Customary Land Use Decisions about Tree Farming and Livelihood Strategies in Markham Valley, Morobe Province, PNG

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Abstract

This paper is an investigation of the nature of customary land-use decisions about tree farming as part of the livelihood strategies in Markham Valley of Morobe Province, PNG. The research adopted randomised purposeful sampling technique as a basis for gathering and evaluating data, while primary data collection was based on 10 percent (%) sampling intensity based on families and household units. Analysis of primary data was done using spreadsheet on MS excel and the Statistical Package for the Social Sciences (SPSS). The study found that tree farming was a central part of livelihood strategies for improving living standards and lifestyle in the Markham Valley area of Morobe Province. Tree farming enhances food security and rural economy of Markham Valley. Findings indicate that land use decisions and participation of rural people in tree farming business are affected by socio-cultural and socio-economic factors as well as lack of infrastructural development and extension services. Furthermore, the study reveals that the main challenges facing tree farming business are land ownership and land legality issues. The paper recommends a holistic approach towards understanding the livelihood needs and challenges of rural communities prior to the initiation of development projects. It also recommends proper landowner-identification-process through social mapping and genealogical studies in order to deal with rightful customary landowners, while successful tree farming entrepreneurship tends to depend on availability of customary landowners having legal land title.

Keywords: *customary land owners, land use decisions, tree farming, livelihood strategies, land legality*.

1. Introduction and Research Problem

The cultivation of tree crops is an integral part of livelihood strategies in the rural communities of Papua New Guinea. According to Igua (2001) and Bourke (2009), subsistence farming supports more than 80% of the population of Papua New Guinea. Trees are cultivated for purposes of food, fuel wood, building materials and for environmental benefits such as soil conservation, biological pest control, wind breaks and shelterbelt as well as ritual beliefs and aesthetical values (Liniger et al., 2011; Binner, 2017).

As with people elsewhere in Papua New Guinea, the rural people of Markham Valley have a number of well-established tree/food farming systems. The common agro-forestry system practised involves incorporation of tree crops in home gardens, tree gardens and also on pasture land for the purpose of fruits and nuts farming for nutrition, cash economy, shade and other environmental benefits (Bourke et al., 2002; Bourke and Harwood (Eds), 2009). The local people also practise cash

crops farming such as cocoa (Aboroma *caco*), coconut (Cocos *nucifera*) and oil-palm (Elaeis *guineensis*) farming using similar techniques of incorporating food crops (Bris Kanda Rural Economic Development Program Report, 2006). The integrated practice of tree and food crop farming systems has been a motivating factor to farmers owing to the income derived from the economic trees. According to Dai et al. (2017), intercropping of food crops with tree crops within farming systems promotes and generates reasonable incomes for the households.

According to Gupta (2017), a Soft Skills and PD Consultant and English Trainer, family and household do not mean the same thing, and they cannot be used interchangeably. Family means the people or members who are related to each other by birth, by marriage, by adoption or due to any other relationship like siblings. Immediate family members include parents, brothers, sisters, spouses, sons and daughters. Extended family members may include grandparents, aunts, uncles, cousins, nephews, nieces, and in-laws. Household is a group of people living together in the same house or apartment and may or may not be related to each other.

The purpose of this paper is to evaluate livelihood assets and factors influencing land use decision-making and the participation of customary landowners in tree farming for meeting the needs of families and household units utilizing forest resources in the Markham Valley of Morobe Province, PNG. The current joint venture tree farming project between the developer (PNG Biomass Project) and customary landowners in the Markham Valley is aimed at mitigating socio-economic problems, enhancing both food security and cash economy and also contributing towards timber production as part of sustainable livelihood strategies.

This paper is centred on the hypothesis that the land-use decisions of customary landowners practising tree farming within Markham Valley is influenced by socio-cultural and socio-economic factors, and lack of infrastructural development and extension services. In addition, the paper seeks to answer the following research question: "What are the land use decisions about tree farming as part of landowners' livelihood strategies?" The focus of the research is the land use decisions about tree farming by families and household units in the Markham Valley of Morobe Province. The research involves a people-focused investigation in which tree farmers' motives, behaviours and perceptions relating to land use and technology decisions were assessed and interpreted. The utmost aim of the study is to investigate various rural household economies, cultural norms especially ethnic issues, and how different categories of individual needs in a household or community affect daily land-use decisions and livelihood activities of local tree farmers.

2. Study Area and Research Method

The nature of the study is basically an open-ended investigation involving direct personal contacts between respondents and interviewers. The general trends and behaviour patterns of the units of analysis informed the study's findings and conclusions emanating from the hypothesis and research question addressed in the paper. The study was carried out at a selected rural community in Markham Valley of Morobe Province, located precisely at longitude 6^{o} 7' 26.75" S and latitude 146^{o} 2' 53.40" E as indicated in Figure 1. The main data collection methods were interviews, focus group discussions, meetings, ground observations, transact walks and questionnaire survey. The logic and strength of purposeful sampling (Patton, 1990; Maxwell, 1996) guided the selection of information-rich-cases for an in-depth survey.

