Influence of Agribusiness Entrepreneurship Development on Stakeholders’ Views, Concern and Reactions in Papua New Guinea

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ABSTRACT

The research investigates the influence of farming on farmers and other stakeholders’ view and it was conducted at PNG Biomass project impact communities of Markham Valley in Morobe Province, Papua New Guinea (PNG). A cross-sectional descriptive study with use of purposive sampling that involving in-depth interviews, focus group discussions, and meeting whereby data were analysed using NVivo software. The findings show that social change influence farmers attitude, behaviour pattern and different perception towards PNG Biomass project development. Further investigation reveals that various stakeholders have different view, concern and reaction towards the PNG Biomass project development: the farmers boost about positive impact; settlers complain about negative adverse effect and PNG National Government assured the landowners and PNG Biomass project to support the sustainable development of climate change resilient and carbon credit project in PNG. The research recommends for the wider community awareness about the positive impact of PNG Biomass project development and also need for project risk evaluation and proper land use planning.

INTRODUCTION

The desired outcome of farming is the positive behavioral change demonstrate by the small holder’s farmers. This positive outcome is achieved through successful implementation of livelihood strategies that solved famers livelihood problems and improve living standard and wellbeing of rural poor people. According to Xu et al. (2005), a significant positive co-relation between characteristics of farm operation and behavioral change. In other words, participation and involvement of farmers in the innovation of farm practices influences behavioral change. Sadati et al. (2010) point out that the effective factors on farmers’ attitude toward sustainable agriculture is influence by social change which include extension contacts, farmers’ knowledge about sustainable agriculture, job satisfaction and literacy. Morris et al. (2012) added that the individual farmer’s behavioral change is the reprisal or product of relationships between people, their environment, and the technology.

Study was based on tree farming business in Markham Valley of Morobe Province, Papua New Guinea (PNG). The farming is a joint venture and partnership project between the landowners of Markham Valley and PNG Biomass project. PNG Biomass is climate change resilience project that attracts carbon credits and reputational benefits to Papua New Guinea.
It is a rural based sustainable agricultural business that promotes rural economy and livelihood improvement strategy through innovation in farming and household cash income with minimum impact on environment and surroundings. FAO report (2018) about E-agriculture strategy in Papua New Guinea point out that it is important to build rural communities to achieve food security, maintain sustainable production and promote rural livelihood programs. Tree farming through PNG Biomass project is an important commodity for rural people in Markham Valley because it does not only provide employment opportunities but also solves social problem such as fuel wood shortage, building materials and improve the biophysical environment. A study by Kanowski et al. (2014) emphasizes about social impacts and the benefits of tree farming (i.e., tree growing) to the livelihood of rural people in upper Markham Valley communities.

**Significant of the Research**

The importance of the study is to provide vital information for developers (i.e., PNG Biomass) to improve visibility and publicity of PNG Biomass project in Markham Valley through effective farm development process and system that may have positive effect on the landowners in terms of behavioral change and livelihood improvement. These social changes and livelihood improvement through household income from farming and land lease payment, wages from employment and improve knowledge and skills of farming through innovation and technology transfer as well as income from carbon markets and shares. As Kumar et al. (2023) point out that “investment in development of entrepreneurial skills may impact positively on the economic growth of the country”. Abdallah et al. (2021) state that sustainable agricultural practices increase farm income and food security. Zhu et al. (2022) also emphasis about social and economic transformations that have a profound impact on farmers' livelihood strategies, and changes in these strategies... These sustainable strategies in farming further contribute towards minimum environmental impact through environmental and ecological friendly approach for resource development by compliance with relevant laws that safeguard business operation. It also provides information about the trend of project development in order to build sustainable farm management practice considering peoples’ livelihood as paramount important of the project development strategies and sustainability. As Fareeha Waseem et al. (2023) point out that “management policy-making procedures align with the interests of equity owners to progress the business’s efficiency and performance”.

The study becomes a basis of information source for PNG Biomass Limited, other development agents and stakeholders who have vast interest in partnership project development.

**Research Problem Statement**

PNG Biomass is a developer, a change agent who is collaborating with customary landowners of Markham Valley to establish joint-venture partnership farm business. The joint venture partnership strategy involves PNG Biomass as a developer who provides technical expertise as well as financial capacity of managing the farm, whereas the landowners or smallholder farmers provide land resources and labor strength for farm development.
The tree farming project was very successful at initial establishment and development stage of the project. The landowners have already benefited from the project through lease payment, carbon credit through carbon shares, employment opportunities and other spin-off benefits. The impact of tree farming and PNG Biomass project development leads to social change and livelihood improvement in the project host communities. However, there is no sufficient information or databases available to establish the effect of farming on farmers’ attitude toward the project, behaviour pattern and perception about the project.

