Learning centres potentials for supporting NTFPS production from agroforest systems

Learning centres potentials for supporting NTFPS production from agroforest systems

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Abstract. Extraction practices of NTFPs without introducing its domestication techniques have the potential to cause the extinction of the particular product or species. Currently, techniques to domesticate NTFPs under agroforestry systems have been explored, with two examples of economically valuable NTFP commodities are Trigona bee (*Trigona sp*.) and Bambu Tabah (*Gigantochloa nigrociliata*). Although techniques for its domestication have been identified, not much farmers know and understand how to domesticate the commodities. Government extension services are not yet disseminating information on NTFPs domestication, alternatives extension services approaches need to be explored to widespread information on NTFPs domestication to farmers. Learning centres can be one of the approaches that can support the dissemination of NTFPs domesticaion. This study was conducted to explore potentials of learning centres to support NTFPs production from agroforestry systems. Two case studies were taken, i.e. Trigona in Gunungkidul District and Bambu tabah in Lombok Tengah District. Information was collected to explore the potential adoption level of domestication techniques introduced by the learning centre, through interview with 60 learning centre visitors in Lombok Tengah and 55 in Gunungkidul. The study showed that learning centres increased the adoption potential of the NTFP domestication, particularly through facilities that were given to the community to be tested in their own plot. However, farmer's accessibility to visit the learning centres are still limited. Government supports is needed to enhance farmers' accessibility and development of learning centres as part of their forestry extension services programs for enhancing production of NTFPs as sources for local livelihoods.

1. Introduction

Non timber forest products (NTFPs) takes the interest of the worlds start from decades, but received low attention from goverment and forest agencies in 1980 - 1990 [1 - 3]. Now, NTFPs receives more attention that provide economic benefit for community [3]. NTFPs is expected to increase income and employment opportunities by commercialization, based on livelihoods perspective [2]. However, in last two decades NTFPs commercialization and extraction was reported to have potential impacts for community and forest sustainability [4 - 7]. For example, in CEPFOR projects (undertaken by the UNEPWorld Conservation Monitoring Centre (UNEP-WCMC)) case, intensive harvesting has caused of increased demand that lead to over-exploration of species [8], non-cultivated NTFPs in the other project (by CIFOR) was also reported to become declined [9]. That issues bring new interest in domestication of NTFPs to keep it beneficial for local livelihood, but less damage to the forest.

Sustainable production of NTFPs will be difficult to be maintained if there are no activities to increase its population [10]. Domestication as a way to promote cultivation of specific commodity was initiated in 1980s and become a global interest in 1990s. Domestication of NTFP depends on various factors, but profitability of NTFPs always become the major factor that attract farmers' interest [11] [12], besides the needs of technical skill and capital investment [2].

Honey and bamboo are examples of economically valuable NTFPs. NTFPs have potential to be developed which is expected can help rural and urban poor people [13][14]). Trigona bee is one of stinglesss honey bees which has potential to be commercialized, especially in tropical countries (such Indonesia), propolis from stingless bee is commercialized internationally and famous medicine in traditional [15]. Indonesian people interest in stinglees bee also grow rapidly in last two years, shown by increasing information about stingless bee in Bahasa from social media (such Youtube), blog, and website. Research and Development Institute of Technology Non Timber Forest Product (Balitbangtek-HHBK) [16] explain that there are some advantages of Trigona beekeeping, for examples: safer because it is stingless, adaptive, and produce more propolis than honey bees (i.e *Apis mellifera*). Moreover, bamboo is also one of potential NTFPs that is produced by community [13], for example Bambu Tabah (in Bahasa) or *Gigantochloa nigrociliata* for bamboo shoots as food [17]. Diah (Lecturer from Udayana University, Bali and researcher) explained that Bambu Tabah has high potential to be developed, in minimum production farmer can obtain IDR 25 million per hectare (assumed the production is 1 ton/ha) which could be harvested until 100 years [18]. A research done by [17] also shown that bamboo shoot processing business has Net Present Value (NPV) IDR 364.253.567; Benefit Cost Ratio (BCR) at 1.42; Internal Rate Return (IRR) at 153.33%; and Pay Back Period (PP) in 2nd year. An article from [19] mentioned that the area of Forest for Special Purpose (KHDTK) Rarung in Central Lombok is designed as central of Bambu Tabah cultivation and production.

