Community readiness on managing agroforestry of candlenut and coffee

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Abstract. Local communities around the Lore Lindu National Park have practiced agroforestry, including candlenut and coffee, which benefited not only for the livelihood of the communities but also for conservation of the national park area. This study aims to analyze the community readiness by the actors of each agroforestry system as a reference for the development of the two agroforestry systems. Based on the CRM approach, the community of candlenut agroforestry actors had a higher level of readiness (6.2 and 5.1) compared to coffee agroforestry actors have (4.9 and 4.7). The t-test analysis shows the difference between the five CRM dimensions. Those indicate that knowledge is significantly different between the readiness level of both the candlenut and coffee agroforestry communities. The value of the knowledge dimension in the candlenut agroforestry community is greater than the readiness value of the coffee agroforestry community. The knowledge factor is the most critical dimension to get attention in the agroforestry development effort.

1. Introduction
Agroforestry is a land-use system that combines trees and non-trees intending to improve their crop management, whether wood, food, and various other environmental and socio-economic services [1]. Coffee agroforestry can increase community income and create jobs and a good carbon storage ecosystem [2]. Likewise, candlenut agroforestry is cultivated through an agroforestry system, especially on flat enough land to get better income [3], as well as assets that will be inherited to the child [4]. Meanwhile, agroforestry around the Lore Lindu National Park (LLNP) plays a vital role in improving the welfare of the community around the forest as well as slowing the rate of deforestation and forest degradation in the area [5].

Adopting agroforestry in forest management means providing access and participation for communities. Agroforestry performance in forest management in Kalimantan, for instance, is generally at a moderate level with high variables of sustainability and efficiency [6]. In West Java, agroforestry has become a trend mainly when it involves the community as a management component [7]. Meanwhile, in Central Sulawesi, the development of agroforestry in community forestry uses a diversification strategy where internal strength is a critical factor to seize long-term opportunities [8].

The contribution of agroforestry trees toward food security is an essential element of agroforestry in land and forest management [9]. Those, along with the effects of climate change and global warming, increase problems in all aspects of life-related to agriculture and forestry [10]. Agroforestry has positive implications,
including soil carbon sequestration, improving groundwater storage capacity and rainwater use, reducing the use of inorganic fertilizers, producing various commercial value goods, diversifying income, and controlling fire use [1], and livelihoods and economic and environmental security [11]. Thereby promoting agroforestry techniques is a crucial step in improving the resilience of a country to climate change in the future [12].

This study examines the dimensions and level of community readiness regarding the issues of candlenut agroforestry and coffee agroforestry in different research sites. Thus this study will contribute to providing a systematic way to measure the dynamics of community readiness.

2. Method

Community Readiness Model (CRM) is a method developed by a team of researchers from the Tri-Ethnic Center for Prevention Research - Colorado State University, which would be used in this study that covers data collection to analysis of the level of readiness of the community. Two research traditions, namely individual psychological readiness and community development, had inspired the CRM method [13]. CRM is also a research approach, and a theoretical model that pays significant attention to cultural and social contexts to understand how a problem is perceived by society and whether taking some action is necessary will solve the problem [14].

This research was conducted for nine months, from March to November 2019 in Sigimpi Village and Karunia Village in Palolo District, and Salua Village and Bolapapu Village in Kulawi District, Sigi Regency, Central Sulawesi Province. These locations are in the northern and southern parts of the Sigi Regency, where the relative position can be seen in Figure 1.

![Figure 1. Position and location of research sites in Sigi Regency, Central Sulawesi.](image)

Data collection was being carried out through interviews with three representative community groups; 12 respondents in each sample village. The total number of respondents who finished the interview, which contained 33 questions were 48 respondents. The average time allocation of interviews with each respondent was approximately 30 to 60 minutes by avoiding discussion with respondents [15] Questions were arranged based on six dimensions of willingness: the business community, public knowledge of the businesses in question, leadership, community climate, knowledge of candlenut agroforestry and coffee agroforestry, and resource prevention. Scoring answers any questions using a scale of 1 to 10, carried out independently by two researchers using the Individual Scoring Sheet (LSI), are different. The agreement between the two
researchers resulted in a Combination Score (SK) used to obtain a Calculated Score (ST) for each dimension. Visualization of community readiness level is mapped using Excel for Windows charts.

Statistical analysis was performed to examine differences in community readiness levels between villages and between types of agroforestry and the correlation between variables and dimensions of CRM. For that purpose, the comparative hypothesis test is the T-test and the Spearman Rank correlation test.

