PAKAR Pendidikan

Non-formal Education Development Strategy in Agroforestry-based Forest Product Management through Honey Bee School Program in Mentawai Islands

Strategi Pengembangan Pendidikan Nonformal dalam Pengelolaan Hasil Hutan Berbasis Agroforestri melalui Program Sekolah Lebah Madu di Kepulauan Mentawai

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Abstract

Forest areas have high ecological, economic and social value. The Mentawai people use forest honey products in traditional rituals and traditional healing practices by Sikerei (medicine experts). However, people collect forest honey without implementing a sustainable concept, namely forest honey is harvested by cutting and burning all beehives, this causes the entire bee colony to die. This problem is rooted in low levels of education and causes a lack of knowledge which influences people's actions in treating forests. The aim of this research is to increase community knowledge in sustainable forest honey collection systems, produce productive communities that care about forest sustainability through the agroforestry-based non-formal Honey Bee School education program. The program implementation applies the principles of apiculture-based agroforestry which integrates forests and trees with honey bees. The research method used is a mixed methods method with an exploratory sequential research design. The type of data used is primary data in the form of interview results and pretest and posttest measurements with a sample size of 25 people, as well as secondary data from literature studies. The research was conducted from July to November 2023. Data analysis was carried out using The House Model, Paired Sample T-test statistical tests, and the Hexa Helix Stakeholder Model. The research results show that the program developed can increase the target's knowledge and skills significantly. Apart from that, this program improves respondents' attitudes and behavior in managing forest products in a sustainable and agroforestry-based direction, marked by the establishment of honey bee cultivation gardens which are integrated with the planting of calliandra seeds as a source of bee food to support agroforestry.

Keywords: Agroforestry, Apiculture, Forest, Honey Bee.

Abstrak

Kawasan hutan memiliki nilai ekologis, ekonomi, dan sosial yang tinggi. Masyarakat Mentawai memanfaatkan hasil hutan madu dalam ritual-ritual adat dan praktek pengobatan tradisional oleh para Sikerei (ahli pengobatan). Namun, masyarakat mengumpulkan madu hutan dengan tidak menerapkan konsep berkelanjutan yaitu madu hutan dipanen dengan memotong dan membakar seluruh sarang lebah, hal ini menyebabkan seluruh koloni lebah mati. Permasalahan ini berakar dari tingkat pendidikan yang rendah dan menyebabkan *lack of knowledge* yang memengaruhi tindakan masyarakat memperlakukan hutan. Tujuan dari penelitian ini adalah meningkatkan pengetahuan masyarakat dalam sistem pengumpulan madu hutan secara lestari, menghasilkan masyarakat yang produktif dan peduli terhadap kelestarian hutan melalui program pendidikan nonformal Sekolah Lebah Madu berbasis agroforestri. Implementasi program menerapkan prinsip agroforestri berbasis apikultur yang mengintegrasikan antara hutan dan pohon dengan lebah madu. Metode penelitian yang digunakan adalah metode *mixed methods* dengan desain penelitian *the exploratory sequential design*. Jenis data yang digunakan adalah data primer berupa hasil wawancara dan pengukuran *pretest* dan *posttest* dengan jumlah sampel 25 orang, serta data sekunder dari studi literatur. Penelitian dilakukan pada bulan Juli hingga November 2023. Analisis data dengan *The House Model*, uji statistik *Paired Sample T-test*, dan *Hexa Helix Stakeholder Model*. Hasil penelitian menunjukkan program yang dikembangkan dapat meningkatan pengetahuan dan keterampilan sasaran secara signifikan. Selain itu, program ini meningkatkan sikap dan perilaku responden dalam pengelolaan hasil hutan ke arah lestari dan berbasis agroforestri ditandai dengan terbentuknya kebun budidaya lebah madu yang diintegrasikan penanaman kaliandra sebagai sumber pakan lebah untuk agroforestri.

Kata Kunci: Agroforestri, Apikultur, Hutan, Lebah Madu.

1. Introduction

Forests have a very important role in human survival. Resources in forest areas are able to drive local and national economies (Kemenko Perekonomian, 2023). It is estimated that 32,447,851 people are living in forest areas, around 21% of whom are categorized as poor (Badan Pusat Statistik, 2019). Based on the results of the LPEM UI study (2020), people living around forest areas are one of the largest groups of poor people in Indonesia. In terms of education, only 9.36% of the population around the forest area are illiterate (Badan Pusat Statistik, 2019). Nevertheless, the quality of human resources living around forest areas is still quite low. In 2020, only around 40.11% of the population completed elementary school. In fact, the population who did not graduate from elementary school reached 22.5% (Badan Pusat Statistik, 2020). In fact, educational factors greatly influence people's actions in treating forests (Ardiansyah, 2019). Surati (2020) added that low education levels lead to a need for more understanding and information in conducting forest management.

The 2020-2024 National Medium-Term Development Plan (RPJMN) emphasizes the importance of developing policies related to forest management that must be aligned with improving community welfare. This is related to various cross-sectoral problems faced by communities around forest areas. Danhas *et al.* (2020) explained that welfare improvement and forest conservation are aspects that must be carried out simultaneously because the two often collide. Eridiana (2018) argues that the quality of education plays a very important role in sustainable forest conservation and management.

Mentawai Islands Regency is one of the forest-dominated areas reaching 491,917 hectares and is the only regency in West Sumatra that is included in underdeveloped areas in 2020-2024 (Perpres No. 63 Tahun 2020). The poor population in the Mentawai Islands reached 14.84% or 14,310 people (Badan Pusat Statistik, 2022). The education level of the community is relatively low, with an indicator of 34% of the community not completing elementary school and a literacy development index of 11.8% (Kearsipan Nasional, 2021). Mentawai people utilize forest products in traditional rituals, one of which is forest honey. The Sikerei (medicine experts) utilize honey as one of the ingredients in traditional medicine practices. Muara Sikabaluan Village is one of the villages in Mentawai Islands Regency that has a large forest area of 3,272 hectares (Badan Pusat Statistik, 2022). The honey in this village is good quality because the bee food sources available in the forest are very diverse, with varied types of flora..

