Sustainable practices: implementing bamboo cina conservation-based management in Ternate –North Maluku-Indonesia

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Abstract. Sustainable Practices: implementing bamboo cina conservation-based management In Ternate- North Maluku-Indonesia Bamboo plant is highly prospective as a basic row material whether for traditional uses or modern industries. Since centuries, a group of farmer in Ternate city of North Maluku defied tradition and planted bamboo for livelihoods. The type of bamboo has special characteristic which the culm of bamboo has brown spots which is similar to the kinds of leopard spots and/or locally known as bamboo cina. The research was conducted in Ternate- North Maluku-Indonesia. Data used were primary and secondary data. In this study we carry out a field research to assess some of agronomic sustainable practices applied by the local people and local wisdom which embedded within the community life. The study find out that agronomic practices applied by respondents are including planting (re-planting and propagation), Maintenance (weeding control and pruning), harvest (selective cutting and age of harvest). Meanwhile, description on existing local wisdom/knowledge that can maintain bamboo Cina conservation-based management are including agronomic knowledge and practices, cultural heritage (philosophy, story/legend, belief), sustainable livelihoods, and recognition of communal right.

1. Introduction
Bamboo is a self-regenerating natural resource, multipurpose non-timber plant that economically give a significant contribution to people’s income. Indonesia has more than 160 species (12% of the bamboo’s world species) and approximately 88 of them are including in the endemic ones [1]. Approximately 76 species are categorized as having the potential to be utilized, which includes 27 for craft materials, 7 for food and other 42 species for particular products[2]. In tropical and sub-tropical areas bamboo plants are adequate to live [3]. Bamboo is widely utilized for various products from traditional uses such as furniture, household appliances, handicrafts to the needs of modern industries like bamboo-based plywood, modern furniture and paper industry [4].

In the areas of Marikurubu and Moya Ternate North Maluku, bamboo in particular, has become an economic crop as it is used by the local community for fences, furniture and other household purposes. This plan contributes to household income and livelihoods of local inhabitants. Small- and medium-sized forest enterprises provide important potential contributions for poverty reduction [5]. The type of bamboo has special characteristic, which the bark of bamboo shades is similar to the kinds of leopard spots and / or locally known as bamboo cina. However, as occur in the study site that are only small group of farmers (including craftsmen) who are working in this field with limited plantation areas. These conditions can cause the decreasing or the loss of bamboo cina population. Therefore, it is important to be aware on how to preserve this plant for future.
There are many practices of using a local wisdom/knowledge to maintain the preservation of critical natural resources. This values have embedded in the culture of the community which is in general very conservation-based. It also culturally practiced by the indigenous people in the management of natural resources which generally intended to utilize and preserve the environment and natural resources in sustainable practices. Environmental values are reflected in the practices of local knowledge, including protection, sustainable use and maintenance. This value is directly related, inter-related, with communal and social systems of a community [6]. Thus, integrating the values of local wisdom into the conservation of a particular species is the best strategic effort. It seems that they are most consistent with the socio-cultural characteristics of the region and within the community. UNESCO[7] stated that local knowledge will be very beneficial to be used for community sustainable development.

2. Materials and Methods
The research took place in two villages Aer Tege-tege and Tongole in Marikurubu village. Both sub villages are considered indicative of the kinds of problem related to the issue of the research. The study relies on both secondary and primary data. The data is taken from observations, interviews, life stories and group discussions. Interviews were conducted using a structured format based on a pre-determined set of questions and by using an unstructured format in in-depth interviews to follow up on questions during an interview. Focus group discussions were used to cross-check the information received in the interviews and to have clearer picture of the situation. As the research relies on qualitative methods, the data sampling used purposive snowball sampling starting with the key informant data as a guide to help identify respondents. Key informants comprised local government officials, village authorities, community leaders (religious and/or traditional leaders).