**Research Questions and Objectives**

The research seeks to answer the following research question: (i) ‘What are the factors that influence the landowners’ views, concern and reaction’? (ii) ‘What are the changes, issues and trend of Biomass project development’?

The first objective of the research was to investigate various factors that influence landowners’ views, concern and reaction towards tree farming and the PNG Biomass project. Secondly, to investigate the challenges, issues, and the general trend of PNG Biomass project development.

**LITERATURE REVIEW**

In Papua New Guinea (PNG) and elsewhere, behavioral change is influence by acceptance of technology transfer and individual participation in the agricultural innovation. According to Riwasino. (2015), the farmers’ knowledge of extension works and decisions on development projects have been guided by what they see or hear from the farmer next-door or from their exposure to such opportunities.

A Social Practice Theory (Bourdieu,1977) emphasis about the ways people pursue diverse concerns, become aware of new possibilities for action as they move across settings of practice, and learn as they adjust contributions to the flow of ongoing activity and to fit demands and structures of local institutions. The theory provides in-depth understanding of how organisational factors and visibility of project development interact to influence individuals’ responses to technology adoption and further contribute towards behavioral change. Pindado and Sánchez (2017) pointed out that the outcome of the behavioral change is influence and by successful implementation of livelihood strategies.

Behavioral change is also influence by both internal and external factors of human psychology (Prager, 2012; Riwasino, 2015). Riwasino (2015) further stress that the internal factors are psychological issues such as education and literacy level, linguistic and perceptual barriers whereas external factors are made of sociocultural issue, socio-economic and infrastructural challenges, biophysical and extension services limitation. The author added that addressing and improving both internal and external factors may consequently influence positive behavioral change.

The theory of Reason Action (Ajzen & Fischenbein, 1980) and the theory of planned behavior (Ajen, 1991) explain the relationship between attitude and intentions that leads to behavioral changes. Prager (2012) stressed that intentions to behave is explained from attitude, social norm and perceived control. In other words, someone’s behavioral change is influence by interaction between attitude, social norms
and perceived controls. Other theories explain about behavioral changes are value-belief norm theory (stern et al., 1999) and theory of interpersonal behavior (sterns, 2000). The value-belief norm theory emphasized on pro-environmental behavior is co-related with pro-social-attitude and personal moral norm. In other words, the individuals were aware of the consequences of their decision and participation that attribute towards the behavioral change.

Impact of Agribusiness entrepreneurship on Farmers and Skateholder Behavior

The human behavior is unpredictable as it changes overtime that depends and influence by situation, circumstance and most importantly the environment. Blackstock et al. (2010) point out that “understanding and influencing behavior is a complex and multi-facet issue whereby it connects and associate with many issues of power and politics within farmer’s culture, as well as wider policy and political settings”. In other words, farmers’ behavior is unpredictable which can be influenced by power and politics within the farmers’ culture. The farmers’ ways of thinking and doing thing had been changed over the period of time due to technology innovation in farming system from subsistence farming to commercial farming. (Rogers, 1995; Pannell et al., 2006). Fuglie and Kascak (2001) stated that timely adoption of new technology can improve overall agricultural productivity and also determine farm survival. This adoption of technology innovation influence farmers’ behavioral change in facilitating farming practices. Moulik (1973) point out that socio-psychological aspect of understanding human behavior in cash cropping and cash economy lacks in Papua New Guinea. In order words, farming entrepreneurship require better understanding of rural people constraints and challenge in order to influence behavioral changes of the farmers towards successful project development. In other words, value- based project is vital for community development whereas project not value - based of a society may likely to fail because it may disturb the social structure of the society.

Influence of Agribusiness Entrepreneurship on Famer’s and Stakeholder Attitude

Attitude is a mindset or a tendency to act in a particular way due to both an individual’s experience and temperament such as personality, beliefs, values, behaviors, and motivations (Ajzen & Fisbein, 2005; Bohner & Dickel, 2011). Palani and Sohrabi (2013) point out that attitude is a settled way of thinking or feeling about something. According to Asabe (2013), attitude influences an individual's choice of action, and responses to challenges, incentives, and rewards. Pickens, (2005) point out that attitude define persons or people’s perception into situation, and it is a reciprocal behavior toward the situation. It is a continuous evaluation of a person or object.