However, the community collecting wild honey does not apply the concept of sustainability. Based on the results of observations on February 3, 2023, the community's way of working is still very traditional; namely, honey is harvested directly by cutting the entire beehive. This harvesting system is very unfavourable, as the bee colony will tend to go elsewhere after harvesting and hinder the development of the colony population because all the bee chicks will die (Suheryadi *et al.*, 2021). In fact, based on the results of an interview with one of the residents of Muara Sikabaluan Village on February 3, 2023, there are still many people who look for forest honey by burning the entire beehive; this causes the entire bee colony to die. This harvesting practice is not only carried out by the people of Muara Sikabaluan Village but also by people on Siberut Island. If this continues, it will threaten the bee population in the Mentawai Islands. The destruction of bee colonies is not only a concern for honey seekers. The most important thing is not only honey but the pollination of forest plants, agriculture, and food supply. Bees serve as the main pollinating insects in nature (Fadiah, 2023). This problem is deeply rooted in the relatively low level of education that leads to a *lack of knowledge* that influences people's actions in treating the forest. The cause is the uneven educational facilities in Mentawai (Hia, 2018). In addition,

data from the National Archives (2021) shows that the literacy development index in the Mentawai Islands is only 11.8%, and the reading level is only about 26%.

These problems require a strategy to create integrated learning to improve community knowledge of sustainable forest honey collection systems. The solution to these problems is through the Honey Bee School program as a non-formal education program to increase community knowledge in sustainable forest honey collection systems, producing forest communities that are economically productive and care about the sustainability of the forest environment. The Honey Bee School program is implemented with a holistic approach applying the principles of apiculture-based agroforestry by Mahendra (2009) and the andragogy (*adult learning*) model by Daryanto (2017). The principles in agroforestry are environmental, economic and social balance. The implementation of this program is carried out through three classes, namely: (1) Agroforestry and Beekeeping Class, (2) Honey Bee Cultivation Class, and (3) Sustainable Forest Honey Harvesting Class.

2. Literature Review

Based on the results of the LPEM UI study (2020), people living around forest areas are one of the largest groups of poor people in Indonesia. This condition tends to be chronic due to the difficulty of access, as well as limited infrastructure, especially education (Murti, 2018). As a result, it is difficult for poor communities in forest areas to get out of poverty, so changes in welfare conditions are very difficult to make (Dewi, 2018). In terms of education, only 9.36% of the population around the forest area are illiterate (Badan Pusat Statistik, 2019). Nevertheless, the quality of human resources living around the forest area is still quite low. In 2019, only around 40.11% of the population completed primary school. In fact, the population who did not graduate from elementary school reached 22.5% (Badan Pusat Statistik, 2020). In fact, according to Ardiansyah (2019), educational factors greatly influence people's behaviour and actions in treating forests. Surati (2020) added that low education levels lead to a lack of understanding and information in conducting forest management.

The 2020-2024 National Medium-Term Development Plan (RPJMN) emphasizes the importance of developing policies related to forest management that must be in line with improving community welfare. This is related to various cross-sectoral issues or problems faced by communities around forest areas. Danhas *et al*. (2020) explained that welfare improvement and forest conservation are aspects that must be carried out simultaneously because the two often collide. The level of interest of communities around forests that are highly dependent on forest products is an obstacle to preserving forests (Purwatiningsih, 2022). Eridiana (2018) argues that the quality of education plays an important role in sustainable forest conservation and management.

The Indonesian government has prepared a program that ensures that poverty alleviation of communities around forest areas can be carried out with a model that creates harmony between welfare improvement and environmental conservation through the Social Forestry Program (Ministry of Environment and Forestry, 2021). According to the Regulation of the Minister of Environment and Forestry Number 9 of 2021, Social Forestry is a sustainable forest management system implemented in state forest areas or customary forests/customary forests implemented by local communities or customary law communities as the main actors to improve welfare, environmental balance, and socio-cultural dynamics. The Social Forestry approach aims to improve the empowerment and socio-economic aspects of local communities in sustainable forest management by providing licenses to manage forests (Forclimate, 2018).

In social forestry, the agroforestry system is the most appropriate model (Forestdigest, 2019). ICRAF (*International Center for Research in Agroforestry*) defines agroforestry as a land-use system that combines woody plants with non-woody plants, also involving livestock, so as to create ecological and economic interactions between forestry agriculture and livestock. One of the non-wood-based agroforestry practices is apiculture. Apiculture is a cultivation pattern that functions the planted trees as a source of bee feed (Ratag *et al*., 2021). An important key to honey bee-based agroforestry management is the availability of sustainable feed.

Based on the literature review, it can be concluded that community knowledge and skills in sustainable forest product management are needed to maintain forest ecosystems while creating community welfare around forest areas in Indonesia. Therefore, this research is a solution to overcoming community problems related to sustainable forest product management. This research is important to do considering that there are still many people who have low education and a *lack of knowledge* that affects people's actions in treating forests. The alternative solution that researchers offer is to design a community empowerment program model based on non-formal education to increase community capabilities related to sustainable forest product management.

3. Research Methods

The research method used is *mixed methods*, which is a combination of quantitative and qualitative approaches used to obtain comprehensive, valid, reliable, and objective data (Creswell, 2016). *The* research design uses the *exploratory sequential design,* namely data collection in stages, starting with qualitative data collection and then continuing with quantitative data collection.

