristics (local specific) in accordance with the cultural characteristics of the people living in and around the forest. Forest resources are interpreted as natural resources that have economic, religious, political, social and cultural value. Therefore, the survival of communities and forests is very dependent

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on the availability of forest resources in the surrounding environment (Ujiandri et al., 2023).

Deforestation and forest degradation are responsible for around 10 to 15 percent of greenhouse gas (GHG) emissions caused by human activities. Losing forest cover means eliminating the natural function of an area in absorbing carbon. It should be noted that there are aspects of forest management so that sustainable forests can be realized amidst climate change which are the focus of various sectors.

The dry season which was blamed for the forest fires that occurred in Sumatra and Kalimantan in 2015 caused losses of more than IDR 2 trillion, not including human casualties. In fact, there are issues that arise if this incident was carried out intentionally. This means that it is alleged that the forest was not on fire, but burned. The problem of forest fires is part of forest destruction, whether carried out by the general public for daily needs, such as firewood, or carried out by the industrial world which requires raw materials. Based on data from the East Java Province Central Statistics Agency (BPS) from September 2022 to August 2023, forest fires in the East Java province area reached an area of 569.22 hectares. Pasuruan Regency dominates with an area of 227.4 hectares or 40% of the total area of forest fires in East Java. This shows that there is a need for alternative efforts to overcome forest fires in Pasuruan Regency. Forest fires cause forests to become denuded, so that they are no longer able to accommodate water reserves during the rainy season, this can cause landslides or floods.

Communities at the foot of Mount Arjuno not only have the potential for coffee cultivation but also cattle rearing. Indirectly, the forest fires that occurred were the cause of the reduction in supporting materials to fulfill their professional needs. However, on the other hand, farming communities and livestock breeders can also use charcoal from burned trees in the Mount Arjuno Prigen Pasuruan forest environment. This step can be an alternative for the community in meeting energy needs and reducing wasted commercial waste.

Jatiarjo is a village located at the southeastern tip of Prigen District. Jatiarjo is located at the foot of Mount Arjuno which has beautiful natural panoramas and cool air. Jatiarjo's potential had been discovered by the Dutch colonial government since the era of forced cultivation. The pattern developed since the Dutch colonial era was agribusiness producing export goods organized according to a market plantation pattern. Apart from cultivating vegetables, secondary crops, forest crops and fruit, in Jatiarjo there are also coffee cultivation activities. The large number of coffee plants in Jatiarjo Village also has a conservation function for the slopes of Mount Arjuno as a water catchment area for several areas in Pasuruan Regency, namely Purwosari, Gempol and Pandaan.

There is a forest community as an organ for caring for the potential of forest areas in Jatiarjo Village, namely the Forest Village Community Institute (LMDH). This organ has an important role in developing and assisting coffee farmers in the Jatiarjo area. LMDH Jatiarjo is located in four Jatiarjo Villages, Dayurejo Village, Ledug, and Pecalukan Village. The four villages that are the focus of LMDH are villages that directly border the forests of Mount Arjuno, Mount Welirang and Mount Ringgit (Wibisono et al., 2020). These forests are the main source of livelihood for local communities. The greatest benefit of forest areas is the creation of employment opportunities that increase individual and family incomes (Ullah et al., 2021).

The shift in people's livelihoods from the profession of charcoal producers to coffee farmers is a step taken to overcome the serious problem of forest fires. Changes in work in society have an impact on work ethic ranging from work enthusiasm, openness and social control (Pontoh et al., 2021). However, this change brings a number of problems that need to be addressed. Change is the process of transition or movement from a fixed (static) status to a fixed status that is dynamic, meaning it can adapt to the existing environment, including the social balance of individuals and organizations in order to apply the latest ideas or concepts in achieving a goal (Irwan et al., 2021)vv. Change is also interpreted as the essence of growth that occurs in a person (Hidayat, 2017). Change is an opportunity and chance to move towards a better direction so that each individual must have the ability and be able to anticipate and face the change itself (Efendi et al., 2023). Based on the definition above, it can be concluded that change is a process of transition or movement as an opportunity to move towards a better direction, including social balance in individuals and organizations. Behavior etymologically comes from the words "peri" and "laku". Peri which means how to do, or action and laku which means behavior, actions, and how to carry out (Rahayu & Syam, 2021). Skinner (1938) defines behavior as part of a person's activity. Behavior is what a person does or what a person observes. Behavior is also part of a person's function involved in an action which is a response or reaction to a stimulus (Pakpahan et al., 2021). Behavioral change is a paradigm that a person will change according to what a person learns either from family, friends, best friends or learning from oneself, this self-learning process is what can shape a person, while this formation is very much adjusted to the conditions and needs of the person both in their daily lives and in certain circumstances (Irwan et al., 2017).

