Bamboo, farmer motivation on cultivation and its affecting factors

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Abstract. Motivation is an important factor to encourage community on bamboo cultivation or maintain existing bamboo plantation. This study aims to determine farmer motivation on bamboo cultivation and its affecting factors. This research was conducted in Sukaharja Village, Rajadesa Sub-district, Ciamis District, West Java on November 2016. Primary data collection is done through interviews and Focus Group Discussion (FGD) with 30 farmers involved in the development of bamboo agroforestry demonstration plots. The questionnaire consisted of socioeconomic characteristics of farmers and farmers motivations for bamboo cultivation. A survey was conducted to determine the motivation statements of farmers on bamboo cultivation using five-point Likert-type scale from 1 = strongly disagree to 5 = strongly agree. Data analysis was carried out using descriptive methods and Likert's Summated Rating (SLR). The result showed that farmer motivation on bamboo cultivation in Sukaharja Village was low. The number of family dependents and the number of information sources are affecting farmer motivation on bamboo cultivation. The farmer motivation on bamboo cultivation can be increased through providing a comprehensive information from stakeholders such as research institute, universities and others stakeholder and increasing the added value of bamboo such as post-harvest processing and expanding its marketing network.

1. Introduction

Bamboo is one of the most multi-use natural products available [1]. Bamboo can be used as a substitute for wood in construction, furniture, scaffolding, flooring [2], roofing, fabrics and cloth, pulp and paper, charcoal, food (bamboo shoots), and ornamental garden planting [1,3], and used in housing and for other construction purposes [4]. Bamboo is also known to be a valuable ecological resource for soil and water conservation and restoration of degraded lands [1]. The most widely known features of bamboo are its fast growth [1,5], adaptability, resilience and substantial biomass production [1].

About 1.5 billion people depend on bamboo for their daily lives [1]. In Indonesia, bamboo areas reported by the agricultural census belong to farmers and thus are classified as private and bamboo forest areas are owned by the government and are classified as public [3].

In spite of the fact that most bamboo resources grow naturally, more prominent consideration has been paid as of late to the foundation of planted bamboo. Bamboos have long been cultivated in villages and, historically, the rural poor have been the prime users of naturally regenerating bamboo [3]. In the Sukaharja Village Ciamis District, population growth and new bamboo processing opportunities have
led to the over exploitation of bamboo resources and farmer replaces bamboo with other commodities because economic reason. It can threaten the existence of bamboo plantation. Widyangsih et al. [6] stated that community perception on bamboo in Sukaharja Village was positive, but not many people cultivate bamboo. The community has assumed that bamboo is a legacy plant that does not need to be cultivated and its existence will not be exhausted. Limited land ownership is also one of the problems, if the land was cultivated with bamboo, they cannot cultivate other plants. Planting with agroforestry based bamboo have not yet understood by the community.

Motivation is an important factor to encourage community on bamboo cultivation or maintain the existing bamboo plantation. Hammond et al. [7] said that understanding the motivations of smallholder farmers to adapt their practices is essential in designing appropriate interventions. The motivations data can also be used to inform the design of mechanisms that encourage farmers to adapt their behaviors. This study aims to determine farmer motivation on bamboo cultivation and its affecting factors.

2. Materials and Methods
This research was conducted in Sukaharja Village, Rajadesa Sub District, Ciamis District, West Java on November 2016. The research location is presented in Figure 1.

![Figure 1. The research location in Sukaharja Village Ciamis District](image)

Primary data collection was done through interviews and Focus Group Discussion (FGD). Interviews were conducted with 30 farmers involved in the development of bamboo agroforestry demonstration plots. FGDs were carried out by involving cultivating farmer’s, farmer group and village officials. Secondary data were obtained from Sukaharja Village Office, Rajadesa Sub District, Ciamis District.

The questionnaire consisted of two major parts: the first part included socioeconomic characteristics of farmers, such as age, education level, number of family dependents, farming experience, land ownership, and income. The second part included statements of farmer’s motivations on bamboo cultivation. For measuring farmer’s motivations, the respondents were asked a set of questions addressing their motivation. A list of 10 motivation factors was finally created and considered, namely: internal motivation (needs, wants, personal expectations, pride, and job satisfaction) and external
motivation (type and character of job, working group, workplace situation, workplace organization, and the current reward system).