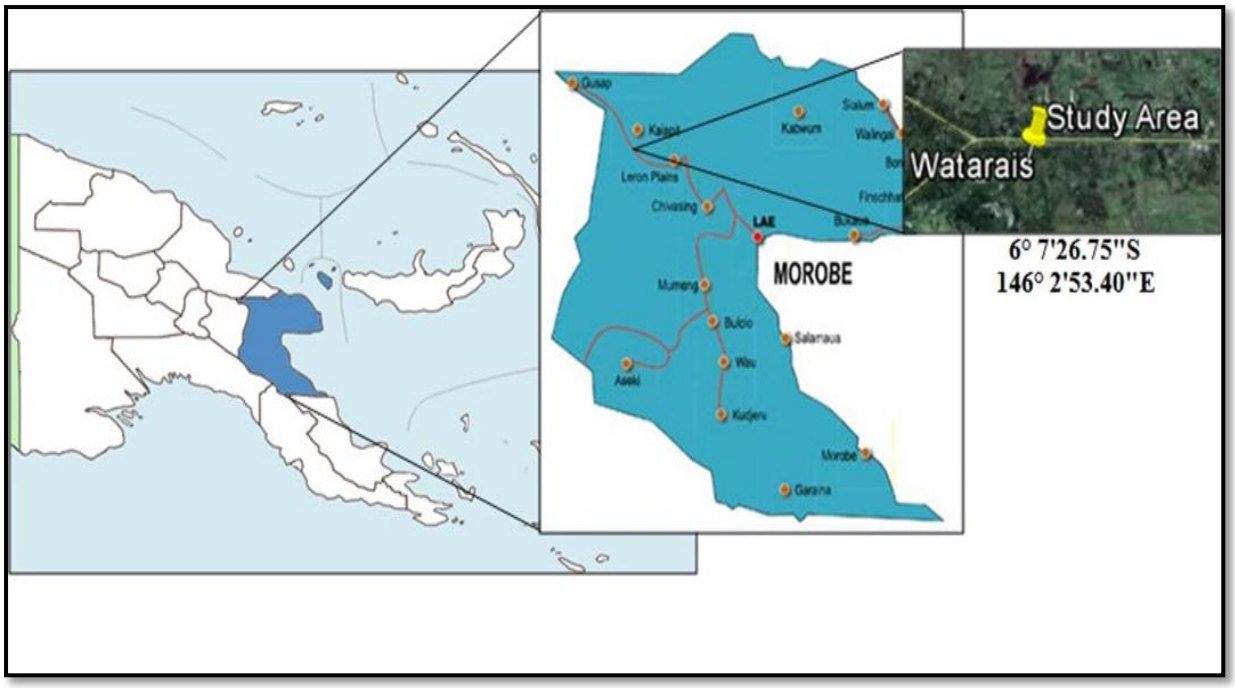

Figure 1: Location of the study site in Markham Valley of Morobe Province, PNG
Source: Google Map, 2018

The aim behind adopting purposeful sampling was to select information-rich cases for evaluation by the researcher to capture the in-depth stories of respondents based on responses to personal questions about challenges facing them. Purposeful sampling is a people-centred strategy in which in-depth knowledge and experience of persons about issues are investigated and important information is captured to analyse particular issues. Qualitative approach was used for data collection, analysis and presentations followed by quantitative and qualitative assessments.

The study selected 10% of 96 households as a representative sample for data collection and analysis. The purpose of 10% sampling strategy was to collect valuable information with minimum cost while ensuring that the findings represent the whole population. The study was conducted at Watarais and Marawasa communities of Upper Ramu in the Markham Valley of Morobe Province (Figure 1). The primary data collected from the field were analysed using spreadsheet on MS excel and MS Word as well as the Statistical Package for Social Sciences (SPSS). The data captured through interviews were also coded and analysed, while qualitative responses were converted to quantitative data.

The problems encountered when using purposeful sampling included some ethnical challenges. This was due to the open-ended nature of the inquiry which involved direct contacts with interviewees (respondents). During the interviews with the respondents, a professional bottom-up approach was applied to mitigate the risk associated with capturing data from information-rich respondents. The purpose and value of the research were clearly explained to the interviewees including reasons behind selecting and interviewing a particular interviewee. Assurance was given to the interviewees at the beginning of every interview so that any confidential information provided by an interviewee could be protected from third parties.

3. Results and Discussion

Findings in this paper were derived from two sets of analysis - the hypothesis tested and the research question answered, namely:

(i) ***Hypothesis:*** "That the land-use decisions of customary landowners practising tree farming within Markham Valley are influenced by socio-cultural and socio-economic factors on the one hand, and lack of infrastructural development and extension services on the other hand."

(ii) ***Research Question:*** "What are the land use decisions about tree farming as part of landowners' livelihood strategies?"

3.1 Test of Hypothesis: Rural Livelihood Strategies and Challenges in Markham Valley.

The hypothesis tested underpins the rural livelihood strategies and challenges influencing land use decisions about tree farming in Markham Valley. To test this hypothesis, we identified five main rural livelihood strategies and challenges, namely: land area and distribution (total area, area owned with legal title and garden space), seasonality (e.g. wet or dry season), livelihood assets (e.g. number of years for crop rotation, types of subsistence crops grown), cash cropping (e.g. effects of climate change) and rural economy. In addition, we isolated household features and labour characteristics as indicated on the survey questionnaire.