Forest fires are an environmental issue that needs to be handled effectively (Schultz et al., 2019). Apart from that, people need to acquire new skills and knowledge related to coffee cultivation, so training and education are important aspects. Questions about economic factors also arise, such as whether this new profession can provide income that is at least equal to or better than charcoal production. The social impact and sustainability of agricultural practices must also be taken into account. Government support and access to resources as well as the involvement of all stakeholders are key in carrying out this transition. Through strong dialogue and cooperation, it is hoped that this transition can be successful in overcoming forest fires without causing new problems.

Several alternative methods and approaches have been used by experts in case research that are relevant to the topic of this research. One of them is a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats). In this research, the SWOT method is used to understand in depth the internal and external factors that influence the job transition from charcoal producers to coffee farmers. By detailing the strengths and weaknesses as well as the opportunities and threats that may be faced, this research can provide a holistic view of the socio-economic conditions in the community. Next, the Analytical Hierarchy Process (AHP) method is used to measure and assess the relative weight of each factor identified through SWOT analysis. This allows research to identify the factors that are most significant and contribute most to the economic impact of shifting livelihoods. Thus, this combined SWOT-AHP approach provides a strong basis for effective decision making in managing employment transitions and their impact on community economies.

This research is important to help solve the income problems of the community at the research location as well as to solve the forest fire problem on Mount Arjuno in a sustainable manner and provide recommendations for priority handling strategies that are appropriate to the conditions on Mount Arjuno.

Method

The application of mixed methods used in this research is a sequence of qualitative and quantitative analysis, which aims to identify concept components through quantitative data analysis and then collect qualitative data in order to expand the available information and obtain a more complete analysis (Sugiyono, 2016). Qualitative methods are used to obtain data through observation, interviews and using questionnaires (Ningrum, 2020). Meanwhile, quantitative methods are used to measure research data in the form of weighting in the SWOT analysis process. SWOT analysis is carried out through a series of calculations known as IFAS (internal factor analysis strategy), EFAS (external factor analysis strategy) calculations taking into account the weight and rating values. EFAS and IFAS factors can be obtained using driving factors and inhibiting factors (Harahap, 2023). Furthermore, the IFAS and EFAS measurement results in the SWOT analysis are used as material in determining priority strategy recommendations using the Analytical Hierarchy Process (AHP) method.

