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Principal agent in tree mortgage system on traditional agroforestry management in Moluccas Indonesia

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Abstract. The agroforestry system in land management has been carried out traditionally by societies in Moluccas. The practice is known as *dusung*, and includes the cultivation of nutmeg trees. Farmers face a number of problems, one of which is a system of debt bondage that inflicts financial loss upon the farmers. This study aims to explain the involvement of farmers with debt bondage system, namely the tree mortgage system (TMS). This research uses a case study approach, with the collection of interviews and participant conservation data. The data is analysed using principal agent theory. The results showed that nutmeg farmers (principal) have a risk when debt bondage (agent) denies an agreement/moral hazard or acts out an agreement. This occurs when agent exploits the access of information and nutmeg marketing prospects, which makes the position of farmers weak and disadvantaged. Improving contracts for TMS and local institutional strengthening is necessary, as it can improve the bargaining position of nutmeg farmers and encourage the preservation of forest resources through sustainable management of nutmeg *dusung*.

1. Introduction

Agroforestry has long been practiced for generations by the people in Moluccas Islands, known by the term *dusung*. This land use pattern combines crop farming (agriculture) and forest trees or forestry (forestry) in the same area and at the same time. One of the perennial plant species developed by communities in *dusung* is nutmeg (*Myristica* sp). According [1] nutmeg is endemic to the Moluccas Islands, and it has played an important role in the world economy since the VOC time; even today, the world demand for nutmeg is still very high.

Unfortunately, nutmeg farmers in the Moluccas Islands remain in a state of helplessness with high poverty rates, despite the worldwide demand for nutmeg. According to data from [2], community plantations of nutmeg in Moluccas province has a total area of 22,271 ha with a total production of 2,347 tons and productivity of 337.56 kg / ha. The number of nutmeg farmers has also increased, from 17,173 people in 2008 to 20,199 people in 2010.

The effort to increase the area of community forest requires government support, such as infrastructure and the strengthening of domestic market [3], [4]. It also requires the support of access



provision to funding the community-based sustainable forest management to increased participation of local communities in forest management, the availability for community source of income in forestry sector, and poverty alleviation [5], [6]. Unfortunately, formal banking institutions are still not willing to fund small-scale ventures, especially for businesses with small-scale plantations, such as Nutmeg *dusung*.

As a form of the community forests, nutmeg farmers often lack standard levels of formal education and must rely on their growing experience. The weak financial management and marketing systems of nutmeg in Moluccas, especially Ambon city, is the reason for farmer involvement in debt bondage. In the local language, debt bondage is referred to as *ijon*, and refers to a system that is very detrimental. Research on *ijon* is rare. For that reason, this study aims to examine the relationship between nutmeg farmer involvement and *ijon*, specifically as it is practiced through a tree mortgage system (TMS). Understanding about the reasons farmers participate in nutmeg TMS can assist in efforts to empower communities around the forest.

2. Methodology

The research was conducted in the village of Hutumuri, District Salahutu Moluccas province. Geographically, this village is located at position 30 to 40 LS and 1280-1290 BT bordering Leihitu peninsula and peninsula Salahutu (Central Moluccas). The village has an area of approximately 15 km² with hilly topography and an elevation of of 50-200 meters above sea level. The distance from the provincial capital is about 25 km, which can be reached within 1 hour drive by using two-wheeled vehicles or four wheels. Hutumuri village was selected as the research site because it is has potential for effective nutmeg *dusung* and is the largest producer of nutmeg in the District of South Leitimur, Ambon.

This research uses the case study method. Data collection was conducted through in-depth interviews and participant observation. Interviews involved 15 owners of Nutmeg *dusung*. Data analysis was performed using the Principal Agent Relationship Theory to explain the existence of a relationship in which one person or multiple people (principal/s) trust in one person or multiple people (agent/s) to perform a task through the delegation of decision-making authority to the partner in question (agent). In the context of this study, the principal-agent relationship is beset by three types of problems: (1) problems related to the transfer of ownership rights (transfer of rights), (2) the problem of a mismatch of information (asymmetric information) in a relationship of principal and agent, and (3) the emergence of transaction costs (information costs, coordination costs and strategy cost).