Analysis of the land area and its distribution reveals that land belongs to the clan and individual clan members are obliged to accept the clan's overriding land use decisions. The land is normally distributed by the clan elders according to the composition of family members in each household unit. Findings indicate that clans have ownership rights over land, measuring between 200 hectares and 2,500 hectares. Furthermore, some lands were found to be illegal for business development purposes. In other words, customary land for tree farming business requires registration of land under the Incorporated Land Group Act (ILG), 1974, as amended in by the 2009 ILG Act, in addition to the provisions under the Lands Act (1996) of Papua New Guinea.

An examination of seasonality shows that the two common seasons in Markham Valley are dry and wet seasons all year round. The dry season falls between June and December whereas the wet season occurs from January to May, both of which are seven months and five months in duration respectively. Our analysis shows that the most popular time for cultivating both food and cash crops is the wet season.

Investigation was also conducted on livelihood assets including rural farming systems, land-use and the use of both water and forest resources in rural communities. Findings indicate that size of land for subsistence farming (garden) for food crops in Markham Valley is determined by family size and household units. The crop rotation period for cultivated land for food crops is influenced by the type of crop(s) being cultivated.

Analysis of land use and soil conservation responses reveals that farmers face challenges from the effects of climate change and weather pattern. The change in weather pattern contributes towards prolonged dry and wet seasons. Prolonged dry season leads to drought that causes high transpiration and loss of soil humus. High transpiration of the biophysical environment leads to bush fires causing major destruction to the natural environment that also affects plants and wildlife. Prolonged wet

season is typified by heavy rains and flooding, which contribute towards soil depletion, landslides, soil erosion and weathering. Findings also indicate that rural people in Markham Valley manage and control soil depletion through traditional methods by creating windrows along the river bank with rootious trees or weed plants and also through construction of drainage systems.

At the time of our investigation, evidence showed that there was scarce water resource in the rural communities of Markham Valley. Water resource was not accessible to the households prompting the local people to travel between 10 and 20 kilometres away from their homes to fetch water for daily household use and consumption. Analysis of use and sustainability of forest resources reveals that forest resources are also not regularly accessible to the local communities due to the fact that forests are located between 100 and 200kilometers away from the local communities.

The study also examined cash cropping and the rural economy of Markham Valley. Findings indicate that about 78% of respondents agreed that surplus food crops from the farms were being sold at local markets and abroad in order to generate income for the households. Findings reveal that the average income generated from sales of surplus food crops range between K7.00 to K100.00 per market day, which depends on the availability of buyers and effective demand for the crops displayed for sale at the market place. Findings also reveal that the size of crops sold at the local markets was determined by the size of the garden and productivity level (yield or harvest) of the gardens. Analysis indicates that household income from cash crops ranges from K30.00 toK150.00 per month while average income per year is K765.00 per household.

Table 1: Average household income from both subsistence and cash crop farming.

Activity	**Income (Kina)**
Subsistence farming	30.00
Cash crop	n.a.
Coconut	35.00
Mangoes	77.00
Oil palm	150.00
Betel nut	55.00
Traditional activity	Nil
Other source	Nil
Labour	150
Business	230
Family member	37
Total	**K765 / Year**

The research also analysed data on household details (e.g. family size) and labour characteristics of household units in Markham Valley. An assessment of households indicates that the number of males and females in each family unit, their productivity value, and the number of people in the family unit that are employed in the formal sector are the most important characteristics (Figure 2). Findings show that the average number of females in a family unit is slightly above the number of males, that is 55% and 45% respectively. This result indicates that there is a higher proportion of females amongst farmers. Study also reveals that females in Markham Valley spend more time in subsistence farming than males, and that it is a culturally mandatory for the females to practise food cropping in Markham Valley. This finding affirms that the female population comprising especially women plays an important role in land cultivation and management of tree farming projects.

Findings further indicate that 68% of individual household units are productive. This result affirms that most females particularly women in household units are more productive and they participate more in tree farming business than males. Findings reveal that 5% of the total population in a family unit was employed in the formal sector. This result suggests that most people are unemployed and live in rural communities. In other words, there is insufficient labour force in each household to get involved and participate in tree farming business.