A survey was conducted to determine the motivation statements of farmers motivations on bamboo cultivation using five-point Likert-type scale that captured farmers' responses to the tested set of motivations from 1 = emphatically oppose this idea to 5 = unequivocally concur. The independence of the farmer characteristics and the motivations was tested using a Spearman's test.

Data analysis was carried out using descriptive methods and Likert's Summated Rating (SLR). Descriptive method is a method of analysing and describing the existing research data and is related to theories that have to do with problems in order to draw conclusions. While the Likert scale (1–5) is used to measure the attitudes, opinions and perceptions of a person or group about social events or phenomena then a range of each category is made using the formula 1 and scores of farmer motivation for bamboo cultivation are presented in Table 1:

\[
\text{interval} = \frac{\text{max score} - \text{min score}}{\text{number of category}} - 0.01
\]

| Category    | Scale | Score     |
|-------------|-------|-----------|
| Very high   | 5     | 4.20 – 5.00 |
| High        | 4     | 3.40 – 4.19 |
| Medium      | 3     | 2.60 – 3.39 |
| Low         | 2     | 1.80 – 2.59 |
| Very low    | 1     | 1.00 – 1.79 |

3. Results and Discussion

3.1. Bamboo in Sukaharja Village

Ciamis District has the potential of bamboo with an area of 5,169 ha and the number of stands of 3,751,357 stems [9]. Bamboo in Sukaharja Village grows naturally and has a potential of 765 bamboo stems per hectare with 53% composed of young bamboo and 47 % old bamboo. The most common types of bamboo found in Sukaharja Village are apus bamboo (Gigantochloa apus), other types of bamboo are petung (Dendrocalamus asper), buluh (Gigantochloa atter), gombong (Gigantochloa pseudoarundinacea), and haur (Bambusa vulgaris v. Vitata) [10].

This shows that Sukaharja Village has considerable bamboo's potential. The apus bamboo has been used for the construction of buildings/houses with inter-regency marketing areas. There are many other uses of bamboo as conveyed by Velez [11] that bamboo is a renewable resource in the areas of construction and infrastructure, which is used structurally in homes and other buildings. Bamboo can be utilized for furniture, carpets, paneling, flooring, allotments, plumbing, roof, structure and shapes, among numerous others.

Apus bamboo is the type of bamboo that is most widely traded by the community which is sold at IDR 2500-3000/stem (prices at locations) and IDR 5000-6000/stem (prices at roadside) [6]. Although this price is still considered very low for farmers, however, farmers still can feel the economic benefits of this type of bamboo. The apus bamboo can be harvested every year without having to do maintenance and can provide better results from young stems and old stems [10].

3.2. Internal and external characteristics

Farmer's internal characteristics are factors that come from within the farmer himself and affect the role and performance of the farmer. Farmer's internal characteristics in this study include age, education
level, number of family dependents, farming experience, income and land ownership. According to Budiono [12], demographic characteristics that affect farmers in managing farming both shifting cultivation and dryland agriculture include age, education level, knowledge, number of family dependents, income, farming experience, land ownership and cosmopolitanism. Farmer’s internal characteristics on bamboo cultivation in Sukaharja Village are presented in Table 2.

Table 2. Internal characteristics of farmer’s

| No. | Description                      | Interval | Average | Score | Category |
|-----|---------------------------------|----------|---------|-------|----------|
| 1.  | Age (years)                     | 20 - 70  | 48.8    | 3.4   | high     |
| 2.  | Education level (years)         | 0 - 12   | 6.2     | 2.1   | low      |
| 3.  | Number of family dependents     | 0 - 5    | 2.2     |       |          |
| 4.  | Farming experience (years)      | 0 - 50   | 21.3    | 2.2   | low      |
| 5.  | Income (IDR/year)               | 0 – 98,000,000 | 1,282,824 | 2.4   | low      |
| 6.  | Land ownership (hectares)       | 0 – 0.37 | 0.02    | 2.2   | low      |
|     | **Average**                     |          | **2.58**|       | low      |

Table 2 shows that almost all internal characteristics are in the low category except age (high) and number of family dependents (medium) with an average score of 2.58 which is in the range of 1.80-2.59 and included in the low category. Age is one of the important factors in supporting someone who will increase work motivation and productivity. Maturity level signifies his mindset. The greater the number of family dependents will increase community motivation to work harder in meeting their needs.