3. Results and discussions

3.1. Transfer of Rights

Harvesting nutmeg on *dusung* managed by communities typically occurs three times a year. Harvesting periods generally occur from March-April, July-August and December-January. Nutmeg harvest periods are associated with the TMS. TMS has a long history in this region, and is one form of the agreement established between nutmeg farmers as principal (P) and debt bondage (*ijon*) with those who borrow capital as an agent (A). The system shows the temporary transfer of rights between P and A. In TMS, farmers (P) use a certain number of nutmeg trees as collateral for borrowing money. Farmers participate in TMS due to economic needs, such as school or college fees, home improvement and other purposes.

The TMS is as follows:

- 1) The two sides, both farmers (P) and creditor (A), know each other well, often through family ties. Thus, *ijon* requires no physical evidence (letter loan) which binds both parties. Mutual trust between the two sides functions as a major asset in this pledge system.
- 2) There are 2 forms of TMS system:
 - a. The annual mortgage. This is an agreement where the trees are mortgaged as collateral for ≥ 1 year, according to the agreement. The annual pledge requirements are as follows:
 - Creditor (*ijon*) will survey the physical condition of trees (diameter and height) as well as the number of trees to forecasted how its value as collateral for the loan value.

- During the mortgage time, the process of maintenance and harvesting is fully arranged by Creditor (*ijon*). Maintenance tasks can be performed together or not, depending on the agreement. Sometimes the creditor hires special labor to nurture the trees or works with the owner of the tree.
 - At harvest time, when yields exceed the value of the loan, the creditor receives all surplus value. When yields are less than the value of the loan, the creditor incurs the loss.
 - Farmers are entitled to participate in the harvest process and are paid by the creditor during the harvest period.
- b. The seasonal mortgage. This is an agreement applicable at the time of harvest. Terms for the mortgage seasons are as follows:
- Trees used as collateral mortgage that is only valid for the largest harvest. For nutmeg *dusung*, large harvests with good quality nutmeg seeds occur during the rainy season (July-August).
 - During the large harvest season, creditors have rights to the yield of all mortgaged trees. If the value of the yield is less than the loans that have been received by the farmer, the excess debts remain valid for the next harvest in order to cover the rest of the loan. However, when the value of the yield is more than the value of the loan, the creditor keeps the surplus.
 - Farmers are entitled to participate in the process of harvesting and will be fully paid by the creditor during the harvest period.

3.2. Asymmetric Information

Relationships created through the TMS between nutmeg farmers as principal (P) and creditors as agents (A) can lead to asymmetric information. This asymmetry exists because marketing and sale price of nutmeg is fully controlled by A. P trusts the sales process and distribution of nutmeg to A, and so almost all information on the management and marketing of the *dusung* is controlled by A. Principal-agent theory establishes that, when an agent has more information about the performance, motivation, and goal, it can create moral hazard and adverse selection [7]. In the context of nutmeg TMS, A exploits the advantage of nutmeg market information and marketing prospects. The relationship between farmers and creditors within the TMS system thus generates a moral hazard that indicates P will not get a fair mortgage loan from the harvest. The principal should pay the costs to monitor the performance of A, and establish incentives structure and efficient monitoring.

Within TMS agreements, P and A often agree that tree maintenance is organized by A. However, this form of rights transfer may put farmers in a weak position, for example when trees are attacked by pests or disease. In this example, treatment will require P bear the consequences of poor maintenance, while A doesn't have any substantial consequences. This indicates that P has a risk if A breaks trust. In many TMS agreements, there is not a signed contract between P and A; it rather based on the trust that is built between the two parties. This can cause opportunistic attitudes when one of the parties, whether P or A, violates the agreement.

3.3. Transaction Cost

Transaction costs are incurred when nutmeg farmers (P) completely trust creditors as agents (A). The emergence of the transaction costs for any coordination process cannot be separated from a marketing system that is fully controlled by A. In the TMS, P should coordinate frequently with A. Coordination meetings establish *dusung* conditions, and help determine an appropriate harvest time.