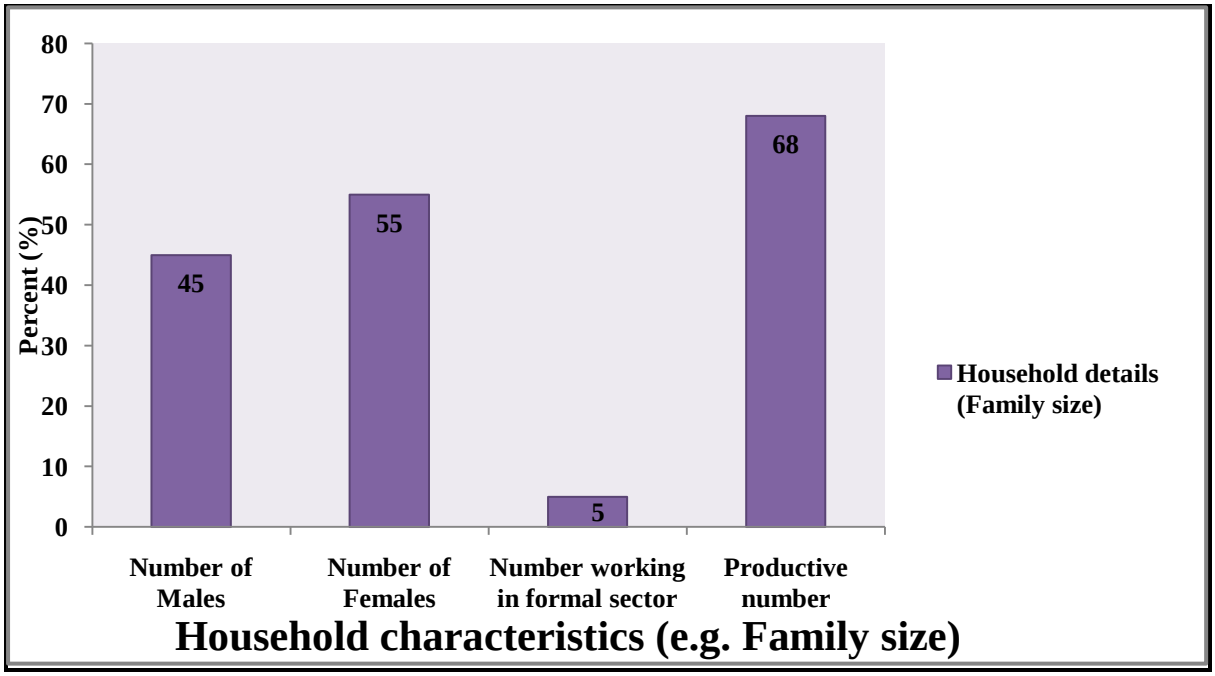

Figure 2: Household characteristics of rural communities in Markham Valley of Morobe Province.

The study also examined labour distribution of the rural population in Markham Valley, with regards to different age groups compared to the number of days spent in subsistence farming, social work and non-working days (Table 2). According to the findings, age groups of 26 - 45 years and 46 - 65 years spend 5 days per week in subsistence farming followed by the young age group of 16 – 25 years with 1 day per week. These results indicate that farmers who are married and have extended family members spend more time in farming to support demand for household food consumption and also for cash income from farming to support and sustain individual family members. The age groups which spend the least time in farming per week are the age groups of 1 - 15 years, 16-25 years and above 66 years. The three age groups can be classified as unproductive age groups (Table 2).

Table 2: Labour distribution of household units in Markham Valley of Morobe Province

Age Class (Years)	Total days/ week	Garden work days/week	Social work days/week	Other days	Non-working days / week
1 – 5	7	0	0	0	7
6 – 15	7	0	0	5	2
16 – 25	7	1	0	5	5
26 – 45	7	5	1	0	1
46 – 65	7	5	1	0	1
66 & above	7	0	1	2	4

3.1.1 Factors influencing land use decision-making by customary landowners and their participation in tree farming.

Figure 2 presents the socio-cultural factors that influence land use decisions on tree farming in Markham Valley. Findings indicate that more than 50% of responses view tradition and customs as the main socio-cultural factors, followed by personal problems (31% - 38%). Tradition and customs were tagged as common factors due to the fact that rural people in Markham Valley make land use decisions based on cultural norms and practices. Study shows that land is owned by the clan and decisions on the use of land are made through collective agreements reached by clan members during clan meetings.

Personal problems were the next socio-cultural factor that influences land use decisions on tree farming. According to the results in Figure 2, more than 38% of responses from the sampled household units encounter personal problems. Eventually, personal problems affect land use decisions as most landowners and household units tend to make land use decisions based on their individual needs and aspirations rather than collective views of clan members, which is a contradiction to the cultural norms of rural and urban communities in PNG with a deeply entrenched *wantokism* culture. This finding supports previous findings regarding the diffusion in recent years of land use decisions from the clan level to the individual family/clan member level is the same reason why in PNG customary land ownership has diminished from 97% to about 86% (Chandler, 2011; Karigawa, 2018).

The most prominent socio-cultural factors having no impact on land use decisions about tree farming are rural power structure (70%), personal needs (38%) and gender inequality (23%). Stated differently, 70% of the respondents view rural power structure as "*not encountered*" because most land use decisions are made through clan meetings where community leaders do not have any influence over land use decision-making process. Personal needs (38%) is the second socio-cultural factor having no impact on land use decision-making about tree farming, followed by gender inequality (23%) as the third factor, and tradition and custom (8%) trailing behind them. Rural communities in Markham Valley constitute a patrilineal society whereby males dominate decisions over the use and management of land resources, while females are regarded as helpers who support project development decisions.