This study is a descriptive-qualitative as it aims to find out the values, knowledge and practices of local conservation-based that exist and are applied by farmer groups in the research locations. The data analysis is to documenting all information and data relating to the conservation of bamboo china which includes: 1) Agronomic knowledge and practices conservation-based from pre-planting until harvesting and processing the crop; 2) Local knowledge as well as daily practices conservation-based in the form of philosophy, local story, ritual, belief toward the preservation efforts on bamboo cina plant. This values already used intra-generation and transmitted informally by their ancestor to the current generation and are still practiced today. After all the data collected then it will be put on the scientific narrative.

3. Results and Discussions
A majority of the sample respondents were male-headed households (75%). Respondents’ age classification shows that youth between 25 and 55 years dominate followed by older than 55 years. While, the majority of respondents (55%) were having completely Junior high school and 40% having completed senior high school.

3.1. Agronomic practices applied by the farmers
In daily practical for propagation, the local farmers used bottom clum with a size of 0.5 to 1 meter. which then put it into planting holes with a diameter of 1 meter and a depth of 60 cm, then planted it vertically. Planting should coincide during the rainy season. Previously, bamboo cina plants are only grow naturally (without re-planting intervention), but since the period of the 90s until today, re-planting started by the farmers considering that bamboo cina is being an important economic crop which also has a good market demand. The local people consume it for personal purposes (i.e. construction material and other simple household appliances), some are selling to the craftsmen which later they process them into furniture and other household appliances. Their empirical experiences also show that bamboo cina products (i.e. handicraft and other) can be used for decades and its quality remain the same or not much change. In the past, bamboo cina only growing in the communal lands. One of problems with bamboo management in Indonesia is most bamboos are growing naturally without being cultivated [8]. By contrast, the farmers in the study site started to do re-planting. As seen now, bamboo cina are mainly distributed in several plantation areas such as the yard of their house, in the cash crop farm,
around the water flow channel (barangka) and also in the communal land belong to sultanate of Ternate that located surrounding the village.

3.2. Maintenance (cleaning and pruning)
In general, for maintenance, farmers did cleaning/weeding in the growing areas (including cleaning of weeds that grow around the planting area), so the bamboo plants can grow well. They stated that it is important to control weeds around each bamboo clumps, failure to do so will invariably result in poor root and stem development in the young bamboo. While pruning/cutting is performing once or twice a year aiming to provide a healthy crop.

3.3. Harvest (selective cutting and harvest time)
Normally the farmers never do overharvested or clear cut the bamboo’s culm but they used selective harvest, choosing only the mature culm that grown under ideal condition aimed to sustain the regenerative characteristic of bamboo itself. It is well understood that selective cutting of mature culms assures the continuous production of bamboo.

   The culm maturity usually recognized by some signs: 1) The clum colour looks dark green; 2) the diameter of the clum between 35-40 cm. They prefer to have selective harvesting in order to keep the sustainability of the plant. They usually remove mature culms together with maintains the vigour of the plants aiming to allow for the continuous generation. Harvesting of bamboo cina is done selectively according to the age and maturity of the culms. The farmers ensure that the quality of bamboo is depending on the maturity of the clum. It is also assuming that the age of harvest or appropriate phases of maturity will resulted the great quality when it is processed into handicraft products.

3.4. Post harvest and its utilization
For post-harvest handling, farmers often drying culms by avoiding direct sun light, letting the culms stand under tree (preferably in shady spots) between 10-14 days or even more. The bamboo cina is considered dry when the colour of its culm will turn into light yellow and the brown spots are appear. In this phase, bamboo is ready to be used for handicraft materials and furniture products such as sofa, dining chair and table, baby box, kitchen utensils and other household appliances.