External characteristics of farmers examined in this study are extension intensity, extension channel and number of information sources. External characteristics of respondents in Sukaharja Village on bamboo cultivation are presented in Table 3.

Table 3. External characteristics of farmer

| No. | Description            | Score | Category |
|-----|------------------------|-------|----------|
| 1.  | Extension intensity    | 2.4   | low      |
| 2.  | Extension channel      | 2.2   | low      |
| 3.  | Number of information sources | 2.8 | medium |
|     | **Average**            | 2.47  | low      |

All external characteristics of farmer’s are in the low category with an average score of 2.47 (1.80-2.59) except number of information sources (medium). At present, information technology can make it easier for community to obtain knowledge related to bamboo, so that it can increase communities motivation in bamboo cultivation. Armstrong and Taylor [13] said that knowledge is what people know about concepts, ideas, theories, methods, phenomena, activities and objects.

Farmer’s knowledge of bamboo can be seen by asking a number of things starting from the aspects of cultivation, utilization, processing and marketing. Buckley and Shortle [14] said that farmers use and integrate knowledge from various sources in order to meet their diverse knowledge needs. In numerous cases the farmer’s information was the foremost noticeable and trusted information source, because it is seen as locally significant and meaningful. In their daily operations, farmers rely primarily on their knowledge they have accumulated, often over extended periods of time, from their practical experience: doing, experimenting and observing.

The potential of existing bamboo plantation can be increased in value through the processing into handicrafts (glass/cups) to get added value and increase community income. The research team has
facilitated the community through training activities to become bamboo craftsmen and succeeded in recruiting 1-2 people who until now have been able to make bamboo crafts as their main source of livelihood. However, these efforts have not succeeded in increasing the motivation of the community to cultivate bamboo.

The frequency of extension workers’ visits to Sukaharja Village is a frequent category. Extension workers regularly visit farmer groups on a schedule once a month depending on needs, but of course extension workers have much information and knowledge limitations regarding bamboo in all its aspects (cultivation, utilization, processing and marketing). The people in the research location are people who depend their lives on vegetables/rops so that the knowledge of extension workers is limited to the commodity.

3.3. Internal and external motivation
Motivation is the strength and heading of conduct and the components that impact individuals to act in certain ways. The term motivation can allude differently to the objectives that people have, the ways in which people chose their objectives and the ways in which others attempt to alter their behavior. Individuals are motivated when they anticipate that a course of activity is likely to lead to the fulfillment of an objective and an esteemed remunerate-one that satisfies their needs and wants [13].

Factors influencing farmer motivations are categorised into intrinsic and extrinsic factors [15] and [13]. Intrinsic motivation takes to put when people feel that their work is critical, curiously and challenging which it gives them with a sensible degree of independence (opportunity to act), openings to attain and progress, and scope to utilize and create their abilities. It can be depicted as inspiration from the work itself [13].

Extrinsic motivation happens when things are done to or for individuals in arrange to motivate them. These include rewards such as motivating forces, expanded pay, laud or advancement, and punishments such as disciplinary activity, with holding pay, or criticism. Extrinsic motivators can have an immediate and powerful effect, but it will not necessarily last long [13]. Extrinsic factors are demographic, economic, geographical, and intrinsic factors are related to knowledge, perceptions, attitudes; and found that intrinsic factors in particular are often overlooked [15]. An intrinsically motivated action is not reliant upon any outcome separable from the behavior itself. For example, a farmer may undertake an environmental activity, such as planting trees, for no other reason than because it is innately satisfying. Conversely, extrinsic motivation is instrumental in nature and so is performed to attain some other outcome. For instance, a farmer might undertake environmental activity as part of an Agri Environmental Services (AES) in order to receive a payment [16]. Intrinsic motivation refers to doing something because it is inherently interesting or enjoyable, and extrinsic motivation, which refers to doing something because it leads to a separable outcome [17].