This research was conducted through three stages, namely the first stage, designing a non-formal education program development model for the Honey Bee School with *The House Model* through a deductive qualitative descriptive approach using relevant theories and concepts regarding forestry, sustainable agriculture, non-formal education, and community empowerment that are assumed to apply to program development. The results of the first stage were implemented on the target respondents, then measured before and after program delivery using *pretest* and *posttest*, then analyzed through *Statistical Product and Service Solutions* (SPSS) *software* using the *Shapiro-Wilk* normality test method and *Paired Sample T-tests* statistical test. The final stage is to provide some managerial implications in maintaining program sustainability through the *Hexa Helix Stakeholder Model*. The framework is outlined in Figure 1.
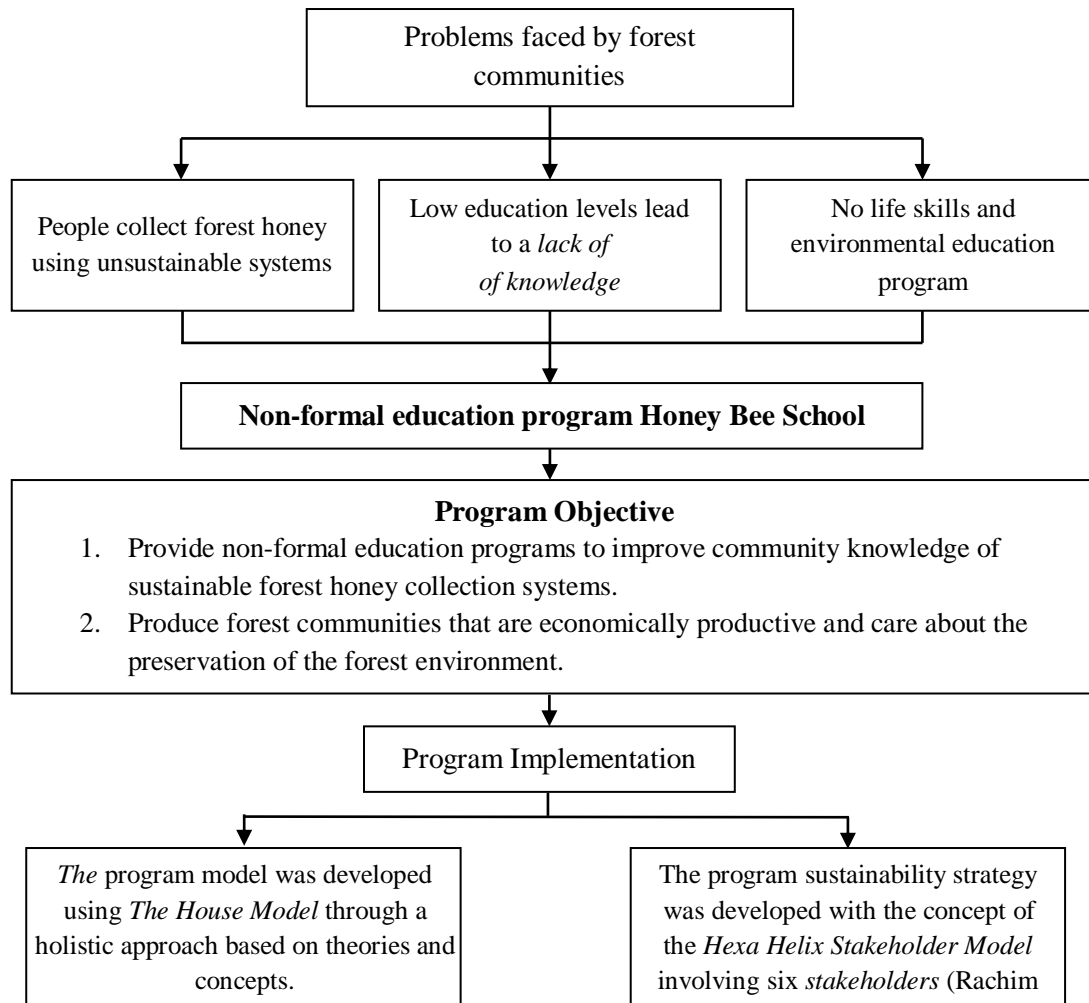
Figure 1. Research Framework

This research was conducted in Muara Sikabaluan Village from July to November 2023. The population used in this study were all forest honey bee seekers in Muara Sikabaluan Village, totalling 25 people. The sampling method in this study uses *nonprobability sampling* with a saturated *sampling* technique. According to Sugiyono (2016), saturated *sampling* is a sampling technique in which all members of the population are used as samples. Thus, 25 people were obtained who became research respondents. The data analysis method used in this study is described as follows:

3.1 *The House Model*

The House Model is a concept built around describing an organization's efforts to turn dreams into action. Horovitz and Ohlsson-Corboz (2007) explain that the main thing that an organization really needs is an inspirational vision of the future of the organization, which is a dream with a time limit. This dream with a time limit requires pillars that can support its existence and achievement. *The House Model* is depicted in Figure 2.
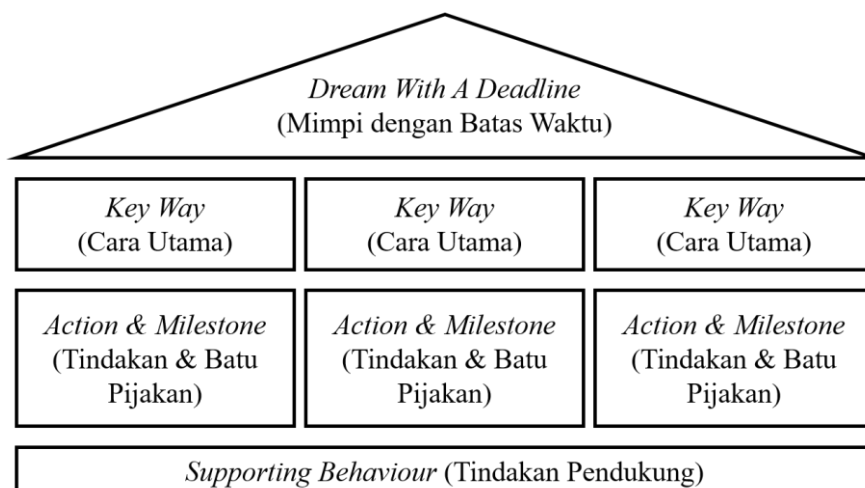
Figure 2. *The House Model* Framework