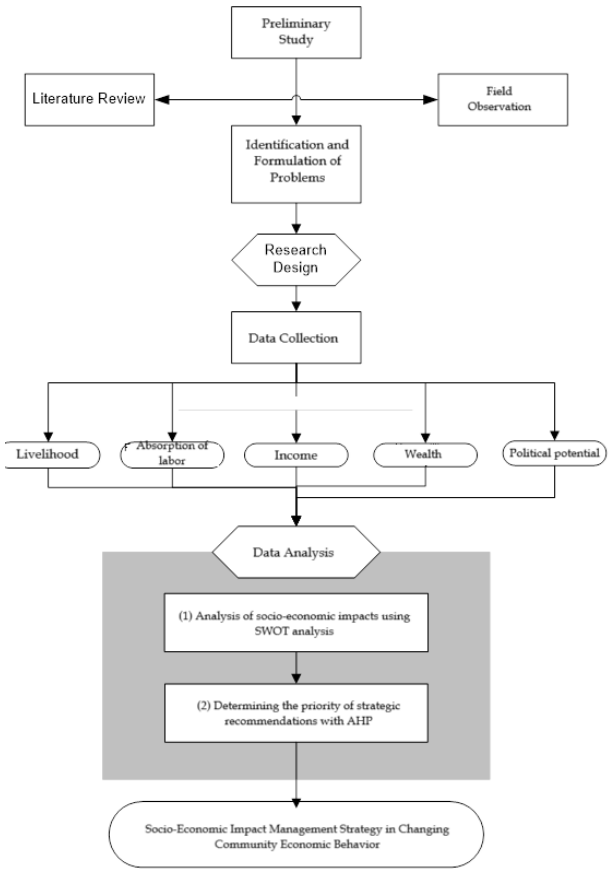

Figure 1. Research Flow

Results And Discussion

As globalization and climate change increasingly affect the agricultural sector, a major challenge for farming communities is navigating the transition from old practices to more sustainable models (Siles et al., 2022). In the context of Pasuruan Regency, especially in Jatiarjo Village, Prigen District, the transition from charcoal production to coffee cultivation is a significant highlight. This study aims to investigate strategies for managing the socio-economic impacts of this transition, focusing on how new farming practices can provide better economic benefits while maintaining environmental sustainability. Such transitions pose

complex challenges, including natural resource management, increasing farmer incomes, and environmental sustainability (Diro et al., 2022). Therefore, this study adopts a holistic approach using the SWOT (Strengths, Weaknesses, Opportunities, Threats) and AHP (Analytical Hierarchy Process) methods to analyze the socio-economic impacts of this transition.

From the results of the research carried out, we began to see and understand the current Socio-Economic conditions. The IFAS and EFAS test results are used to evaluate the main strengths, weaknesses, opportunities and threats in the functionality area and evaluate the relationship between these areas. Several important internal and external factors (IFAS and EFAS) are as follows Table 1.

Table 1. Internal and External Factors

Internal factors	External factors
Strengths	Opportunities
a) Supporting natural resources	a) Global market for sustainable products
b) Heritage of local traditions and knowledge	b) Training support and resources
c) Conservation and infrastructure program	c) Development of conservation educational tourism
d) Strategic partnership and funding with csr	d) Ecotourism and environmental education
e) Increasing land cover and biodiversity	e) Access to premium marketplace
f) Development of conservation infrastructure	f) Economic diversification through ecotourism
g) Technical and educational support	g) Premium market penetration
h) Community empowerment	h) Potential for ecotourism development
	i) Wider market access
	j) Ecotourism infrastructure and opportunities
	k) Environmental awareness and education
	l) Agroforestry product development
	m) Collaboration and community empowerment
Weakness	Threats
a) Lack of processing and distribution infrastructure	a) Climate change and extreme weather patterns
b) Limited access to modern agricultural technology	b) Coffee market price fluctuations
c) Basic infrastructure limitations	c) Unexpected natural disasters
d) Limited market access	d) Social resistance to change
e) Dependence on a single source of funds	e) Legal uncertainty and government policy
f) Limited processing and marketing infrastructure	f) Pandemic and global economic uncertainty
g) Dependence on external support	g) Limited access to technology and information
h) Lack of infrastructure to support ecotourism	h) Degradation of the environment and natural resources
i) Infrastructure and technology limitations	i) Competition with other commodities

Previous research results show that internal factors of livelihood changes are low income, as well as the heavy burden and risk of loggers' work. External factors include the thinning of forest areas and the existence of laws and regulations that limit timber harvesting activities. Internal and external factors are the causes of livelihood changes (Sulistia et al., 2023). Supporting Natural Resources: Coffee farmers in the Sapen forest area, Ledug Village, and its surroundings enjoy natural conditions that are very supportive for coffee cultivation, including fertile soil and a suitable climate, which allows for the growth of high-quality coffee. Supporting environmental resources need to be supported by the desire of coffee farmers to protect nature, knowledge and concern for the next generation (Makhali & Widjanarko, 2023). Local Tradition and Knowledge: Many coffee farmers have hereditary knowledge about coffee cultivation, which has been refined over generations. This includes seed selection, planting techniques, and effective land management. However, in the tradition of coffee farmers in Indonesia, there are several shortcomings in its implementation such as low productivity and community knowledge about climate, inadequate infrastructure and transportation, and low and unstable selling prices. This needs to be resolved to improve the welfare of coffee farmers in Indonesia (Darma et al., 2021).