Farmers internal motivation on bamboo cultivation (Table 4) is influenced by needs, wants, personal expectations, pride, and job satisfaction [13]. Table 4 shows that the internal motivational factors are in the low category with an average score of 2.57 (1.80-2.59), except for the needs and wants factors that are in the medium category. This is consistent with Armstrong and Taylor [13] that people are motivated when they expect that a course of action is likely to lead to the attainment of a goal and a valued reward one that satisfies their needs and wants.

The link between needs and behaviours is direct and automatic, rather than mediated by human consciousness, values and choice [18]. Intrinsic motivation alludes to accomplishing something since it is naturally intriguing or pleasant [17]. Bamboo has not fulfilled the farmers’ expectations, especially in the economic aspects to be used as the main source of livelihood. The lack of diversification in the use of bamboo, which so far has only been limited to construction/buildings is thought to influence this assumption. The price of a bamboo stick measuring around 6 m in length is priced at IDR 6000/stick.
People certainly think that the selling price is still not meet with their expectations, especially if it is associated with the time needed to grow the bamboo plants (the average harvest age is 3-5 years).

**Table 4. Internal motivation of farmers**

| No. | Description               | Score | Category |
|-----|----------------------------|-------|----------|
| 1.  | Needs                     | 2.80  | medium   |
| 2.  | Wants                     | 2.83  | medium   |
| 3.  | Personal expectations     | 2.50  | low      |
| 4.  | Pride                     | 2.37  | low      |
| 5.  | Job satisfaction          | 2.37  | low      |
|     | **Average**               | **2.57** | low     |

Economic dependence is diminishing farmer motivation to participate in conservation programs, but found that income was less important than other factors for responders [19]. In their review of about 160 studies on factors that affect farmer participation in biodiversity policies, Siebert et al. [20] found that many analysis corroborate that economic motivations play a key role—which is not surprising since farmers need to manage their farms in an economically viable way. Financial compensation and incentives function as a necessary, though clearly not sufficient, condition to explain farmer support for agri-environmental measures. Burton and Schawarz [21] and Home et al. [22] said that they concluded by pointing to a need for more conceptual and empirical attention for influencing social norms and expectations, which escape scientific attention when focusing principally on farmer’s individual economic interests.

For decades the people in Sukaharja Village have made the agricultural sector, especially the cultivation of vegetables/crops as the main source of livelihood to meet the needs of daily life. The inherent habit is certainly difficult to let go of if the community has not seen other work alternatives that are more promising, especially agroforestry bamboo cultivation which so far has not attracted their attention. Farmers external motivation (Table 5) is influenced by type and character of job, working group, workplace situation, workplace organization, and current reward system [13].

**Table 5. Farmers external motivation**

| No. | Description               | Score | Category |
|-----|----------------------------|-------|----------|
| 1.  | Type and character of job | 2.10  | low      |
| 2.  | Working group             | 2.60  | medium   |
| 3.  | Environmental situation   | 2.40  | low      |
| 4.  | Workplace organization    | 3.53  | high     |
| 5.  | Current rewards system    | 2.43  | low      |
|     | **Average**               | **2.41** | low     |

The most of farmers external motivation have a low score, except for working group (medium category) with an average score of 2.41 (1.80-2.59). Farmers feel comfortable with the existence of farmer groups where they share experiences/information/gatherings.

**3.4. Factors affecting farmers motivation on bamboo cultivation**

Based on the calculation results (Appendix), relationship between characteristics (internal and external) and motivation (internal and external) are presented in Table 6. The correlation between number of family dependents (internal characteristic) and number of information sources (external characteristic) on workplace situations (external motivation) is quite strong, significant and unidirectional. This means
that the greater number of family dependents will increase the motivation of the community to work harder to meet their needs, so that it requires a comfortable workplace situation. At present, the community is very easy to access data and information through technology. So the source of information is not only through counseling (face to face). This condition allows farmers to get comfortable in working. Comfortable work situations, one of which can be obtained from various things such as other farmers who have the same goals.