3.2 *Paired Sample T-test* Statistical Test

The level of knowledge was based on the *pretest* and *posttest* scores of 25 target respondents based on four variables: basic concepts of agroforestry, honey bee biogeography, honey bee cultivation, and sustainable forest honey harvesting. The data obtained in the form of scores from a questionnaire with a 5-level Likert scale used for evaluation ranged from 1 (very unaware) to 5 (very aware) with the following scale:

Table 1. Likert Scale

Score Range	Criteria/Category
1	Very Unclear
2	Not Understood
3	Understood enough
4	Understand
5	Very well understood

The data obtained were averaged and analyzed using the *Shapiro-Wilk* normality test method to determine the level of knowledge of target respondents before and after program implementation. The *Shapiro-Wilk normality* test was used because the sample in this study was less than 50 samples. The normality test uses the decision-making basis, according to Santoso (2014). The decision of the normality test results is described as follows:

1) If the value (Sig.) > 0.05, then the *pretest* and *posttest* data are normally distributed.
2) If the value (Sig.) <0.05, then the *pretest* and *posttest* data are not normally distributed.

Evaluation of the effectiveness of program implementation was carried out with the *Paired Sample T-test* statistical test. The *Paired Sample T-test* statistical test was used because the data used in the normality test analysis was normally distributed. *Paired Sample T-test* is a parametric test to assess the effectiveness of treatment, characterized by differences in the average before and average after treatment. The decision of the statistical test results is as follows:

1) If the significant value > 0.05, then Ho is accepted, or Ha is rejected (the difference in performance is not significant).
2) If the significant value <0.05, then Ho is rejected, or Ha is accepted (significant performance difference).

'Ha' is the hypothesis proposed in the study, namely "There is an increase in knowledge after being given a series of education from the non-formal education program of the Honey Bee School".

3.3   *Hexa Helix Stakeholder Model*

The Hexa Helix Stakeholder Model is a concept of *stakeholder* collaboration to commit to achieving the same goal. Rachim *et al*. (2020) argue that six *stakeholders are* needed to play an important role in achieving a program goal, namely the government, universities, community organizations, private/industry, mass media, and affected community groups. Affected community groups should not be placed in a position as objects but rather as subjects that must be involved as *stakeholders* in achieving a program goal. The *Hexa Helix Stakeholder Model is* depicted in Figure 3.
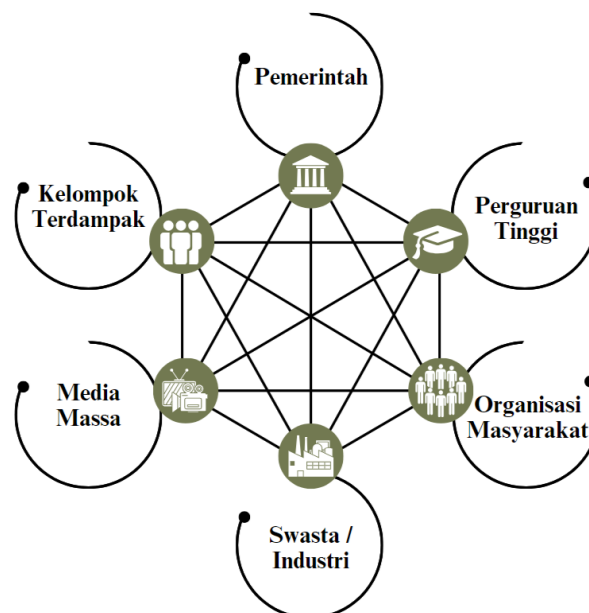

Figure 3. *Hexa Helix Stakeholder Model*

4.   Results and Discussion

4.1   Honey Bee School Non-formal Education Program Development Model

The House Model of this research will promote the vision of a green economy, which is no longer just about seeking personal profit but emphasizes the balance between economic welfare while reducing the risks of environmental and ecological damage. This vision is the "roof" of *The House Model of the* Honey Bee School program. The pillars that support the "roof" of *The House Model* come from relevant theories and concepts on forestry, sustainable agriculture, non-formal education, and community empowerment. Relevant theories and concepts include apiculture-based agroforestry by Mahendra (2009), the andragogy learning model (*adult learning*) by Daryanto (2017), and the Minister of Manpower Decree number 68 of 2013, which are realized through learning classes in each pillar.