Currently, techniques to domesticate Trigona beekeeping and Bambu Tabah cultivaton under agroforestry systems have been explored. But, not much farmers know and understand how to domesticate that. Trigona beekeeping in Gunungkidul and Bambu Tabah in Central Lombok are slowly domesticated because of limited goverment sources of extension workers (Ryandoko et. al. 2016)[20]. But, extension service has a role for farmer in adopting technology [21][22].

2. Methodology

This study was conducted by interviewing 115 respondents from two case studies, they are 55 visitors of Madu Sari Forest-farmer Group in Gunungkidul as learning centre of Trigona beekeeping and 60 farmers who are user of Forest for Special Purposes (KHDTK) Rarung in Central Lombok which has potential to become learning centre. Respondents were chosen by random sampling with 70% and 30% of gender composition for male and female, respectively. Visitors' characteristic and their level of adoption were collected through interview to explore the potential adoption level of domestication techniques. Collected data was analyzed descriptively to know the level of adoption, and then some factors which are expected have influence in adoption level was analyzed by regression with SPSS Statistical Software.

3. Result and discussion

3.1. Characteristic respondents

Respondents or this research are visitors of Madu Sari Forest-Farmer Group as Trigona beekeeping learning centre in Gunungkidul District, and also farmers that were registered as land cultivator in KHDTK Rarung, Lombok Tengah District. Total of respondents were 115, with age average was 46 years and gender composition were 79% and 21% for male and female, respectively. Respondents have various education background: 11%; no formal education; 40% graduated from elementary school; 24% graduated from junior high school; 16% graduated from senior high school; and 9% graduated from diploma or undergraduate program, respectively. Seventy percent of total respondents have basic occupation as farmers..

3.2. Learning centre operation

Madu Sari Forest-farmer Group as learning centre of Trigona beekeeping is managed by Mr. Sugeng Apriyanto that had started trigona beekeeping from 2004. He learned it mostly from internet, then tried it through trial and errors, and receive some training from government and others. Government start its interest on Madu Sari from 2014. Cooperatives and Small-Medium Enterprises Agency of Gunungkidul regency is the first agency that supported the establishment of Madu Sari as learning centre of trigona beekeeping. The agency gave some training about group management and support Madu Sari to become a business group as legal cooperatives. Madu Sari Cooperatives was established for businessto sell their products. Recently, Madu Sari Forest-Farmer Group was appointed as one of biggest learning centre in Gunungkidul Regency. It has some packages for visitors to learn about trigona beekeeping. Visitors that visited Madu Sari learning centre were not only from Gunungkidul or East Java, but also from other provinces in Indonesia.

On the other hand, Forest for Special Purpose (KHDTK) Rarung, Central Lombok, which is managed by Forestry Research and Development Agency Mataram, has vision to become a learning centre for farmer, so that farmer can receive benefit not only from maintaining forest cover, but also can increase their knowledge and skill. Increased knowledge and skill are expected can increase their plot production and income. KHDTK Rarung has introduced two NTFPs technologies that had been shared to the farmer, i.e. Bambu Tabah and Trigona beekeeping.

3.3. Potential adoption

Learning centre as one of extension services approach is expected can support the dissemination of technology better than other extension services. Because it provides packages of learning and training depends on visitors' need. Different packages of learning and training are also expected can give different stage of adoption, based on visitors' need. Innovation or technology had a long stage to be called adopted, [23] explained that an innovation or technology is adopted when the receivers has decided to make full use of it for reach their need.

3.3.1. Trigona Bee. Trigona (stingless bee) get more interest from farmer recently, shown by increased number of Madu Sari visitors (interviewed by author). KHDTK Rarung also put interest in Trigona beekeeping, by disseminating its domestication technologies to farmers. Learning centre (Madu Sari and KHDTK Rarung) are expected could be a new source for farmer to get knowledge and increased skill in Trigona beekeeping. Table 1. shows the level of uptake from the information given from the learning centres in different adoption stages of Madu Sari and KHDTK Rarung visitors on Trigona beekeeping technology.