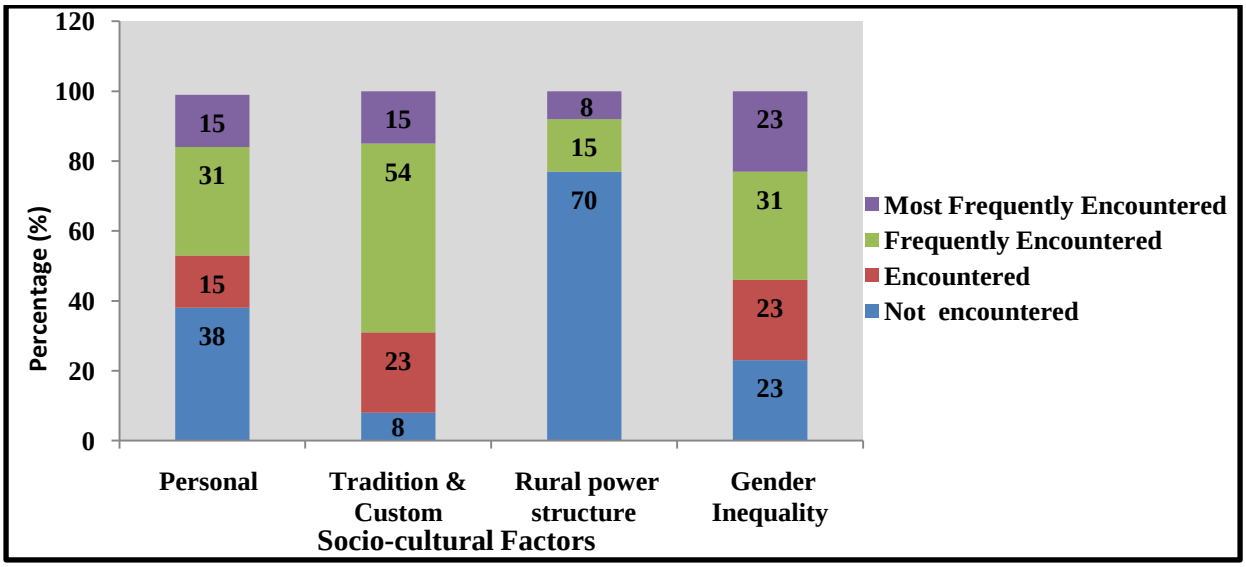

Figure 2: Socio-cultural factors of land use decisions about tree farming

Figure 3 presents the socio-economic factors influencing land use decisions on tree farming in the Markham Valley of Morobe Province. The majority (69%) of respondents in the household survey indicate that lack of funding is the main socio-economic factor driving land use decisions, followed by lack of understanding (62%) of land use matters. Customary landowners require funding in order to access tools and equipment including materials for farm management practices. For example, farmers require agrochemicals to manage large-scale farming operations. The revelation that lack of understanding about tree farming and its benefits affects land use decisions is interesting. This is because most rural people tend to have a misconception over the use and development of their land for generating income due largely to their low levels of literacy and education.

The specific socio-economic factors that may have an effect on land use decisions about tree farming in Markham Valley are "lack of collaboration" and "lack of participation" (Figure 3). According to our findings, lack of collaboration (77%) and lack of participation (70%) are widely not supported or not recommended by the respondents as having any significant effect on land use decisions about tree farming in Markham Valley. In other words, the majority agreed that positive collaboration (23%) and positive participation (31%) are necessary inputs in effective land use decisions for successful tree farming. This is owing to the fact that most land-owning families already collaborate and participate in the development of their customary lands, anyway. This happens in the spirit of *wantokism*, which is regarded as an effective cultural and participatory approach to bonding together as family or clan members determined to share the benefits of viable development projects.