The first pillar (Agroforestry and Beekeeping Class) was obtained from the development of apiculture-based agroforestry principles by Mahendra (2009). The second pillar (Honey Bee Cultivation Class) and the third (Sustainable Forest Honey Harvesting Class) were obtained from the development of the Minister of Manpower Decree number 68 of 2013 concerning the Indonesian National Work Competency Standards (SKKNI) in the Forestry Sector with

competency units (1) applying K3 guidelines; (2) cultivating honey bees; and (3) harvesting honey. Based on the Decree of the Environmental and Forestry HR Training Center (2020), in order to improve knowledge, abilities, community welfare and support development programs in the field of environment and forestry, it is necessary to manage non-timber forest products, namely honey bee cultivation. The andragogy (*adult learning*) learning model is implemented during the program. Andragogy is an appropriate learning approach for the community (Daryanto, 2017). This is because the target respondents of this program are adults. *The House Model of the* Honey Bee School can be seen in Figure 4.
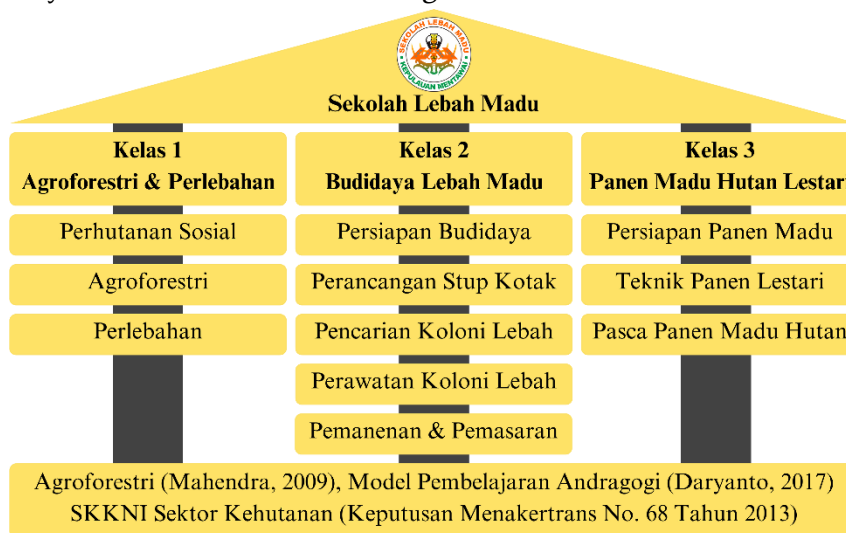

Figure 4. *The House Model of the* Honey Bee School Program

4.2 Implementation of the Honey Bee School Non-formal Education Program

The program implementation was carried out in three stages, namely the preparation stage, the program implementation stage, and the final stage, which consisted of *monitoring* and evaluation. The program implementation was carried out offline at the Siberut National Park Office, Region II National Park Management Section (SPTN), for 25 meetings from July 24 to August 16, 2023. The program implementation stage includes three classes as follows:

1) In Class 1 (Agroforestry and Beekeeping), respondents were educated on social forestry, agroforestry and beekeeping concepts.
2) In Class 2 (Honey Bee Cultivation), respondents were educated on cultivation preparation and setup box design, searching for bee colonies, managing and caring for bee colonies, harvesting, packaging, and marketing.
3) In Class 3 (Sustainable Forest Honey Harvesting), respondents were educated on forest honey harvest preparation, sustainable forest honey harvesting techniques, and forest honey post-harvesting.

Figure 5. Implementation of the Honey Bee School Non-formal Education Program

After the program was implemented, researchers conducted *monitoring* and evaluation. Evaluation activities were carried out through comparison of *pretest* and *posttest* scores to see the achievement of the program and the impact of changes from program implementation. The measuring instrument used consisted of 34 questions based on four variables of knowledge and skills, namely the concept of agroforestry modified from Mahendra (2009) to measure knowledge of the basic concepts of agroforestry, learning introduction theory of *honey* bees modified from Supeno *et al*. (2016) to measure knowledge of honey bee biogeography, and a modified beekeeping competency test kit from LSP Rimbawan and Lingkungan to measure skills in honey bee cultivation and harvesting forest honey bees. Data obtained in the form of scores from a questionnaire with a 5-level Likert scale used for evaluation ranged from 1 (very unaware) to 5 (very aware) as follows.
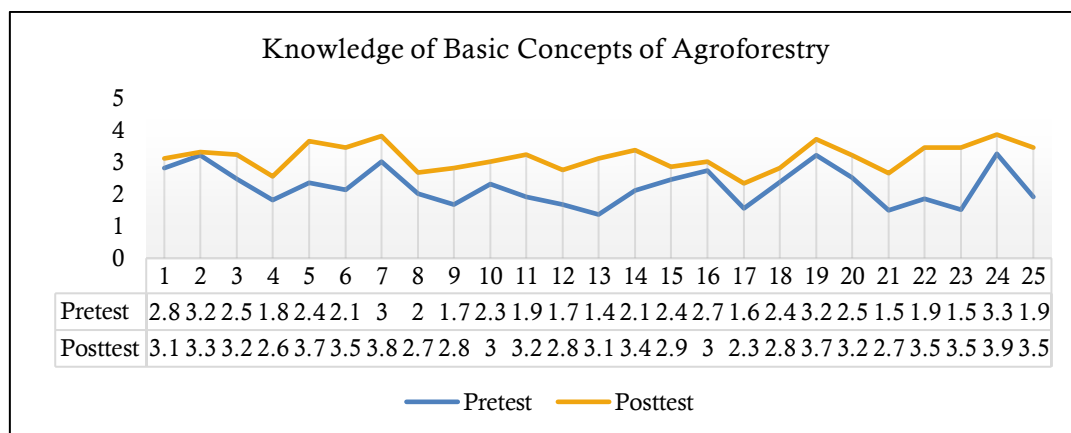

Figure 6. Results of Changes in Knowledge Measurement of Basic Agroforestry Concepts