The World Bank Report (2011) on mind, society and behaviors point out that agribusiness development influence farmers ways of thinking, feeling and action. In other words, the process involves in agricultural innovation and technology transfer thus affects and influences the farmer’s attitude towards stage of conscience and action. According to Rudmann (2008), entrepreneurship requires creating learning environment and it must motivate the farmers to take advantage of learning opportunities. In other words, farming entrepreneurship influences farmers’ ways of thinking and doing things (action).
Study by Muresan et al. (2015) stress about the “local residents’ attitude toward sustainable rural tourism development” shows that positive attitude is exhibit as employment opportunities and wellbeing increase which is reflection of rural population participation and willingness to project development and also the individual and personal benefit that acquire from the project such as monetary benefit and infrastructure development.

**Perceptive of Farmers and Stakeholder on Trend of Farming Entrepreneurship**

The perceptive is the ability to see, hear, or become aware of something through the senses. It is the way in which something is being regarded, understood, or interpreted (Bodenhausen & Hugenberg, 2009). Hoffman (2015) point out that perception as adaptive interface in which shape by natural selection in order to hide the truth. Kastanakis and Benjamin (2013) stress about the effect of culture on human perception and understanding in reasoning out challenges and issues. The perception describes the way humans see the world and relate to experiences in terms of challenges and issues. The individual person has own personnel perspective towards understanding and interpretation of issues surrounding the environment that lives and depends upon. The level of understanding and interpretation is determined and influence by factors. These factors include low illiteracy and education level, age limitation and fear of change and economic development in the society (Bebington, 1999; Thi Ngoc Chi, 2002).

**Agribusiness Entrepreneurship and the Social Change**

The transformation of culture and social institution leads to social change (Khondker and Schuerkens, 2014; Fang, 2016). According to Weichold and Barber (2009), “social changes are associated with transformation in various spheres of human life which include social structure, systems and processes; behavioral patterns, cultural norms and values; economic restructuring, changes in societal value systems, the spread of media technology, and changes in educational systems or population composition.”. Greenwood and Guner, (2008) point out that social change is the shift in the attitude and behavior especially adaptation to improve technological environment in the society. In other words, attitude and behavior of farmers is influence by transformation in technology and the social change. According to Riwasino (2015), these social changes are the outcome of value-based project that influence behavioral change and participation in the project development.

**RESEARCH METHODOLOGY**

**Research Design and Study Area**

The research was a people-focused investigation whereby person-oriented approach is given as a guide to the researcher interested in carrying out person-oriented research (Bergman and Wångby, 2014). In this research study, the landowners view, concern, and reaction as well as challenges and the trend of PNG Biomass project development were captured through person-oriented approach. The research involves cross-sectional design, aims at finding out the prevalence of a phenomenon, situation, problem, attitude, or issue by taking a cross section of a population once to give an overall
picture (Levin, 2006; Kumar, 2011). The cross-sectional study research design was based on qualitative research approach that intended to investigate the landowners view, concern, and reaction. Therefore, nature of research enquiries was based on social change and factors that influence the landowners view, concern, and reaction as well as challenges and the general trend of PNG Biomass project development. The behaviour pattern and general trend of the study addressed the research question that provide findings and conclusion to the research.

The research was conducted at the rural communities of Markham Valley in Morobe Province, Papua New Guinea (PNG). Geographically, Markham Valley is located at longitude of 60°26.75” S and latitude of 145°2’53.40” E. Markham Valley is located in a strategic location where future commercial farming activities is conceivable due to fertile land and proximity to coast as Lae City is the main industrial hub and shipping port for New Guinea mainland and Papua New Guinea.

Data Collection Methods

The main data collection method were in-depth interviews, focus group discussions and meetings. Interview was carried out to collect the in-depth stories of respondent through asking personal questions and opinion about issue experience by the interviewee regarding the cause-effect relation of PNG Biomass project and tree farming business. Anyan (2013) point out that interview as a method of data collection enabling individuals to think and to talk about their needs, expectations, experiences, and understandings.