Information costs are incurred by both parties, P and A. However, A has more control over information, especially about marketing the products from the Nutmeg *dusung*. P is unable to access marketing and sale information, due to the absence of cooperatives local institutions. This weakens the bargaining position of farmers (P). As a result of asymmetric information, power and other resources, A is able to spend strategically on transaction costs to secure business activities.

3.4. Improvement Contract on Tree Mortgage System

Risk incurred by farmers and creditors (either by P and A) exist because the TMS is inefficient. However, the inefficiency is not borne equally by both parties: farmers, as principals, are systematically exploited through TMS. In the seasonal TMS arrangement, if the yield is less than the value of the loan that has received by P, the mortgage remains valid for the next harvest in order to cover the lack of the P loan. However, if the value of the yield exceeds the value of the loan, then A claims all surplus value. According to [8] the process of contract improvement is essential to minimize the risk of P.

Determining the optimal written contract is very important, and much outline the rights and obligations between P and A to ensure a fair and equitable agreement. The contractual relationship between P and will guarantee that P gains incentives from *dusung* management activities. P can draw up contracts where they modify the behavior of A. To design an efficient P-A relationship, the contract should be self-enforcing, and minimize the risk of moral hazards and inefficiencies. The following improvements can guide contract improvements between nutmeg farmers and creditors who develop a TMS agreement.

- 1) P can select an A based on their potential to receive the best price. In this case, P needs to identify who will work with him, so that the potential of the A can be taken into consideration.
- 2) P can monitor the activity of A. Monitoring efforts are necessary because information asymmetry leads to the weak bargaining position of P.
- 3) P can draw up a contract which contains articles that increase the TMS agreement's credibility. This can outline penalties for violating agreements, and identify courses of remediation.

In addition to TMS, strengthening of local institutions is also necessary. The weak bargaining position of nutmeg farmers in Hutumuri village is inseparable from the existence of an inefficient market system; farmers increasingly depend on creditors (*ijon*), because they do not have the option to sell their products elsewhere. Long chains of commerce and a lack of market information is also a disadvantage for farmers. Moreover, the absence of organizational support for farmers and other parties related to the bargaining position of farmers is very low. According [9], collaboration between local institutions, local NGOs, national and international, universities, research institutions, private companies through CSR, and others can improve the bargaining position of local institutions, in order to encourage local government policies that favor local institutions (see [10]).

The increased bargaining position of nutmeg farmers can encourage forest resources sustainability through nutmeg *dusung* management. Studies conducted by [11] in the village of Soya (Ambon Island), Alang village (Ceram), as well as Paperu Booi village (Saparua) shows how Nutmeg *dusung* promote many positive outcomes beyond economic development, including environment and social benefits. Nutmeg *dusung* performance at all locations showed that: (1) productivity and cost structure nutmeg farmers' income is associated with the number of cultivated plants; (2) cultivation and security efforts undertaken by the owner with the help of Kewang (traditional forest police) indicates the orientation of the productivity and sustainability; (3) community priorities in managing *dusung* is for commercial purposes, especially for nutmeg and clove cultivation, while vegetables are for subsistence purposes; and (4) cultivation of *dusung* is relatively efficient if calculated by the ratio of the input and output of production. For these benefits to accrue in the long-term, it is essential that financial contracts avoid moral hazards and inefficiencies, and that institutional improvements, such as rights relating to land/tree ownership, control, management and the availability of and respect for tenure, is mutually recognized by *dusung* owners, managers, harvesters and their communities.

4. Conclusions

The relationship between nutmeg farmers and creditors (*ijon*) in TMS reveals specific problems that accompany the temporary transfer of rights from the farmer to creditor. Asymmetric information occurs because creditors have access to and exploit marketing and price information when issuing loans and incurring transaction costs from TMS activities. Improvement of contract system for tree mortgages should emphasize issues and results related to the monitoring and evaluation of the system implementation. Strengthening local institutions is also important to addressing inefficiencies, because

it can improve the bargaining position of nutmeg farmers and encourage the sustainability of forest resources through sustainable management of nutmeg *dusung*.

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