Based on Figure 6, the results of the *pretest* and *posttest* scores show that there is an increase in knowledge of the basic concepts of agroforestry from 4 people to 15 people who are categorized as quite understanding to very understanding. High knowledge of the basic concepts of agroforestry is expected to protect forest areas from the possibility of actions that damage the forest. The community empowerment program outlined in the social forestry scheme can realize sustainable forests and prosperous communities (Firdaus, 2018). This means that 15 people already have good knowledge of the basic concepts of agroforestry and social forestry to realize sustainable forests after participating in the program.
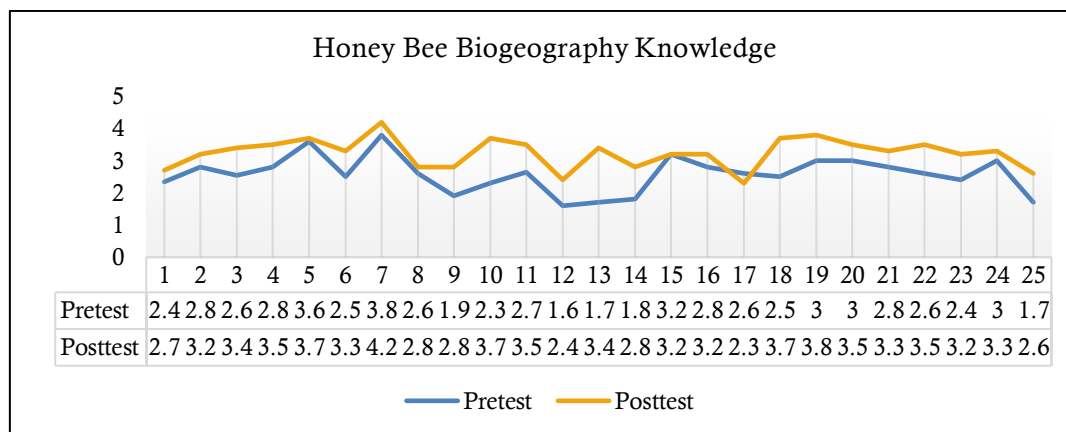
Figure 7. Changes in Honey Bee Biogeography Knowledge Measurement Results

Furthermore, Figure 7 shows that the results of the *pretest* and *posttest* scores indicate that there is an increase in knowledge of honey bee biogeography from 6 people to 17 people who are categorized as moderately understood to very understood. This is shown by the enthusiasm of the target respondents in participating in a series of educational activities in class 1 (agroforestry and beekeeping). The high knowledge of honey bee biogeography is expected to be able to mobilize the interest of the target respondents and the surrounding community to recognize honey bees, which are a potential Non-Timber Forest Product (NTFP) product to be developed on Siberut Island, Mentawai Islands Regency.
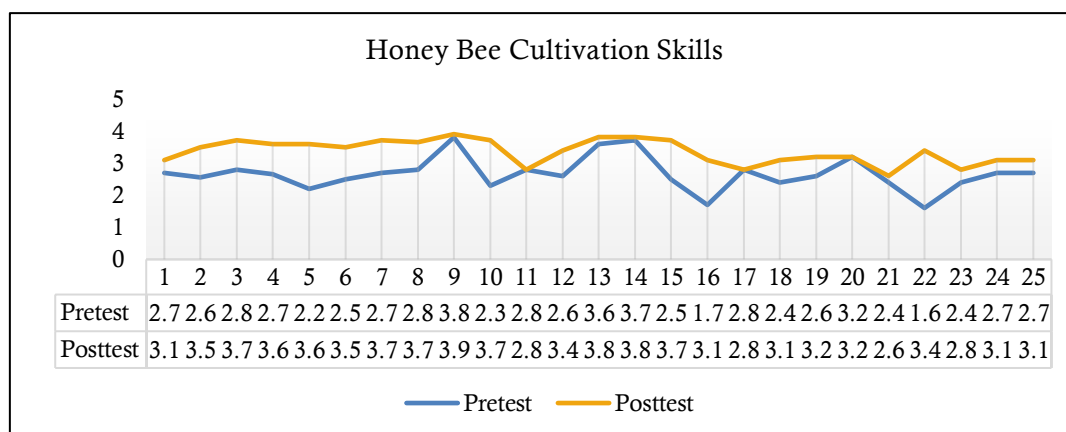

Figure 8. Results of Changes in Honey Bee Cultivation Skill Measurements

Then in Figure 8 shows that the results of the *pretest* and *posttest* scores show that there is an increase in honey bee cultivation skills from 4 people to 21 people who are categorized as quite understanding to very understanding. This was shown by the target respondents participating in a series of educational activities on honey bee cultivation in class 2 (Honey et al.). Honey bee cultivation can increase the income of the target respondents, who will become the driving agent for all members of the village community, so as to improve the economy of the Muara Sikabaluan Village community and reduce the number of unemployment and poverty as one of the social problems.
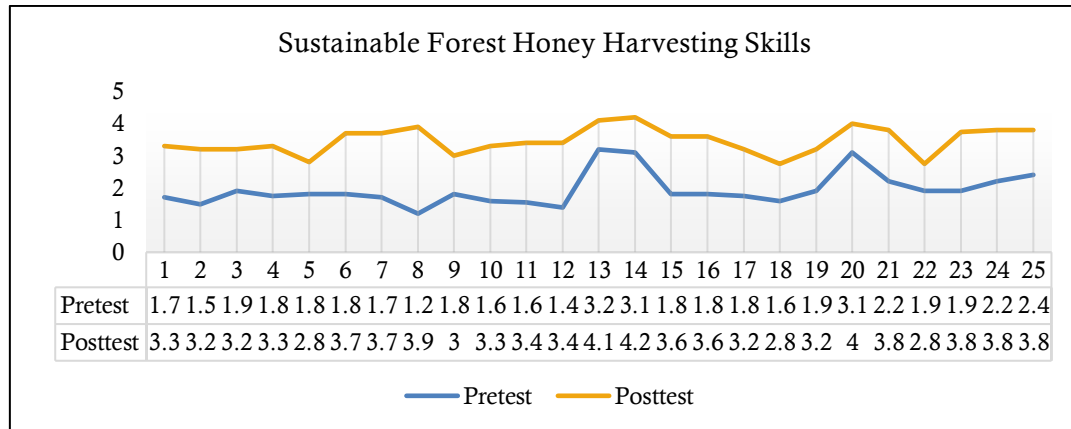
Figure 9. Changes in Measurement Results of Sustainable Forest Honey Harvesting Skills