The interview target tree farmers, non-tree farmers and general population within PNG Biomass project impact communities of Markham Valley in Morobe Province, Papua New Guinea. During the interview, specific question about the impact of PNG Biomass project is being asked and the interviewee responded to the question by answering and providing views, opinion, and reaction towards the effect of the project in the community. The focus group discussion and meetings involve all stakeholders including PNG Biomass project impact communities of Markham Valley, Local Level Government (LLG), International Consultant and Papua New Guinea Government official from the Department of Forestry, Treasury and Finance including PNG Biomass project management team. During the discussion and meeting the landowners express their view, concern, and their reaction toward Biomass project development. The other stakeholders who attended and participated in the discussion and meeting also provide their view and opinion about the impact of PNG Biomass project. The developer, PNG Biomass team in the meeting responded to varies queries, complains and concern, and further assured the landowners and other stakeholder about ways forward to address the issue and concerns, and also provides strategies for improving the PNG Biomass project in Markham Valley.

Research Sampling Technique and Sample Size

The research involves stratified random sampling to select sample size to represent whole population of the study area. Nguyen et al. (2019) stress that stratified random sampling (SRS) is a widely used sampling technique for approximate query processing. The purpose of choosing stratified sampling in this research study was to ensure specific subgroups are present in the sample of various sites through
formal invitation to the location for hosting interviews, focus group discussion and meetings for capturing information that was relevant and informative to the research and findings. The information and data that forms the basis of this research was 40 people who attended organised focus group discussions, interview and meetings at 4 different sites and location at appoint time. The 40 people represent 10% of total population size in the project communities and research site. These sites and locations were randomly selected throughout the PNG Biomass project impact communities of Markham Valley in Morobe Province, Papua New Guinea.

The two (2) main approach used were in field data collection: (1) distribution of survey questionnaires to the landowners whereby the landowners themselves filled in the blank questionnaire and (2) interview the concern tree farmer through face-to-face interview and jotted the sediment from the farmer during the conversation. In the first approach, research questionnaires were distributed to individual landowners who are literate to read and answer the questions themselves in the questionnaire. The respondents answered all the questions by filling in the blank space of the question, the completed form returned back to the researcher. In the second approach the questionnaire was answered in an interview, where the respondents ‘answers were written by the researcher. This method was used when dealing with the illiterate respondents.

The landowners view, concern and reaction were captured in the form of segment, and transcript on the notebook respectively. The segment and transcript were translated, interpreted, processed and analysed using textual analytical approach through the use of NVIVO for quotes or narratives from farmers in order to provide findings to the research. According to Jackson & Bazeley (2019), NVivo is widely used in the qualitative data analysis process in order to provide findings to the research.

RESULT AND DISCUSSION

Result

Findings in this research were derived from two sets of analysis which were the hypothesis tested and the research question answered. The research hypothesis stated that ‘Is the landowners view, concern and reaction is influenced by social change due to the impact of PNG Biomass project’. The research question was based on: ‘What are the factors that influence the landowners view, concern and reaction’; ‘What are the challenges, issues and trend of Biomass project development?’ There were several occasions, events at selected villages and hamlets of PNG Biomass project impact areas in which the interview, group discussion and meeting were conducted as outlined and discussed below:

Test of Hypothesis: The landowners view, concern and reaction are influenced by social change due to the impact of PNG Biomass project

In order to test the hypothesis, landowners view, concern and reaction were captured during the in-depth interview, focus group discussion and meetings within the PNG Biomass project impact communities of Markham Valley in Morobe Province.
A group discussion was held at 41-mile hamlet of Chivasing Village in Markham Valley where the main discussions at the meeting were about food security, livelihood assets and the impact of PNG Biomass project in the community. During the meeting, Martin Eris, a tree farmer with PNG Biomass project emphasis about effect of the PNG Biomass project development. Mr. Eris explains about the positive impact of PNG Biomass project when he said, ‘PNG Biomass project provides freedom of choice to allocate and make land use decision for tree farming according to the land use need’. According to Sack (1973) in the book title, Problem of Choice Land in Papua New Guinea’s Future, “for the peoples of Papua New Guinea land is overwhelmingly important, not only as the sole means of life but also for what it means in their culture.” In technical report 2 of Bey (2012) about enabling customary landowners to participate effectively in CFM and REDD schemes within four pilot areas of Papua New Guinea, it clearly stated that consultation with landowners for land use decision is vital for partnership project development.

Research Question 1: ‘What are the factors that influence the farmers’ attitudes, behaviours and perceptions’ towards tree farming and PNG Biomass project development’.