Table 6. Statistical test results using a Spearman’s test

| No | Relationship between | Correlation coefficient | Significant |
|----|----------------------|-------------------------|-------------|
| 1. | Farming experience (internal characteristic) with pride (internal motivation) | -0.411 | 0.024 |
| 2. | Number of family dependents (internal characteristic) with workplace situation (external motivation) | 0.438 | 0.016 |
| 3. | Income (internal characteristic) with current rewards system (external motivation) | -0.378 | 0.040 |
| 4. | Extension channel (external characteristic) with workplace situation (external motivation) Number of information sources (external characteristic) with workplace situation (external motivation) | -0.400 | 0.028 |
| 5. | | 0.365 | 0.047 |

A farmer's motivations could not, in this case, be reliably inferred from his livelihood and farm characteristics without having gathered separate, specific information regarding motivations. Such data are not usually collected, and socio-demographic proxies are usually used instead [23]. In this study, the usual proxies (age, ethnicity, education) showed no significant predictive power of farmer’s motivation type. Our results here show that predicting how likely a farmer is to adapt his behaviour based on the usual farm typology data of farm structural characteristics, livelihoods or demographics [24] is not a very reliable strategy, and that consideration of intrinsic motivations [15] should be done separately. However, we acknowledge that further work is required to test the degree to which these motivation types accurately predict actual behaviour. A panel survey approach would be very valuable in this regard, particularly where farmer’s responses to an intervention or set of interventions could be monitored [7].

Some people will be much more motivated by money than others. It cannot be assumed that money motivates everyone in the same way and to the same extent. Avoid the introduction of a performance-related pay scheme in the belief that it will miraculously transform everyone overnight into well-motivated, high-performing individuals [13].

3.5. Policy implication

Motivation will be more successful in leading to the desired behaviour if incentives or directives are tailored to both complement existing or intrinsic motivations and to remove barriers [25]. Intrinsic motivation emerging from the work itself can be more impressive than extrinsic motivation.

The interplay between intrinsic and extrinsic motivations is more complex and cannot be straightforwardly separated [26]. In the initial stages an extrinsic motivation approach can be used to increase community motivation in bamboo cultivation. Although Ryan and Deci [17] said that some extrinsic motivations can undermine and suppress intrinsic motivations and Greiner and Gregg [27] said that it can even lead to crowding out of intrinsic motivations.

Shifting farmer’s extrinsic motivations for undertaking environmental management activities to more intrinsic ones is necessary to ensure sustained and widespread environmental improvements. As
environmental practices that are undertaken voluntarily, without coercion or incentives, have a greater potential for sustained and durable benefits. Farmer motivation on bamboo cultivation can be increased through the transfer of knowledge and technology from research institutes, universities and others stakeholders and increasing the capacity of extension workers.

4. Conclusion
The motivation of farmers on bamboo cultivation in Sukaharaja Village is low because bamboo is considered unable to provide promising economic value to farmers. Factors that can effect farmer motivation are the number of family members and the number of sources of information. The farmer motivation on bamboo cultivation can be increased through providing a comprehensive information from stakeholders such as research institute, universities and others stakeholder and increasing the added value of bamboo such as post-harvest processing and expanding its marketing network.

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Appendix 1. The relationship between internal characteristic and internal motivation