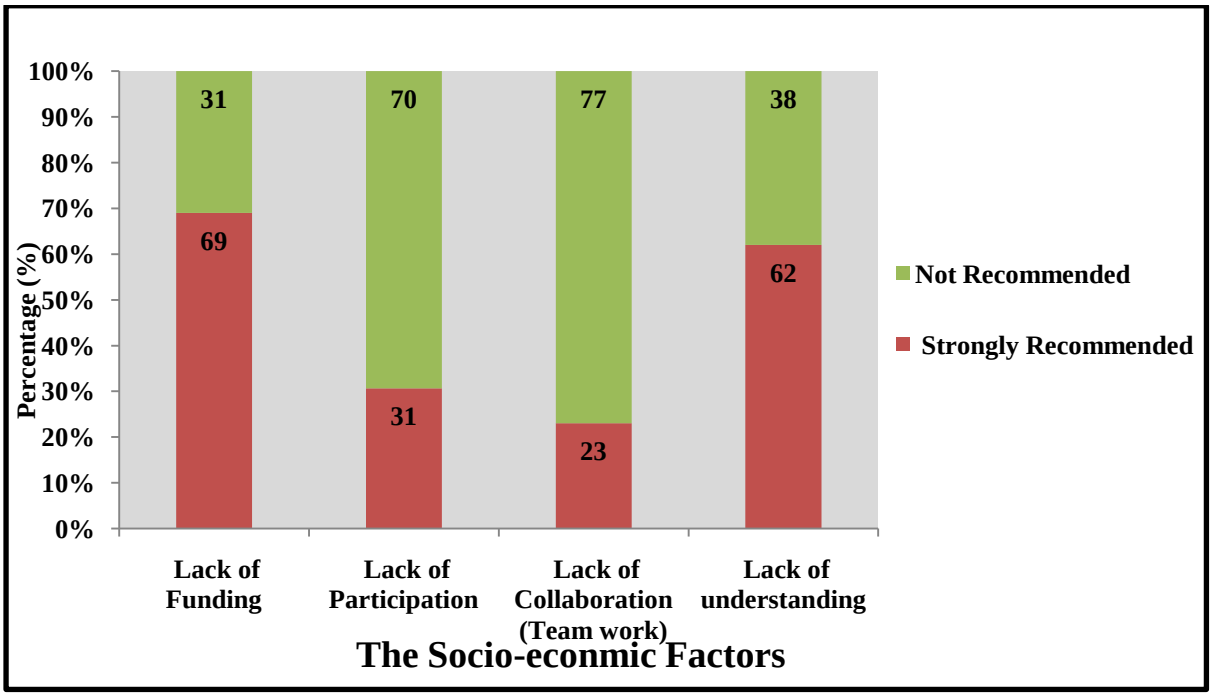

Figure 3: Socio-economic factors influencing land use decisions on tree farming in Markham Valley.

The study also analyses the infrastructure limitations that influence land use decisions on tree farming in Markham Valley. The infrastructure limitations investigated are: lack of roads, bridge network, communication medium, electricity and transport systems. The findings presented in Figure 4 indicate that electricity (62%) and communication medium (54%) are the two most challenging infrastructure services militating against smooth land use decisions on tree farming in Markham Valley. The lack of electricity was found to be the most serious problem due to the fact that most household units have no access to electricity. The study found that although Markham Valley is strategically located along

Ramu Grid Power Transmission line of PNG, the rural people are unable to access power (electricity) due to limited power supply along the transmission line and also because of the excessive costs of purchase and supply of power for household consumption.

Communication medium was found to be the next problematic infrastructure as most rural people do not own and use communication media such as television, radio and mobile phones due to the high costs of purchase and use of the communication media. Another reason is that most rural people in Markham Valley are unfamiliar with the use of these communication media due to the fact that they are uneducated and illiterate and cannot read and understand the media.

The infrastructure limitations that the majority of respondents agreed as having no influence on land use decisions for tree farming in Markham Valley are road and bridge network (100%) and transportation system (92%). It is contended that the main reason for these negative findings is that most rural communities in Markham Valley use feeder roads and the main Highlands (Okuk) highway for transportation. These respondents instead believe that existing road and bridge network and conditions safely allow minimum access and movements in their rural communities within Markham Valley.

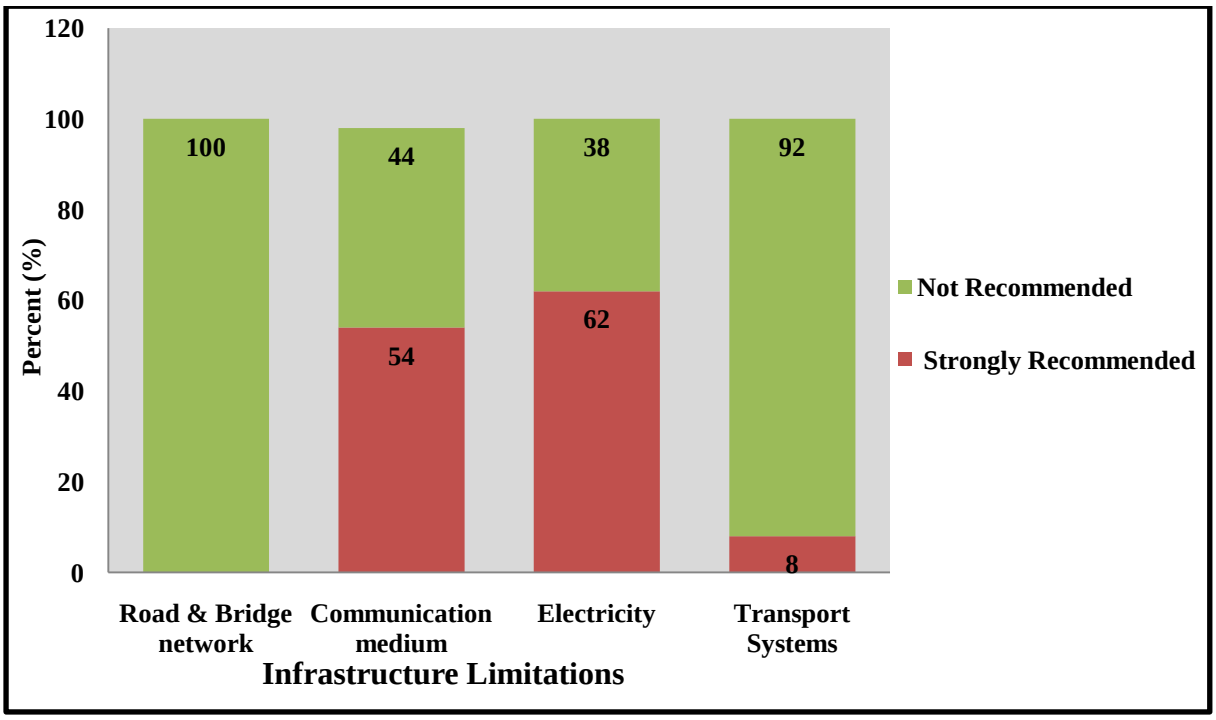

Figure 4: Infrastructure Development and Service Limitations in Markham Valley.