Conservation and Infrastructure Programs: Conservation initiatives that support infrastructure development such as endemic plant laboratories and local bird cages, as well as plant procurement, improving coffee quality and sustainable practices. The construction of toilets and reservoirs also supports ecotourism and water conservation. The importance of conservation in the research area is to ensure that endemic plants and animals remain diverse while improving the welfare of coffee producing communities (Méndez, 2008). Strategic Partnership and Funding: Collaboration with PT. Tirta Investama Pandaan provides financial and logistical resources that enable the implementation of effective conservation and community empowerment programs. This includes

strong financial and managerial support for conservation activities and capacity building for coffee farmers. The collaborative partnerships implemented allow communities to demonstrate positive contributions to forest management and improve their livelihoods, thereby improving the economy on a regional scale (Gunawan et al., 2023). Improvement of Land Cover and Biodiversity: Planting activities of 30,000 trees from 40 types of plants improves soil conditions and water sources, improves ecology, and supports the sustainability of coffee farming. The importance of maintaining plant species diversity is to maintain soil erosion and increase soil fertility, produce food, traditional medicines from plants and materials for local traditional rituals (Iskandar et al., 2019). Technical Support and Education: Conservation programs that receive technical support from PT. Tirta Investama provide training and education for coffee farmers, improving their skills and knowledge in sustainable coffee farming practices. The training that can be provided for coffee farmers is the application of the agroforestry system, because based on research, there is an increase in income from implementing this system compared to not implementing the agroforestry system (Ismono et al., 2022). Community Empowerment: Implementation of activities such as planting 10 ha of biodiversity plants and procuring trees as well as community empowerment activities support ecological sustainability and improve the welfare of the surrounding community. Empowering coffee farming communities is very important to do because empowering communities can increase their sense of responsibility towards the environment (Kasmita et al., 2021).

Transportation plays an important role in coffee farmer production, the wrong transportation strategy causes high transportation costs so that infrastructure improvements are needed (Sundana & Raharja, 2022). Limited Access to Modern Agricultural Technology: Many coffee farmers do not have adequate access to modern agricultural technology that can increase their productivity and efficiency, despite having hereditary knowledge. The application of agroforestry technology actually provides proven benefits for farmers, but many farmers are unwilling to apply the technology due to differences in priorities (Wienhold & Goulao, 2023). Dependence on External Funding: This development program is highly dependent on financial support from PT. Tirta Investama, which may not be sustainable in the long term without diversifying funding sources. Assistance from other parties such as government support, support from coffee farmer community leaders and a commitment to the sustainability of coffee farming play a major role in the sustainability of coffee farming (Martiningsih et al., 2023).

Table 2. IFAS Table (Strengths and Weaknesses)

Strength	Weight (B)	Ratings (R)	Score (B X R)
a) Supporting natural resources	0.08	6	0.48
b) Heritage of local traditions and knowledge	0.08	8	0.64
c) Conservation and infrastructure program	0.07	5	0.35
d) Strategic partnership and funding with csr	0.09	8	0.72
e) Increasing land cover and biodiversity	0.07	6	0.42
f) Development of conservation infrastructure	0.07	4	0.28
g) Technical and educational support	0.07	6	0.42
h) Community empowerment	0.08	7	0.56
i) Sub total strength	0.61		3.87
j) Weakness			
k) Lack of processing and distribution infrastructure	0.06	5	0.30
l) Limited access to modern agricultural technology	0.06	4	0.24
m) Basic infrastructure limitations	0.04	5	0.20
n) Limited market access	0.06	6	0.36
o) Dependence on a single source of funds	0.05	6	0.30
p) Limited processing and marketing infrastructure	0.04	4	0.16
q) Dependence on external support	0.03	4	0.12
r) Lack of infrastructure to support ecotourism	0.06	5	0.30
s) Infrastructure and technology limitations	0.04	5	0.20
t) Sub total weaknesses	0.39		2.18
u) Total strengths and weaknesses	1.00		6.05

Based on the Table 3, the total IFAS score is 6.05 and the total EFAS score is 7.14. This shows that Jatiarjo Village is in a fairly strong position internally and has great external opportunities. These conditions provide a solid basis for villages to develop effective strategies in maximizing the benefits of transforming community

behavior, from charcoal makers to coffee farmers. Internal strengths such as abundant natural resources and traditional knowledge in coffee cultivation, combined with external opportunities such as increasing market demand for sustainable coffee and support from government programs, can be key drivers in achieving success.