| No. | Internal characteristic | Internal motivation               |
|-----|-------------------------|-----------------------------------|
|     | Needs                  | Wants                             | Personal expectations | Pride                  | Job satisfaction |
|     | Corr. Coeff. | Sig. | Corr. Coeff. | Sig. | Corr. Coeff. | Sig. | Corr. Coeff. | Sig. | Corr. Coeff. | Sig. |
| 1.  | Age                     | 0.001 | 0.996 | 0.087 | 0.647 | -0.038 | 0.842 | -0.091 | 0.633 | -0.151 | 0.425 |
| 2.  | Education               | -0.117 | 0.539 | -0.111 | 0.361 | 0.110 | 0.564 | -0.084 | 0.657 | 0.130 | 0.492 |
| 3.  | Farming experience     | -0.156 | 0.411 | -0.013 | 0.945 | -0.088 | 0.644 | -0.411 | 0.024 | -0.353 | 0.056 |
| 4.  | Number of family        | 0.173 | 0.361 | 0.250 | 0.183 | 0.352 | 0.057 | 0.188 | 0.320 | 0.033 | 0.864 |
|     | dependents              |                                 |                      |                     |                     |                     |                     |                     |                     |
| 5.  | Income                  | 0.092 | 0.629 | -0.031 | 0.872 | 0.261 | 0.163 | 0.216 | 0.252 | 0.087 | 0.647 |
| 6.  | Land ownership          | -0.013 | 0.945 | -0.157 | 0.409 | 0.018 | 0.925 | 0.127 | 0.503 | 0.027 | 0.886 |
### Appendix 2. The relationship between external characteristic and internal motivation

| No. | External characteristic       | Needs          | Wants          | Personal expectations | Pride         | Job satisfaction |
|-----|-------------------------------|----------------|----------------|-----------------------|---------------|-----------------|
|     |                               | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           |
| 1.  | Extension intensity           | -0.162        | 0.391          | -0.003        | 0.987          | 0.110        | 0.562          | 0.027        | 0.889          | 0.204        | 0.279          |
| 2.  | Extension channel             | -0.028        | 0.884          | -0.033        | 0.861          | 0.285        | 0.127          | -0.340       | 0.066          | -0.155       | 0.414          |
| 3.  | Number of information sources | 0.153         | 0.419          | 0.217         | 0.249          | 0.054        | 0.775          | 0.107        | 0.573          | -0.064       | 0.736          |

### Appendix 3. The relationship between internal characteristic and external motivation

| No. | Internal characteristic       | Type and character of job | Working group | Workplace situation | Organization of the place of work | Current rewards system |
|-----|-------------------------------|---------------------------|---------------|---------------------|----------------------------------|------------------------|
|     |                               | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           |
| 1.  | Age                           | 0.045         | 0.812          | 0.221         | 0.240          | 0.030        | 0.876          | 0.232        | 0.217          | 0.160        | 0.398          |
| 2.  | Education                     | -0.202        | 0.284          | 0.074         | 0.699          | -0.091       | 0.634          | -0.088       | 0.644          | -0.083       | 0.662          |
| 3.  | Farming experience            | 0.032         | 0.866          | 0.287         | 0.125          | 0.235        | 0.211          | 0.325        | 0.080          | 0.232        | 0.217          |
| 4.  | Number of family dependents   | 0.105         | 0.579          | 0.329         | 0.076          | 0.438        | 0.016          | -0.111       | 0.558          | 0.079        | 0.678          |
| 5.  | Income                        | -0.066        | 0.729          | -0.080        | 0.673          | 0.196        | 0.299          | -0.304       | 0.103          | -0.378       | 0.04           |
| 6.  | Land ownership                | -0.048        | 0.801          | 0.024         | 0.901          | 0.000        | 1              | -0.027       | 0.885          | -0.080       | 0.675          |

### Appendix 4. The relationship between external characteristic and internal motivation

| No. | External characteristic       | Type and character of job | Working group | Workplace situation | Organization of the place of work | Current rewards system |
|-----|-------------------------------|---------------------------|---------------|---------------------|----------------------------------|------------------------|
|     |                               | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           | Corr. Coeff.  | Sig.           |
| 1.  | Extension intensity           | 0.258         | 0.168          | 0.251         | 0.181          | 0.096        | 0.614          | 0.077        | 0.684          | 0.135        | 0.478          |
| 2.  | Extension channel             | -0.250        | 0.182          | 0.183         | 0.334          | 0.365        | 0.047          | 0.319        | 0.085          | 0.244        | 0.194          |
| 3.  | Number of information sources | 0.025         | 0.894          | -0.434        | 0.017          | -0.400       | 0.028          | 0.178        | 0.346          | -0.045       | 0.815          |