The study also investigated the quality of extension services in the rural communities of Markham Valley. Specifically, the three problematic extension services adversely affecting land use decisions on tree farming in Markham Valley are: lack of transfer agents, lack of awareness and training programs, and inadequate field trials (Figure 5).

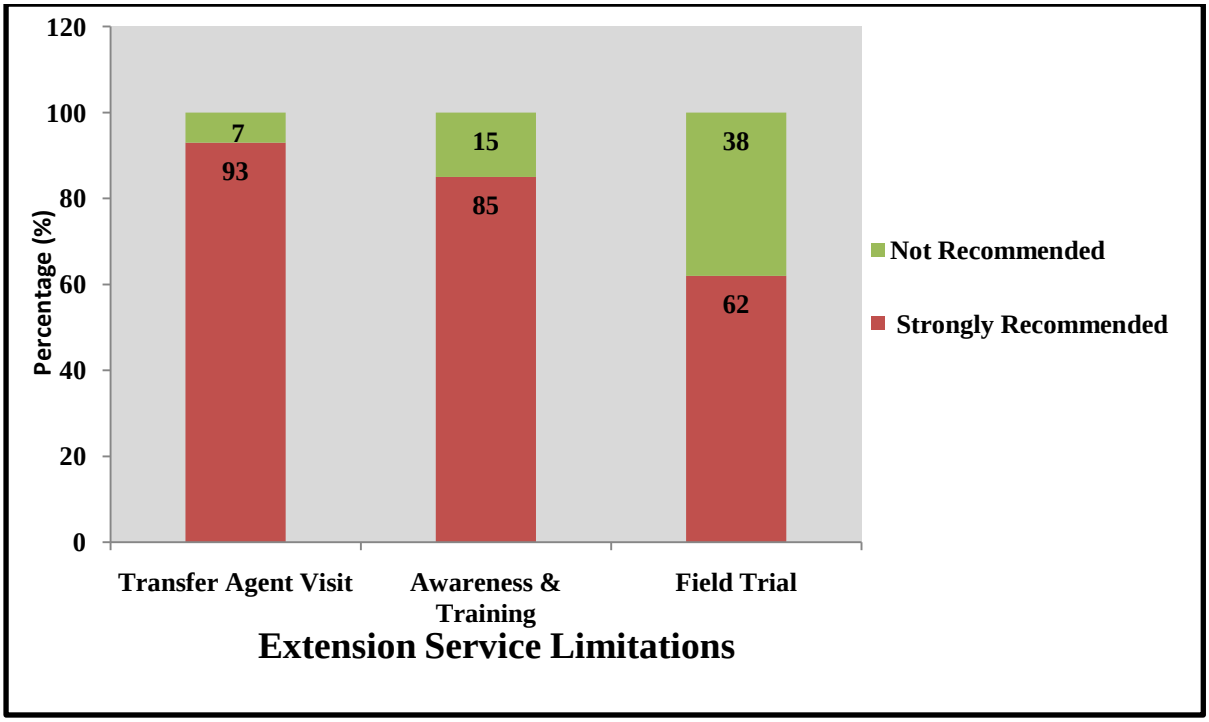

Figure 5: Extension Service Limitation in Markham Valley.

Findings indicate that 93% (Figure 5) of respondents strongly agree that poor visitations due to lack or shortage of transfer agents (93%, lack of awareness and training (85%) and poor field trials (62%) influence land use decisions on tree farming in Markham Valley. These findings appear to be logical, rational and consistent with global best practices because most respondents view the presence of extension agents in the communities, good publicity and extensive field trials as necessary inputs towards remarkable technology transfer and innovations in farming systems. Furthermore, respondents generally believe that access to new information about improving farm management practices and systems is imperative for Markham Valley. This proposition corroborates the popular view that a proper understanding of field trials is the hope that people have in order to observe and allow development projects flourish on their customary lands. It also attracts interest from landowners about the use and management of their lands for beneficial sustainable development.

Having regard to the whole gamut of empirical evidence in this paper, the hypothesis tested in this paper is supported. That is, the hypothesis stating: "That the land use decisions of customary landowners practising tree farming within Markham Valley are influenced by socio-cultural and socio-economic factors and lack of infrastructural development and extension services," is supported. On the other hand, the null hypothesis is not supported by available data.