Based on Figure 9, the results of the *pretest* and *posttest* scores show that there was an increase in attitudes and skills in sustainable forest honey harvesting from 3 people to 19 people who were categorized as moderately understood to very understood. This is shown by the enthusiasm of the target respondents in participating in a series of educational activities on honey bee cultivation in class 3 (Panen Madu Hutan Lestari). The existence of high skills in harvesting forest honey sustainably is expected to be able to change the traditional system that has not prioritized aspects of sustainability and environmental sustainability. The principle of agroforestry is environmental, economic and social balance. This approach can create individuals who can live in harmony with the environment. Sustainable forest is the main goal of agroforestry (Ratag, 2021).

Furthermore, the 4 data variables above were averaged and analyzed using the *Shapiro-Wilk* normality test method because the number of respondents was less than 50 samples. The following are the results of the *pretest* and *posttest* data normality tests.

Table 2. Results of *Pretest* and *Posttest* Data Normality Test with *Shapiro-Wilk*

	df	Mean	Median	Std. Deviasi	Min-Max	Shapiro-Wilk P value/sig
Pretest	25	2.35	2.26	0.272	1.82 - 2.95	0.494
Posttest	25	3.30	3.30	0.236	2.66 - 3.85	0.557

Based on Table 2, the results of the normality test with *Shapiro-Wilk* above, the *p-value / Sig* on the *pretest is* 0.494, which means> 0.05, so the *pretest* data is normally distributed. While on the *posttest, the Sig* value is 0.557, which means> 0.05, so the *posttest* data is normally distributed. In accordance with the basis for making decisions on the results of the normality test, it can be concluded that the data from the *pretest* and *posttest* results are normally distributed. After conducting a normality test, then a statistical test is carried out to determine whether there is an effect of the intervention that has been given, a hypothesis test is carried out using the *Paired Sample T-test* in Table 3 below.

Table 3. Statistical Test Results of *Pretest* and *Posttest* Data with *Paired Sample T-test*

	df	Selisih Mean	Std. Deviasi	P value/sig (2-tailed)
Pretest Posttest	24	-21.389	0.221	0.000

The sample test results using the *Paired Sample T-test*, on the *pretest* and *posttest* results obtained a *Sig (2-Tailed)* value of 0.000 so that it is less than the value <0.05. Therefore, Ha is

accepted, which means that there is an increase in knowledge after being given a series of education from the Honey Bee School non-formal education program. This proves that the non-formal education program of Sekolah Lebah Madu has a positive effect on increasing the knowledge and skills of the target respondents.

In addition to increasing respondents' knowledge and skills, the program improved their attitudes and behaviors in managing forest products in a sustainable and agroforestry-based manner. This is shown by respondents being able to utilize idle land into a honey bee farm. On this land, 1,000 Kaliandra seedlings were planted with the help of CSR (*Corporate Social Responsibility*) of PT Semen Padang as a source of bee feed and support apiculture-based agroforestry that integrates forests and trees with honey bees. According to Ratag *et al*. (2021), apiculture is a cultivation pattern that functions the planted trees as a source of bee food. An important key to honeybee-based agroforestry management is the availability of sustainable feed. Kaliandra (*Calliandra Callothyrsus*) is a plant that flowers throughout the year with nectar that can be consumed by honey bees (Triwanto *et al*., 2021). Kaliandra is able to live on critical land, very suitable for land revitalization. Aside from being a source of food for bees, planting Kaliandra can optimize the function of forests in reducing carbon emissions, preventing flooding, and erosion (Rahayu *et al*., 2021). From the social and cultural aspects, this program evokes the local wisdom of *pumonean,* which is a traditional agroforestry system practice of the Mentawai tribe and utilizes honey bees in the traditional rituals of the *Sikerei* (medicinal experts) as one of the ingredients in the practice of traditional medicine.

Figure 10. Honey Bee Farm and Application of Apiculture-Based Agroforestry

4.3   Managerial Implications of Program Sustainability

Efforts to realize the program as described through *The House Model* have internal and external obstacles. Such complex challenges require solutions from various elements to support the sustainability of the program. Therefore, managerial implications are needed so that the program that has been implemented can continue to grow. According to Rachim *et al*. (2020), the *Hexa Helix Stakeholder Model* is a reference for developing synergy between agencies to achieve goals. The *Hexa Helix Stakeholder Model* concept requires six *stakeholders* who play an important role in achieving a goal, namely the government, universities, community organizations, private/industry, mass media, and affected community groups. *Stakeholders* who play a role in maintaining the sustainability of the program can be seen in Figure 11.
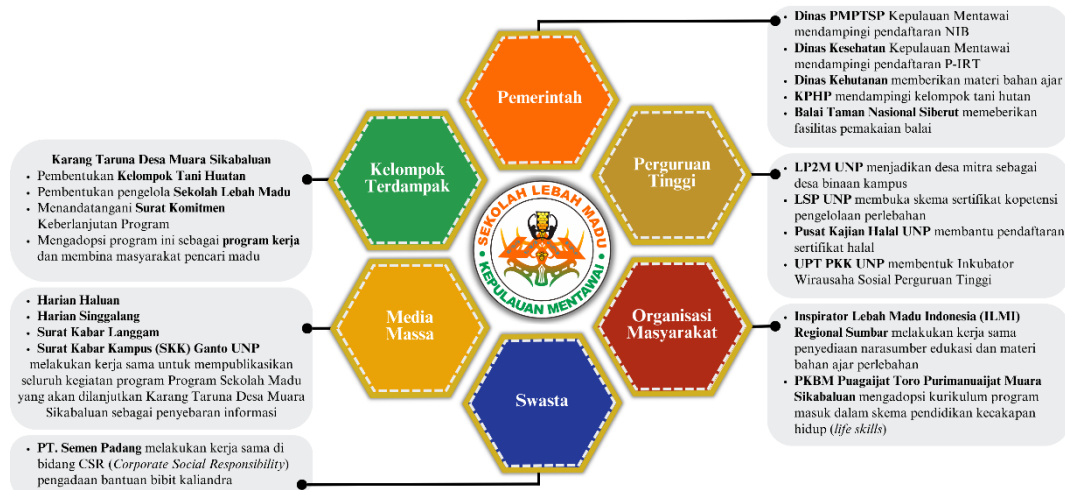
Figure 11. *Hexa Helix Stakeholder Model of* Program Sustainability