Table 3. EFAS Table (Opportunities and Threats)

Opportunity	Weight (B)	Ratings (R)	Score (B X R)
a) Global market for sustainable products	0.06	6	0.36
b) Training support and resources	0.07	8	0.56
c) Development of conservation educational tourism	0.05	5	0.25
d) Ecotourism and environmental education	0.05	8	0.40
e) Access to premium marketplace	0.04	6	0.24
f) Economic diversification through ecotourism	0.06	4	0.24
g) Premium market penetration	0.05	6	0.30
h) Potential for ecotourism development	0.05	7	0.35
i) Wider market access	0.05	6	0.30
j) Ecotourism infrastructure and opportunities	0.06	8	0.48
k) Environmental awareness and education	0.05	5	0.25
l) Agroforestry product development	0.06	8	0.48
m) Collaboration and community empowerment	0.06	7	0.42
Sub total odds	0.71		4.93
Threat			
a) Climate change and extreme weather patterns	0.04	5	0.30
b) Coffee market price fluctuations	0.03	4	0.24
c) Unexpected natural disasters	0.04	5	0.20
d) Social resistance to change	0.05	6	0.36
e) Legal uncertainty and government policy	0.04	6	0.30
f) Pandemic and global economic uncertainty	0.03	4	0.12
g) Limited access to technology and information	0.04	6	0.24
h) Degradation of the environment and natural resources	0.03	5	0.25
i) Competition with other commodities	0.04	5	0.20
Sub total threat	0.29		2.21
Total opportunities and threats	1.00		7.14

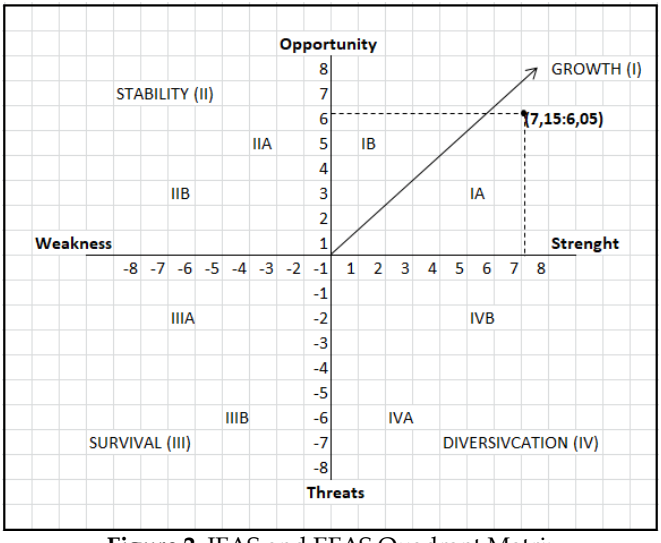

Figure 2. IFAS and EFAS Quadrant Matrix

Based on the picture above, it can be seen that the socio-economic impact of the transition of charcoal producers to coffee farmers in Jatiarjo Village is in a position between the strength and opportunity axes, and is located in the IA quadrant. This means that the village has significant internal strengths and large external opportunities to capitalize on. This position shows that Jatiarjo Village is in a favorable situation to develop an aggressive and proactive growth strategy. A proactive strategy is a strategy that focuses on existing strengths (Asrikamongga et al., 2024).

It is recommended to carry out expansion and development strategies that focus on utilizing existing strengths, such as supporting natural resources, strong local knowledge, and conservation infrastructure support. In addition, villages can take advantage of global market opportunities for sustainable coffee and support programs from governments and non-governmental organizations. This strategy could include increasing production capacity through technical training, investing in modern agricultural technology, and increasing access to broader markets. In this way, Jatiarjo Village can significantly improve the welfare of its people through increased income and better economic stability. Training for technology adaptation such as land management, crop production and post-harvest must be applicable in the daily lives of farmers

to increase their productivity (Sarirahayu & Aprianingsih, 2018).

Analytical Hierarchy Process (AHP)

AHP will help identify the most priority and effective strategies to implement. For example, strategies to increase production capacity and market access may be valued more highly than other strategies, such as product diversification or technological improvements. By using AHP, strategic decisions can be taken more objectively and measurably, ensuring that Jatiarjo Village can utilize existing strengths and opportunities optimally, overcome weaknesses, and face threats with the right strategy. The final results of this AHP analysis will provide a clear road map for achieving sustainable socio-economic goals and improving the welfare of village communities. The criteria used in this AHP analysis are as follows:

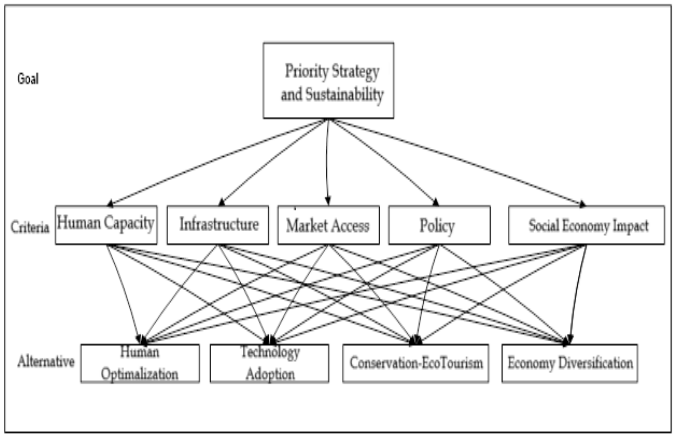

Figure 3. Hierarchical Structure of Priority and Sustainable Strategies

Apart from compiling a decision hierarchy, before calculating the final weights, the initial weights for each element must be determined. Based on data on land productivity in Jatiarjo Village, weights are generated for each criterion so that the weight value of each alternative can be determined. The weights of the natural resource optimization criteria can be seen in Table 5.5. Based on Table 4, the initial weight of each alternative can be determined by adjusting the specifications.

Table 4. Initial Weights for SDA Optimization

Natural resource optimization (Land Productivity/Ha)	Weight	Information
> 500	5	Very high
400 – 500	4	High enough
200 – 400	3	Currently
100 – 200	2	Low
1 – 100	1	Very low

Administratively, Jatiarjo Village has an area of 1,170,012 hectares with total land productivity: Area Area (-) Residential Land (-) Public Facilities. The area of yards is 139 hectares, fields/fields are 499.9 hectares, forests and other land are 1,169.37 hectares, and public facilities are 0.375 hectares. The recorded critical land in the village is 531 hectares, the fire area is 700 hectares and the author's activity area is 600 hectares, the boundaries of the Jatiarjo Village area. Next, the Interest criteria, their initial weights, can be seen in Table 5.6. By knowing the weight of the Interest criteria, the initial weight of the alternative to Interest can be determined.

Table 5. Initial Weight of Technology Adoption

Technology Adoption	Weight	Information
According to major	5	Very good
Not Appropriate Major	3	Good

Furthermore, regarding the conservation-ecotourism criteria, the initial weights can be seen in Table 5.7. By knowing the weight of the conservation-ecotourism criteria, the initial weight of alternatives to conservation-ecotourism can be determined.

Table 6. Initial Weight of Conservation-Ecotourism

Conservation-Ecotourism (Number of visitors)	Weight	Information
> 1,000	5	A huge amount
500-1,000	4	Lots
200-500	3	Currently
100-200	2	A little
1-100	1	The least

Lastly, the Work Load criteria, the initial weights can be seen in Table 7. By knowing the weights of the economic diversification criteria, the initial weights of alternatives for economic diversification can be determined.

Table 7. Initial Weight of Economic Diversification

Economic Diversification	Weight	Information
7-10	5	Lots
4-7	3	Currently
1-4	1	A little

In assessing the management of the economic impact of changes in the behavior of charcoal makers to coffee farmers, criteria were weighted based on the results of interviews. After that, the weights are changed and entered into the form of a pairwise comparison matrix to determine the scale for each criterion, and can be seen in the following table.

Table 8. Pair Criteria Matrix

	Human Capacity	Infrastructure	Market Access	Environment	Policy	Socio Economy
Human Capacity	1	5	5	5	5	3
Infrastructure	0,2	1	1	1	0,33	0,33
Market Access	0,2	1	1	1	0,33	0,33
Environment	0,2	1	1	1	0,33	0,33
Policy	0,33	3	3	1	1	1
Socio Economy	0,33	3	5	3	1	1
Total	2,26	14	16	12	8	6

Then the criteria weights (priority vector) are calculated. Each value in the matrix column is a pairwise comparison, by dividing each value in the matrix column by the sum of the corresponding columns. To make calculations easier, all numbers are replaced with decimal fractions. Then the average of each row of the matrix is calculated. The steps for calculating the priority vector criteria can be seen in Table 9.