In regard to the research question 1, stakeholder engagement meeting was conducted at Zifasing Cattle Ranch hamlet of Chivasing Village in Markham Valley. The meeting was between, the tree farmers, representative of Treasury Department of Papua New Guinea Government and the developer (PNG Biomass Limited).

The meeting was conducted purposely for the Treasury Department representative to consult tree farmers and people within the project impact communities to obtain their consent over the development of PNG Biomass project, especially the landowners’ views and opinion about impact of the project and how best the state (PNG Government) may intervene and support the project in terms of legislative requirement and regulatory compliance matters.

On behalf of Treasury Department and the State of Papua New Guinea, Martha Z said, ‘the government has vast interest in the project as it is the new concept and approach whereby the state has vision for investing into new source of energy development in the country, particularly looking at renewable and carbon-based project development such as PNG Biomass project in Markham Valley’. Papua New Guinea Development Strategic Plan (2010-2030) stated clearly that investment undertaken by state owned enterprises, such as PNG power, In partnership with the private sector, energy development from renewable sources (PNG Department of National Planning & Monitoring, 2010).

Caroline S added when explains about the legislative process of project development and stated that ‘Incorporated Land Group (ILG) registration is vital for customary land legal tenancy and business development by any developer. ‘Miss Caroline further asked the landowners, the tree farmers; ‘What is your current status of land registration particularly, ILG formulation’. Karigawa et al. (2016) in Sustainability of Land Groups in Papua New Guinea point out that under Section 13 of Environmental Act (1996), empowers the landowners through their ILGs to enter into development agreements with relevant stakeholders.
Mr. Sam Meyab, a landowner representative explains about land legal tenancy with PNG Biomass project when he said, “we, the landowners dissolve the land dispute prior to the land is being leased to PNG Biomass project”. He further claims and said, “the formulation of ILG is the lengthy process and requires legislative requirement before actually approves as ILG group.”

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Mr. Meyab also explains about benefit and impact of joint venture tree farming project and said, ‘We, the landowners are benefiting from the project through monetary benefit including cash income from land lease or rental and contract work payment as well as technology transfer such as introducing spraying methods for the local illiterate people and agricultural innovation particularly the introduction of intercropping method in the farming system’. According to Hall (2006) and also by Ramírez-Gómez and Rodríguez-Espinosa (2022) emphasis about partnerships need to be viewed in the framework of an innovation system and a development scenario.

Another landowner representative, Kelly Jimmy acknowledges the presence of government official at the project site when he said; ‘we, the landowners of tree farming pleased to see you, the representative of Treasury Department to come to witness and the see the progress and development of PNG Biomass project in Markham Valley’. Mr. Kelly Jim further explains when he said, ‘large portions of land in Markham Valley is undeveloped land area which requires investors for land development’.

Michael Henson, the PNG Biomass Project Director explained and said, ‘PNG Biomass through Oil Search Limited has the money to invest and develop the land but require the government approval in terms of legislation and formalities.

Nao (2019) point out two main challenges of customary land governance in Papua New Guinea which are state institutions’ lack of compliance with laws and regulations, and lack of compliance by executives or other members of landowning groups (incorporated land groups or ILGs) with regulations for the management of ILG assets as defined by the Land Groups Incorporation (Amendment) Act 2009.

Research Question 2: ‘What are the challenges, issues and trend of PNG Biomass project development’?

The local people who participated in these meetings and discussion were tree farmers, non-tree farmers, community leaders and communities at large. Philip Ontrip, a local villager who was not part of tree farming (non-forest grower) from Tararan village in Markham Valley complains about the impact of PNG Biomass project development when he said, ‘development of proposed power plant and burning of wood for turning turbine engine for generating power will produce smoke and other waste materials that is likely to cause harm to the environment such as pollution to the air, soil and nearby water system’. According to Paletto et al. (2019), size of biomass energy plant and fuel-wood
burning will adverse environmental impact including air pollution and land degradation such as damage to human health, to ecosystems, and to environmental resources.

Mr. Waiah Langim, a local Ward Councillor of the PNG Biomass project impact community highlight about the 5 years’ ward development plan for the community and how best the PNG Biomass project shall partner with the local level government to assist in the development and building of basic infrastructure such as school fencing, elementary school, and sporting facilities in the community. Mr. Langim requested when he said, ‘PNG Biomass project must provide financial assistance for building and upgrading of the school building and other facilities in the community’. World Bank (2022) evaluation report on Private-Public partnership project development reveals about supported strategies that had a focus on rural infrastructure development, especially in the transport and agriculture sectors.