The non-formal education program design of the Honey Bee School, which can be seen through *The House Model,* can be applied by communities around the forest area in order to achieve a balance between economic welfare while reducing the risks of environmental and ecological damage. The problem of *lack of knowledge* that affects people's actions in treating the forest can be minimized after this program is implemented. Thus, the way the community works in collecting forest honey that has not applied the concept of sustainability can be changed and applied sustainably. However, the improvement effort needs to involve external parties, as the community around the forest area itself still lacks experience and capital. Such coaching and development can be done in the form of a foster partner program.

The government is expected to facilitate the community around the forest area and simplify the bureaucracy. Universities play a role in providing guidance with a science and technology approach that is realized through community service as an implementation of the Tri Dharma of Higher Education. Meanwhile, community organizations become the driving force in fostering community participation in order to realize program goals. The private sector/industry can assist in coaching through a series of *corporate* social responsibility programs. In addition, there is mass media that acts as a medium for program promotion and wider dissemination of information media to the outside community so that the program can be applied elsewhere. There are affected community groups, namely communities around the forest area, who should not be placed in a position as objects but as subjects who must be involved as *stakeholders* in achieving program goals and running programs in the field. A detailed explanation of the role of each *stakeholder* can be seen in Table 4..

Table 4. *Stakeholder* roles in the *Hexa Helix Stakeholder Model*

Stakeholders	Person in Charge	Role
Government	• Forest Service of West Sumatra Province	• Material assistance and support for honey NTFP management facilities
	• UPTD KPHP Mentawai Islands	• Social Forestry (SF) Assistance to Forest Farmer Groups
	• Siberut National Park Center	• Facility support for the use of the hall as a venue for educational activities
	• Mentawai Islands PMPTSP Office	• Assisted NIB registration for honey bee farmers

	• Mentawai Islands Health Office	• Assisting the registration of P-IRT certificates for honey bee farmers
Higher Education	• Institute for Research and Community Service (LP2M) UNP • UNP Professional Certification Institute (LSP) • Center for Halal Studies (PKH) UNP • UNP Career and Entrepreneurship Development Unit	• Assisting partner villages as university-assisted villages to develop programs • Opening a beekeeping competency certification scheme • Assisted the registration of Halal certificates for honey bee cultivators • Establish a university social enterprise incubator
Community Organization	• Indonesian Honey Bee Inspirators (ILMI) West Sumatra • PKBM Puagaijat Toro Purimanuaijat Muara Sikabaluan	• Accompanying honey bee farmers, providing educational resources and beekeeping materials. • Adopt programs in the life skills education scheme and provide learning citizens.
Private/Industry	• PT Semen Padang CSR	• Cooperation in the field of CSR (*Corporate Social Responsibility*) on the procurement of calliandra seedlings for bee feed and support agroforestry
Mass Media	• Singgalang Daily • Haluan Daily • Style	• Cooperation for the publication of all program activities of the Honey School Program as information dissemination
Affected Group	• Forest honey seeker • Village Forest Farmer Group Muara Sikabaluan • Youth Organization of Muara Sikabaluan Village • Honey Bee School Manage (combination of KTH & Karang Taruna)	• Implement a sustainable harvest system • Implementing agroforestry patterns and sustainable harvesting of forest honey • Adopt this program as an economic work program. • Collaboration with PKBM, KTH, and Karang Taruna to expand educational programs

5. Conclusion

The Honey Bee School program was able to achieve the objectives and solve the problems needed by the target respondents. The increase in knowledge, skills, attitudes and behaviours of the target respondents indicated a significant increase in life skills. The problem of *lack of*

knowledge that affects the community's actions in treating the forest can be minimized after this program is implemented. Thus, the way the community works in collecting forest honey that has not applied the concept of sustainability can be changed and applied sustainably. From an environmental aspect, the program changed the unsustainable forest honey collection system and realized reforestation by planting bee food plants such as calliandra. The establishment of honey bee farming businesses supports productive economic activities to overcome poverty problems faced by communities in forest areas. From the social and cultural aspects, this program evokes the   local wisdom of pumonean, which is a traditional agroforestry system practice of the Mentawai tribe and utilizes honey bees in the traditional rituals of the Sikerei (medicinal experts) as one of the ingredients in the practice of traditional medicine.

The House Model Honey Bee School Program can be applied by communities around forest areas in order to achieve a balance between economic welfare while reducing the risks of environmental and ecological damage. Efforts to improve this program need to involve external parties. Therefore, the researcher advises the program implementers to synergize and work together by involving six *stakeholders* who   play an important role in this program, namely the government, universities, community organizations, private/industry, mass media, and affected community groups.

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