3.5. Local knowledge based-conservation
Culturally, the farmer learnt agronomic practices from their ancestor which has transmitted informally within the family groups. They are including: 1) Seeds selection, they are able to select the appropriate seeds (mature culm) for propagation; 2) Planting method, the farmers have the knowledge on how to appropriately grow bamboo cina so the plants will not die in the process of growth; 3) They usually planting it during rainy season; 4) Cleaning (weeding control), in supporting the optimal growth of bamboo cina, they consider that weeding control should take place regularly, once or twice a month; 5) pruning, once or twice a year, farmer remove older, unattractive culms and cut off any dead or unattractive branches. They assume pruning will provide a healthy crop; 6) Harvest, farmers have knowledge on recognising mature culm as well as do selective harvest.

3.6. Cultural Heritage
In their philosophy, bamboo cina symbolized their cultural identity, it also recognized as one of their cultural heritage that inherited from their ancestor. It is collectively agreed that to maintain the sustainability of this plant has become an cultural responsibility. In their point of view, bamboo cina is rarely find in other places, so it make this plant has very special meaning. Bamboo cina is also considered as an economic bamboo which has been used as a source of income for the people there since long time ago.

   Historically, there is a common local story embraced by the people that the crop is brought by Chinese traders in the 17th century to Ternate, then it later planted and/or propagated by their ancestor, so they named it bamboo cina. Though these plants are not native, the local resident keep considering that bamboo cina is part of their life which keep motivate them to preserve this plant. Most of agronomic practices associated with this plant is also obtained from the stories of their ancestors. It somehow
motivate them to care and preserve it through the re-planting process, selective cutting and other sustainable practices in order to maintain its sustainability.

Consistently, they continue to transfer the agronomic skill and knowledge as well as the technique on making bamboo products to their young generation in order to keep their own heritage to exist in the future. The traditional and indigenous knowledge systems are foundation also being a basis of managing the agro-ecosystem, including processes and functions, to keep maintaining the general ecosystem and landscape integrity [9]. Likewise, in building a sustainable livelihoods, we should need to integrate the local knowledge and practices into the conservation management. There are two strategies that can be applied which are 1) involving main actors within local community (i.e. the groups of farmers and craftsmen) into a conservation-based management. Especially to whom are directly depending on this crop for livelihoods, and perhaps see that bamboo cina is part of their cultural heritage; 2) Integrating the local wisdom that existing and applying by the local people into bamboo cina conservation-based management. This plant is rapidly after planting, easy to produce and able to have plants yields for many decades, so it is very helpful to support the local livelihoods. The local people in those two areas have been managing bamboo for commercial products as livelihoods sources for intra generation. The first previous product created was only used a traditional-style design, but today, they have modified bamboo products to meet the urban life requirement. The utilization of bamboo resource by the rural community can also play major role as a solution to rural poverty and unemployment. Beside its economic role, it is well known by the local people that bamboo is a conservation plant. It has function to preserve soil stability and water quantity and to protect their living areas which located in hilly landscape and surrounded with water flow channel from upstream(mountain areas).

3.7. Recognition of communal right

Existing of communal right within community, particularly for bamboo cina live in the communal land. It is commonly agreed that the people who stay close to the land and/or having farming land close to the communal land are obliged to maintain the plants as well as have right to access and to harvest it. In case of there is a demand for public needs i.e. material construction for public building and/or other public facilities as well as for the specific purposes of the other community needs, then, the bamboo cina in communal land also can be taken communally.

FAO [10] declared that globally, 1.5 billion local people are managing their forest resources through community-based tenure. This communal system is proven to let people having secure rights and make them are more likely to participate in managing their own resources in sustainable practices. Agricultural heritage systems can be seen as treasures left by the ancestors. This systems are dynamic and adaptive, exhibiting the strategic values of multi-functionality and sustainability [2,11].

4. Conclusions

Farmer play a major role in applying agronomic conservation-based practices through re-planting and propagation, maintenance (cleaning and pruning) and harvest (selective cutting). Local knowledge conservation-based in the form of agronomic practices and cultural heritage (philosophy, belief, values), sustainable livelihoods and recognition of communal right help to maintain the sustainable management of bamboo cina.

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