A meeting was held at Kokok hamlet of Chivasing village in Markham Valley. At the meeting, two PNG Biomass consultant and 15-20 local villagers attended the meeting. During the meeting, Martin Sampin, a local leader complains and said, ‘PNG Biomass project is venturing and occupying most of the land used for hunting grounds for the community and we are losing bush material for building and also wild food’. He further asked ‘What future plans does PNG Biomass have towards local communities in terms of food security and other livelihood assets’? Febe Nantrop, a woman’s spokesperson added further and said, ‘Tree farming will be using chemical and fertilizer in the tree farmed land and there is a high risk for contamination of nearby creek that we will be used for drinking and other livelihood use’.

A focus group discussion was held at Nowa Settlement which was located at the outskirt of Tararan Village, near to the Rumian Farm in Markham Valley of Morobe Province. Nowa settlement is comprised of settlers from other parts of Morobe Province and Papua New Guinea who migrated into the area to employed in the farm and also become handy man for the local people and communities. Most of the people do their subsistence gardening on the customary land of Markham people and fear that development of the PNG Biomass project might occupy the land in which they used for gardening, hunting and other basic livelihood assets such as kunai grass (imperata cylindrica) for roofing of bush material house. They also concerned about the use of chemical and fertilizer which may have environmental impact particularly pollute the water system at the nearby creek. Mr Amos Laktoko of Menyamya descendent complains about the effect of farming on livelihood when he said, ‘the landowners allow us to make garden on their land, but biomass project is acquiring ALL those lands and where are we going to make gardens and access to other livelihood items such as land to make garden and other livelihood activities including fishing, hunting and herbal medicine from the bush’. Benton et al. (2021) points out that the conversion of natural ecosystems for crop production or pasture has been the principal cause of habitat loss, in turn reducing biodiversity.

However, the successful business entrepreneurship for customary land access and development in Papua New Guinea tends to depend on both proper land-use agreement (Imbun, 2013) and customary land with legal land title (Riwaisino et al., 2018).
Discussion

The basis of research was about the different stakeholders’ views, concern, and reaction regarding the impact of PNG Biomass project development in Markham Valley of Morobe Province, Papua New Guinea. These views, concern and reaction were from landowners of Markham Valley, official from Local Level Government (LLG) and PNG National Government including the Developer (PNG Biomass Limited).

The landowners’ views, concern and reaction were found to be from both farmers and non-tree farmers (local villagers) as well as from the settlers residing in Markham Valley. The landowners who involved in the tree farming business with PNG Biomass project boost about the positive impact of the PNG Biomass project development. These landowners stated that PNG Biomass project provides freedom of choice to allocate and make land use decision for farming in accordance with their land use needs. They also claimed that the PNG Biomass project provides monetary benefits through land lease and contractual work payment as well as other spin-off benefits in the community. The farmers boost that PNG Biomass project enhance their skills and knowledge from introducing new methods of farming (innovation in farming) and employment opportunities. According to Dobermann et al. (2013), the solution to sustainable rural development and smallholder agriculture requires structural transformation of rural poor through collaborative and participatory process. The author further elaborates that approach can enhance and improve farming practices and systems by improving new technological and business models for better benefits of the rural people such as decent jobs, allow the overcoming of resource constraints, enable greater market participation, and also lessen physical hardships in agriculture.

The non-tree farmers who do not involved in the PNG Biomass project complained about adverse environmental impact of the PNG Biomass project development. They claimed that the use of agrochemical (both fertilizer and pesticide) may contaminate nearby creek and water system for human use. They also viewed that the development of power plant and burning of wood for turning turbine engine for generating power may produce smoke and other waste materials, which may indeed cause harm to the environment such as pollution to the air, soil, and nearby water system. Arnab et al. (2013) explains that biomass-fired power plant is being known for clean source of energy but also have both environment and ecological effect. The author further elaborates about adverse effect of fuel wood which creates toxic gases and other by-product causing air pollution as well as land and water contaminations.