3.2 Answering the Research Question

A reminder of our research question: **"***What are the land use decisions about tree farming as part of landowners' livelihood strategies?"*

We have thus far presented the various factors influencing land use decisions about tree farming in Markham Valley. The second objective of this paper is to present the actual land use decisions of the land owners in the study area. This is best addressed by answering the research question: **"***What are the land use decisions about tree farming as part of landowners' livelihood strategies?"* A careful

review of our findings in support of the tested hypothesis in this paper reveals the following land use decisions behind tree farming as an agricultural enterprise on customary land in Markham Valley:

(i) Making Difficult Decisions about Sustainable Livelihoods (Tree Farming and Rural Subsistence Farming)

The study intensely reveals the picture and consistent struggle of a group of Melanesian people bounded by a common destiny to survive by dint of hard work as subsistence farmers on customary land with little, if any, financial support from the formal sector of the PNG economy. Analysis of the land area and distribution reveals that land belongs to the clan and individual clan members are obliged to accept the clan's land use decisions. The land is normally distributed by the clan elders according to the composition of family members in each household. Findings indicate that clans have ownership rights over land, measuring between 200 hectares and 2,500 hectares. Furthermore, some lands were found to be illegal for business development purposes. In other words, customary land for tree farming business requires registration of land under the Incorporated Land Group Act (ILG), 1974, as amended in 2009, as well as under the Lands Act (1996) of Papua New Guinea. An examination of seasonality shows that the most popular time for cultivating both food and cash crops is the wet season which is from January to May all year round. Investigation into rural farming system show that size of land for subsistence farming (garden) for food crops in Markham Valley is determined by family size of household units. In sum, customary land-use decisions on tree farming in rural communities of Markham Valley is mostly influenced and determined by livelihood needs, in the face of challenges.

(ii) Making Decisions to Resolve Multifarious and Complex Challenges

Tree farming as a major activity in rural subsistence farming in Markham Valley is very challenging. Analysis of land use and soil conservation responses reveals that farmers face complex challenges from the effects of climate change and weather pattern. The change in weather pattern contributes towards prolonged dry and wet seasons. Prolonged dry season leads to drought that causes high transpiration and loss of soil humus. High transpiration of the biophysical environment leads to bush fires causing major destruction to the natural environment that also affects plants and wildlife. Prolonged wet season causes heavy rains and flooding, which contribute towards soil depletion, landslides, soil erosion and weathering. Findings indicate that rural people in Markham Valley manage and control soil depletion through traditional methods by creating windrows along the river bank with rootious trees or weed plants and also through construction of drainage systems.

(iii) Making Decisions to Overcome Shortage of Needed Natural Resources

Empirical evidence shows that the rural communities of Markham Valley often battle with acute shortages of water and forest resources particularly in the dry seasons. During those periods, water resource is not accessible to the households prompting the local people to travel between 10 and 20 kilometres away from their homes to fetch water for daily household use and consumption. The research also reveals that forest resources are not regularly accessible to the local communities due to the fact that forests are located between 100 and 200 kilometres away from the local communities.

(iv) Making Competitive Economic Decisions

The investigation into cash cropping and the rural economy of Markham Valley reveals that about 78% of respondents agree that surplus food crops from the farms are being sold at local markets and abroad in order to generate income for the households. Findings also reveal that the average income generated from sales of surplus food crops range between K7.00 and K100.00 per market day. Analysis indicates that household income from cash crops ranges from K30.00 to K150.00 per month, while average income per year is K765.00 per household. Furthermore, findings show that the average number of females in a family unit is slightly above the number of males, that is 55% and 45% respectively. This result indicates that females constitute a higher proportion of farmers than males. The study also reveals that females in Markham Valley spend more time in subsistence farming than males, and that it is a cultural obligation and duty for the females to practise food cropping in Markham Valley. This finding affirms that the female population comprising especially women plays an important role in land cultivation and management of tree farming projects. The labour distribution of household units indicates that the age groups of 26 - 45 years and 46 - 65 years spend 5 days per week on subsistence farming followed by young aged 16 – 25 years with 1 day per week. This result shows that farmers who are married and have extended families spend more time on farming due to family demand for household food consumption and also to sustain the cash income derived from farming to keep their families going.

4. Conclusion and Recommendations.

This paper is designed to investigate the livelihood assets, strategies and challenges for the household units and the tree farmers of Watarais and Marawasa communities in Upper Ramu area of Markham Valley in Morobe Province. The study also identifies and evaluates factors influencing customary land use decisions governing tree farming. Findings indicate that the main livelihood asset in Markham Valley are land ownership by clans and then the use of land by clan members and family units to practise farming in order to provide food and generate income for their household unit. Findings also show that women play an important role in land cultivation.

The study found that tree farming is part of livelihood strategies aimed at boosting living standards and wellbeing. Tree farming contributes towards cash cropping that enhances food security and the rural economy in Markham Valley of Morobe Province. It also resolves both social and environmental problems, such as mitigating shortages of fuel wood and building materials and improving the quality of the bio-physical environment.

Furthermore, the study reveals some factors and limitations. These include socio-cultural and socio-economic factors as well as limitations in infrastructure and extension services that influence land use decisions on tree farming in Markham Valley of Morobe Province. Findings show that the main socio-cultural factor is tradition and customs (>50%), and lack of funding (69%) in the category of socio-economic factors. Findings also indicate that limitations in infrastructure and extension services are: lack of electricity (62%) and lack of visits by extension agents (93%) respectively. Furthermore, the study reveals that the main challenges facing tree farming business are land ownership and land legality issues.

Finally, this paper recommends a holistic approach towards understanding the livelihood needs and challenges of rural communities prior to the initiation of development projects. It also

recommends proper a landowner-identification-process through social mapping and genealogical studies in order to identify rightful customary land owners, while successful tree farming enterprise tends to depend on the availability of knowledgeable customary landowners having legal and clean title to land.

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