Table 1. Information uptake based on adoption stages of Madu Sari and KHDTK Rarung visitors on Trigona beekeeping domestication

Adoption Stage	**Percentage from total number of respondents (n=115)**
Awareness of Knowledge (n=115)	68%
Interest (n=115)	23%
Evaluation (n=115)	53%
Trial (n=115)	55%
Adoption (n=115)	29%

a. Awareness of knowledge: visitors or technology receiver who in awareness stage are who had known what is Trigona and how to do beekeeping in trigona. Type of information and its main source of visitors is shown by Table 2. Table 2 shows that most of information about trigona beekeeping (81.6%) is from learning centres (Madu Sari and KHDTK Rarung). Eventhough most of visitors (67%) knewTrigona bee (physically) before they came to learning centre because it was one of local bees in Lombok and Gunungkidul

Table 2. Visitors' information sources

Type of Information	Sources (%)	
	Learning Centre	**Other**
Type of Trigona bee	33	67
Trigona benefit	75	25
Trigona culturing	90	10
Colony placement	87	13
Product harvesting	86	14
Processed products	93	7
Supporting plant	87	13
Product packaging	93	9
Marketing	90	10
Average information uptake from learning centre	**81.6**	**18.4**

b. Interest: visitors who in interest level were searching more information about trigona beekeeping after got information and training from learning centre. Table 1 shows that only 23% of visitors who have more interest to search deeper information about trigona beekeeping, it means that 77% of visitors did not try to find more information about it. But, most visitors who did not find more information have an interesting reason: they do not know another information source of trigona beekeeping aside from learning centres, so that learning centres is important as source of information.

c. Evaluation: visitors evaluate the benefit of trigona beekeping and make a comparison between it and other business. The result (Table 1) shows that 53% of them could compare the economic values of doing trigona beekeeping and other business. Most of the respondents said that trigona beekeeping would be more beneficial than other business because it has a good economic value and easy to be implemented. However, less than half of them could not give a good comparison, because of their lack of information about trigona's production, so that they do not know yet the beneficial of trigona.

d. Trial: visitors tried the technology after receiviedtraining. Result in Table 1 shows that more than half (55%) visitors tried the technology. Most of them got the colony from surrounding house, bamboo building, field, forest, dry land, and others. Some of them also receive it from goverment or other institution program. Moreover, learning centre can also facilitate the colony if needed, so that visitors could try it directly. Besides, there are some visitors who already have bee colony before went to learning centre.

e. Adoption: visitors called as adopter when the technology was successfully implemented to reach their needs. The result of this study shows that 29% of visitors had been adopted the technology. All of adopter had been successfully developed the amount of their colony by applying the technology they learned from learning centre, but not all of them harvested the product, because they wanted to increase the number of colony first before harvesting it.

3.3.2. Bambu tabah. KHDTK Rarung disseminated technologies on Bambu Tabah cultivation to the farmer in 2016. KHDTK Rarung was not only disseminated the technology, but also gave the Bambu Tabah seedlings to the farmer (4 seedlings for each farmer who manage KHDT's area) to create a faster adoption of Bambu Tabah cultivation. There are more than 400 farmers who manage the land in KHDTK Rarung, but most of them did not get training about how to cultivate the Bambu Tabah (because of limited resources of KHDTK Rarung and access of farmer to attend the training), only the leaders and

some members of farmer group who received training. KHDTK Rarung expected that trained farmer could disseminate the technology when they distributed the Bambu Tabah seedlings to other farmers. The adoption level of Bambu Tabah cultivation technology is shown by Table 3 below:

Table 3. Adoption stages of KHDTK Rarung visitors on Bambu Tabah cultivation

Adoption Stage	Percentage of total respondent in Lombok Tengah (n=60)
Awareness of Knowledge (n=60)	51%
Interest (n=60)	8%
Evaluation (n=60)	35%
Trial (n=60)	83%
Adoption (n=60)	60%

a. Awareness of knowledge: visitors or technology receiver who in awareness stage are who had known what is Bambu Tabah and how its cultivation. Type of information and main visitors' source is shown by Table 4. Table 4 shows that most of information about Bambu Tabah cultivation (81.6%) is from learning centres (KHDTK Rarung). The result also shows that almost all of information about Bambu Tabah cultivation was from learning centre.