The settlers who lived in Markham Valley also complained about PNG Biomass project development. The settlers feared that development of the PNG Biomass project might occupy the land in which they used for gardening, hunting and other basic livelihood assets and needs such as kunai grass (imperata cylintrica) for roofing of bush material house, wild food and hunting ground for protein. They also concerned about the use of chemicals and fertilizer which may have adverse environmental impact particularly pollution of nearby creek and water system for human use. Vezmar et al. (2014) point out about social and environment adverse effect of biomass power plant that require large area for biomass
fuel wood production which caused social problems such as land shortage as well as pollutions and contaminations due to the use of agrochemical in farming system. Majale (2002) stress that sustainable livelihoods approach is a holistic approach that tries to capture and provide a means of understanding about the cause and dimension of poverty considering other factors such as economic issues and food security. Koczberski and Curry (2005) further elaborate that the changing of livelihood depends on new policies and analytical approaches in rural development, resource management and poverty.

Another Stakeholder in the PNG Biomass project was the Local Level Government (LLG) representative which requested PNG Biomass project for community development and initiative project assistance. The LLG proposed that PNG Biomass should partner to assist in the development and building of basic infrastructure such as school fencing, elementary school and sporting facilities in the community. Morris et al. (2012) stress that the material context such as socio-technical infrastructure established, and practice draws attention and contributes towards behavioral change for individual farmers to involve in farming. In other words, the outcome of the behavioral change is being influenced and by successful implementation of livelihood strategies such as assisting towards building infrastructure in the community.

The state (representative from PNG government) was another stakeholder who concerned about the PNG Biomass project development. The state through Department of Treasury expressed vast interest in PNG Biomass project due to nature of the project, which viewed as renewable resource and clean energy project that may have significance positive impact both at local, national, and international scenario in terms of poverty reduction, economic growth and contribution towards mitigating of greenhouse effect and global warming respectively. The state representative from Treasury Department assured the developer (PNG Biomass Limited) and landowners about their support towards Biomass project development in Markham Valley. They emphasized about due process of acquiring land from customary landowners for legal entity, business security and the sustainability of the PNG Biomass project development. One of their concerns was acquiring customary land through Incorporated Land Group (ILG) under Incorporated Land Group Act (ILG), 1974, as amended in by the 2009 ILG Act as well as provisions under the Lands Act (1996) of Papua New Guinea (Riwasino et al.,2018). The main stakeholder in project development was the PNG Biomass Management. The PNG Biomass Management assured both landowners and state (PNG government) that PNG Biomass project have the financial capacity (money) to invest and develop the land but require the government approval in terms of legislation requirements and regulatory compliance matters. These views, opinions and reaction toward PNG Biomass project draws conclusion to the research.
CONCLUSION AND RECOMMENDATION

Conclusion

The research findings discussed under researched hypothesis ‘The landowners view, concern and reaction are influenced by social change due to the impact of PNG Biomass project’; research question was about: ‘What are the factors that influence the landowners view, concern and reaction’? ‘What are the changes, issues and trend of PNG Biomass project development’?

The hypothesis test confirms that social change is being influenced by stakeholders’ view, concern and reaction towards tree farming and PNG Biomass project development in Markham Valley. It was revealed through in-depth interviews, focus group discussion and meetings with different stakeholder including landowners, settlers, both local and national government officials.

Further investigation to answer the research questions about the factors influencing stakeholders’ view, concern, and reaction toward the impact of PNG Biomass project development in Markham Valley of Morobe Province, Papua New Guinea. The finding shows that most landowners and farmers involved in PNG Biomass project development express their segment about, both positive and negative effect of tree farming and PNG Biomass project development. These landowners and tree farmers boost about the benefit of PNG Biomass project. The settlers’ views that commercial farming is likely to displace them by occupying large land area and they feared that there will be shortage in livelihood assets due to nature of the project covering large landmass area, and further cause environmental pollution and damage. The local government representative requested PNG Biomass project for community development and initiative project assistance. The state (PNG National Government) through Treasury Department is willing to support the sustainable development of renewable clean energy source in Papua New Guinea and also point out about legislation requirement and regulatory compliance matter that affecting the PNG Biomass Project Development.

Recommendation

The research recommends that publicity and visibility through community awareness and community development initiative program is vital for the sustainability of the PNG Biomass project development. The research also recommends for PNG Biomass project to conduct due diligence into its operational practices during the different phase of project development to ensure that field operation and activities comply with regulatory requirement that mitigate social and environment adverse effect. The research further recommends for proper land use plan for settlers’ resettlement and preservation of livelihood assets for the community need and use.
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