Table 9. Normalized Criteria Paired Matrix

	Human Capacity	Infrastructure	Market Access	Environment	Policy	Socio Economy	*Priority Vector*
Human Capacity	0,44	0,35	0,31	0,41	0,62	0,5	0,44
Infrastructure	0,08	0,07	0,06	0,08	0,04	0,05	0,06
Market Access	0,08	0,07	0,06	0,08	0,04	0,05	0,06
Environment	0,08	0,07	0,06	0,08	0,04	0,05	0,06
Policy	0,14	0,21	0,18	0,08	0,125	0,16	0,15
Socio Economy	0,14	0,21	0,31	0,25	0,125	0,16	0,20

After getting the results, the next step is to calculate the eigenvector (λ) value which will be used in calculating the consistency index (CI). The eigenvector (λ) itself is the maximum eigenvalue of the comparison matrix by adding up the results of the multiplication between the cells in the Total row of Table 8. with the priority vector in the Result column of Table 9. with the eigenvector calculation being as follows:

After getting the results, the next step is to calculate the eigenvector (λ) value which will be used in calculating the consistency index (CI). The eigenvector (λ) itself is the maximum eigenvalue of the comparison matrix by adding up the results of the multiplication between the cells in the Total row of Table 8. with the priority vector in the Result column of Table 9. with the eigenvector calculation being as follows:

λ= (2.2667×0.442081) + (14×0.06712)+ (16×0.06712)
+ (12×0.06712)+ (8×0.153974)+ (6×0.202585)
λ= (1,002065) + (0.93968) + (1.07392) + (0.80544) + (1.231792)
+ (1,21551)
λ= 6.268407

After getting the λ value, you can then calculate the consistency index or CI using the following calculations:

$$CI = \frac{6,268407-6}{6-1} \quad (1)$$

Resulting in CI = 0.0536814. Because the CI value ≠ 0, the tolerance limit for inconsistency or CR must be calculated, where the RI value is taken from the Random Consistency Index table with n = 6 which has a value of 1.24. The calculations are as follows:

$$CR = \frac{0,0536814}{1,24} \quad (2)$$

Produces CR=0.043291 and is considered consistent because the CR value is smaller than 10% or 0.1.

After carrying out a comparison matrix on the criteria, the result is the weight for each criterion, namely the priority vector in Table 9. It shows that HR capacity is the criterion with the highest weight, followed by socio-economic impact, policy, market access and the environment.

The recommendations for priority and sustainable strategies in managing the economic impact of changing the behavior of charcoal makers to coffee farmers are as follows. First, developing human resource (HR) capacity is a top priority by providing ongoing training programs that focus on coffee cultivation techniques, farming management and marketing skills, as well as establishing a consultation center to provide technical and managerial guidance. Education provided to coffee farmers can increase their knowledge in managing coffee land more wisely both economically and as a soil protector (Irmeilyana & Maiyanti, 2022). Second, managing socio-economic impacts through economic diversification to create additional sources of income and increase access to health services, education and basic infrastructure. One of the things that can be done to increase income and revenue for coffee farmers is to add the location as a tourism sector (Hermawati et al., 2023). Factors that influence the amount of income of coffee farmers are coffee production, selling prices and coffee farming costs (Yoansyah et al., 2020). Third, increasing supporting policies by advocating government policies that support coffee cultivation, including tax incentives and subsidies, as well as developing strategic partnerships with various institutions. The cooperation required by coffee farmers and which can usually be supplied by partners or other institutions is transportation, assistance and product markets. Fourth, market access is improved by strengthening the supply chain and a strong marketing campaign to promote Jatiarjo coffee as a premium product. Promotions that can be done consist of advertising, personal selling, sales promotion and publication. All of these promotions are expected to increase the income of coffee farmers (Dewi, 2024). Fifth, environmental preservation through sustainable agricultural practices and conservation of natural

resources, such as agroforestry and the use of organic fertilizer. Research shows that agroforestry practices can improve soil quality and increase plant diversity in the research location (Pribadi et al., 2023). By implementing these strategies, Jatiarjo Village can manage the socio-economic impacts of this transition effectively, ensure community welfare, and create economic and environmental sustainability.

Conclusion

Management of the socio-economic impact of changes in the behavior of charcoal makers to coffee farmers in Jatiarjo Village shows that this village has great potential to utilize supporting natural resources and rich local knowledge in coffee cultivation. Human resource (HR) capacity development has the highest weight in strategic priorities, followed by socio-economic, policy, market access and environmental impacts. This highlights the importance of investment in education and training to improve coffee farmer skills, as well as the need for strong supporting policies and better market access for village coffee products

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The authors declare no conflict of interest.

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