Table 4. Visitors' information sources

Type of Information	Sources (%)	
	Learning Centre	Other
Bambu Tabah	79%	21%
Bambu Tabah benefit	79%	21%
Bambu Tabah cultivation	78%	22%
Bambu Tabah nursery	96%	4%
Harvesting	80%	20%
Kind of Bambu Tabah processed product	87%	13%
Pest and disease of Bambu Tabah	82%	18%
Processing product of Bambu Tabah	89%	11%
Marketing	83%	17%
Average	**84%**	**16%**

b. Interest: visitors who in interest level were searching more information about Bambu Tabah cultivation after got information and training from learning centre. Table 3 shows that only 8% of visitors who did more Bambu Tabah information. The reason why visitors did not find more about Bambu Tabah cultivation is similiar with Trigona beekeeping, they do not know another information resource of Bambu Tabah cultivation besides KHDTK Rarung. They could not develop their knowledge on Bambu Tabah cultivation if they do not have access to KHDTK Rarung.

c. Evaluation: visitors evaluate the benefit of Bambu Tabah cultivation and make a comparison between it and other business. The result (Table 3) shows that 35% of them could compare between Bambu Tabah with other business. Most of them said that Bambu Tabah would be more beneficial than other business because it has a good economic value and easy to be implemented. However, more than 70% of them could not give a good comparison, because of their lack of information about Bambu Tabah and because most of them did not attend the training and did not get enough information from trained farmer.

d. Trial: visitors tried the technology after received training. Study result shows that almost all of farmer (83%) tried to cultivate Bambu Tabah although most of them did not attend the training.

It is because KHDTK Rarunggave Bambu Tabah seedlings to the farmer, so that farmer could cultivate it in their own land (inside KHDTK Rarung's area).

e. Adoption: technology receiver called as adopter when the technology was successfully implemented to reach their needs. The result of this study shows that 60% of farmers had been adopted the technology. All of adopter had been successfully cultivated their Bambu Tabah, but only half of them who had harvested the bamboo shoot and only few of them who sold it.

3.4. Factors affecting adoption

3.4.1. Trigona Bee. Factors which are expected have influence in adoption level are gender, age, education background, and visit frequencies. The result of regression test which is done by SPSS Statistic is shown by Table 05. below:

Table 5. Factors influence adoption level of Trigona bee technology

Adoption Stage	Sig. value of t-test			
	Age	Gender	Education Background	Visit frequences
Awareness of Knowledge	0.985	0.967	0.000*	0.000*
Interest	0.829	0.651	0.037*	0.918
Evaluation	0.795	0.114	0.026*	0.002*
Trial	0.415	0.085	0.013*	0.000*
Adoption	0.192	0.262	0.146	0.000*

*significant in alfa 5%

Table 5. shows that education background and visit frequences are the most factors that have significant influence in 4 stages of of Trigona bee technology. Significant results of visit frequencies also shown that learning centre has a potential to deliver the technology.

3.4.2. Bambu tabah. Factors which are expected have influence in adoption level are gender, age, education background, and visit frequencies. The result of regression test which is done by SPSS Statistic is shown by Table 06. below:

Table 6. Factors influence adoption level of Bambu Tabah technology

Adoption Stage	Sig. value of t-test			
	Age	Gender	Education Background	Visit frequences
Awareness of Knowledge	0.821	0.836	0.333	0.018*
Interest	0.408	0.982	0.650	0.685
Evaluation	0.562	0.113	0.090	0.722
Trial	0.128	0.754	0.914	0.519
Adoption	0.306	0.654	0.844	0.075

*significant in alfa 5%

The result of regression test in factors which influence the adoption level of Bambu Tabah technology is different with adoption level of Trigona bee technology. Significant factor is only shown in awareness of knowledge and only one factor which significant, it is visit frequencies. It is happened because farmer in KHDTK Rarung's area is given Bambu Tabah seedling by Forestry Research and Development Agency Mataram, so that almost all of them had been tried to adopt the technology. But, visit frequencies still has significant contribution to increase the level of awareness of the knowledge on Bambu Tabah

cultivation. Thus, for Bambu Tabah cultivation, the role of learning centre mostly for increasing awareness by providing information and seedlings.

4. Conclusion

The study showed that learning centre has a potential roles to increase the dissemination of NTFPs. Packages from the learning centre that combined providing knowledge with providing facilities motivate farmers to try and adopt the technologies. Different packages for different products need to be designed to ensure the farmers adopting the technologies. Despites of its high potential roles for disseminating NTFPs technologies, farmer's accessibility to visit the learning centres are still limited. Thus, supports from government and other agencies are needed to enhance farmer's access to learning centre as well as the development of other NTFPs learning centre besides the established centres.

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