3. Results and discussions
The main result of this study was the level of community readiness shown by the Cobweb graph (Figure 2). The chart shows that the level of readiness of the candlenut agroforestry communities in Sigimpu and Karunia villages that had a higher level of readiness (6.2 and 5.1) compared to the people of Bolapapu Village and Salua Village who practice coffee agroforestry with their readiness levels were 4.9 and 4.7. The graph also shows the dimensions of community business, and their knowledge of the business showed the highest and lowest levels of readiness. The highest was in the people of Sigimpu Village (7.2), while this dimension was the lowest score in the people of Salua Village (3.8).

Candlenut agroforestry had a level of preparation and initiation readiness showing different values in all dimensions. Likewise, in coffee agroforestry, a pre-planning readiness level has different values in all dimensions. The t-test in Table 2 shows a comparative analysis that indicates differences in readiness values according to dimensions in candlenut agroforestry and coffee agroforestry.

![Figure 2. The readiness of communities practice candlenut agroforestry (Sigimpu and Karunia Villages) and practice coffee agroforestry (Bolapapu and Salua Villages).](image-url)
Table 1. T-test result of candlenut agroforestry and coffee agroforestry in 5 Dimensions

| Dimension                          | T     | Sig. (2-tailed) | Mean Difference | Std. Error Difference |
|------------------------------------|-------|----------------|----------------|----------------------|
| Community effort and knowledge of efforts | 2.801 | 0.135          | 1.74           | 1.43                 |
| Leadership                         | 1.414 | 0.029          | 0.20           | 0.14                 |
| Community climate                  | 1.414 | 0.029          | 0.48           | 0.34                 |
| Knowledge about issue              | 2.887 | 0.102          | 1.21           | 1.42                 |
| Resources                          | 1.408 | 0.049          | 0.66           | 0.46                 |

Table 1 shows the dimensions that indicate a significant difference between the Candlenut and Coffee Agroforestry’s, namely the dimensions of Leadership (p = 0.029), Community climate (p = 0.029), and Resources (p = 0.049).

In the ontology dimension, knowledge can be categorized as personal knowledge and social knowledge of the community or group/organization. However, society or an organization cannot produce knowledge without the thoughts or ideas of an individual or a person [16]. Therefore, socio-ecological interactions are fundamental in generating and developing knowledge in society. This also means that people's knowledge will potentially have implications for the development of agroforestry in rural areas. Local knowledge not only plays the right role in planning a project but also helps the community to face various obstacles in implementing development [17,18]. Applying knowledge in agroforestry development will make knowledge dynamic and developing. It can even generate new knowledge through individual capacity and collective learning. Recognition of capacity and ability development will be able to direct development capabilities to a better level of community readiness.

Knowledge development must go through the context of life and social interactions, exchanging experiences, and information in complex situations of socio-economic and cultural life [19]. A learning network is needed to improve the ability to find new learning sources that are relevant to exist local information needs [20]. Traditional networking can use modern social media and process it to be effective and efficient in developing knowledge itself and contributing to development [21].

Individual capacities and abilities are fundamental in generating new knowledge due to the socio-ecological interactions concerned as agroforestry actors. Sharing ideas and knowledge in society is a crucial phase in developing science to get recognition and be adopted by the wider community. Modern social media can contribute to this phase, where knowledge management plays an important role. Community readiness is an essential factor determining whether a program can be implemented effectively and supported by the community [22]. Further explained that information on the effectiveness and public support, through community readiness models, can also be known information about further research is needed. The establishment of community readiness will be in an optimal policy implementation system, namely when management regularly performs effective internal monitoring and evaluation based on accurate data and information routinely obtained.

The willingness of the public is essential information, especially for underdeveloped communities, so that information and government intervention can be more optimal in improving community businesses or businesses [23]. This argument is very much in line with the application of CRM in managing candlenut agroforestry and coffee agroforestry in the study area where the target community is a village community that can be categorized as a Bottom of Pyramid (BOP) community. There are two distinguishing factors between rural and urban communities in the context of community readiness, namely networking and a sense of belonging [24]. Increasing community economic enterprises is possible because forests and agroforestry can contribute at least 34% of total community income [25]. However, this income can be
hampered and not maximized by the limitations of the structural and institutional factors of the village community [26]. Also, the size of land owned by farmer households is an important factor for farmers' income and welfare [27].

The community readiness model (CRM) assumes that a community will have a level of readiness to implement or develop a program, and this is the determining factor whether local programs, for example, the development of candlenut and coffee agroforestry on the outskirts of TNLL, will be effectively supported by the community [22]. Furthermore, it was explained that CRM was developed to meet research needs as well as an applicable practical instrument to help the community to make meaningful changes.

4. Conclusions
Candlenut and coffee agroforestry practiced by local communities around the Lore Lindu National Park need to be developed, not only for the livelihood of these communities but also for the conservation of the national park area. The readiness of the community actors to build each of these agroforestry systems has a different level. Candlenut agroforestry communities have a higher level of readiness compared to the coffee agroforestry actors. However, the knowledge factor is the most critical dimension to get attention to develop this agroforestry

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