Feasibility Study On Climate Change, Food, and Nutrition Security, Conservation and Land-Use in Enga Province of Papua New Guinea

Final Assessment Part 2

Strengthened Food and Nutrition Security

United Nations Development Programme (UNDP)

RFP No: RFP/PNG/004-2021

This publication was developed through the Papua New Guinea Climate Change and Development Authority and Enga Provincial Government in partnership with the United Nations Development Programme and the European Union.

Citation: Jusi, S. Pérez Chaves, P. Waki-Wafi S. and Tanyi, T. et.al. (2022) Feasibility Study On Climate Change, Food, and Nutrition Security, Conservation and Land-Use in Enga Province of Papua New Guinea, UNDP Papua New Guinea

Contributors: Sari Jusi, Pablo Pérez Chaves, Stella Waki-Wafi and Tabiagbor Tanyi, with Katherine Yuave, Martin Umba, Everlyne Luio Sap and Kumcy Yopahafo

Affiliations: Dr. Sari Jusi and Dr. Pablo Pérez Chaves are Directors at Finnish Overseas Consultants (FinnOC). Stella Waki-Wafi and Tabiagbor Tanyi are experts at FinnOC. Katherine Yuave, Martin Umba, Everlyne Luio Sap and Kumcy Yopahafo worked as research assistants during the data collection campaign.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
AIDS	Acquired immunodeficiency syndrome
CBO	Community Based Organisation
CCDA	Climate Change and Development Authority
CDM	Clean Development Mechanism
CEPA	Conservation and Environment Protection Agency
CIC	Coffee Industry Corporation
DAL	Department of Agriculture and Livestock
DoH	Department of Health
EU	European Union
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FinnOC	Finnish Overseas Consultants
GDP	Gross domestic product
GGGI	Global Green Growth Institute
GIS	Geographic Information System
HH	Household
HIV	Human immunodeficiency virus
ICF	International Finance Corporation
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
K	Kina
LP	Lead partner
MSME	Micro, Small and Medium Enterprise
MTDP	Medium Term Development Plan
NARI	National Agricultural Research Institute
NCDR	National Coffee Development Roadmap
NGO	Non-governmental organization
NSO	National Statistical Office
PGK	Papua New Guinea Kina

PMV	Public motor vehicle
PNG	Papua New Guinea
PPAP	Productive Partnerships in Agriculture Project
RA	Research Assistant
REDD+	Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
SME	Small and medium-sized enterprise
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WFG	Women's focus group

EXECUTIVE SUMMARY

The project "Strengthening Integrated Sustainable Landscape Management in Enga Province Papua New Guinea" for the period 2021- 2026 will support the country in its continuing efforts to address climate change. It will assist in strengthening sustainable and inclusive economic development of the Enga Province of Papua New Guinea (PNG) by three components/objectives: i) improving climate change mitigation and adaption; ii) strengthening food and nutrition security and iii) improving biodiversity and land/forest conservation.

This report focuses on Component 2: Strengthened food and nutrition security. The aim of the component is to:

a) Describe food and nutritional security situation in study villages in Enga.
b) Conduct an assessment study of barriers to private sector investment as well as opportunities to strengthen subsistence agriculture commercial value chains to access domestic and international commodity markets.
c) Conduct market study of the financial services sector to identify climate investment opportunities for coffee producers in Enga province.
d) Identify and analyse capacity issues as well as develop capacity building topics for farmers and women groups on climate resilient approaches and agricultural techniques.
e) Review of current Provincial and District Development Plan and propose options to strengthen food and nutrition security in provincial development planning.

To uncover the issues related to climate change mitigation and adaption, food and nutrition security including biodiversity and land/forest conservation in Enga, a total of four study tools (questionnaires) were developed and employed together with social sampling methods to collect both quantitative and qualitative data relating to the study parameters. The Consultant developed the following survey instruments used for the study: a) farmers focus group survey, b) women's focus group survey, c) coffee producers' questionnaire, and d) household survey. Also, a discussion guideline was developed targeted to district and provincial authorities.

One team of Research Assistants (three females and two males) with the support of the project team, conducted the surveys in the field. The group surveyed two villages in each five districts of Enga, totalling ten villages. The selection of study villages was based on their suitable location and vulnerability, and was done together with the Client, advised by the Environment/Climate Change Officer of Enga Provincial Government.

The researchers conducted one focus group of smallholder farmers, one focus group of coffee producers, and one women's focus group in each survey village. Household surveys were conducted in each study villages. The number of household surveys collected during the data collection exercise

totaled 456 households[1]. In total ten women's focus group, coffee farmers and farmers focus group each and 6 coffee farmers focus group interviews were conducted. The team conducted the surveys in February 13 till March 6, 2022.

Characteristics of smallholder farming and food and nutrition security situation in study villages

Agriculture is the dominant economic activity in Enga Province, characterized by smallholder farmers producing mostly subsistence crops for household consumption combined with some cash crops as a source of income. The farmers follow the 'mixed cropping or mixed farming' system where diversity of food crops, fruits and nuts and vegetables are inter-planted with each other in a mixed manner often at very high densities. Generally, the data collected from the households observed not big variability in livelihood activities, production systems, and food systems within the study villages visited.

Gardens are an integral part of local food systems in Enga. Households in study villages possess around five to ten gardens. Households see multiple gardens as a strategy to enhance household food security including increasing income and livelihood opportunities in study villages. According to household and farmers focus group data gardens contain a high diversity of different plants such as banana, kaukau, potatoes, taro, spring onion, beans, peas, corn, pawpaw, yam, peanuts, etc. Households engaged with poultry farming varies from 12% to 56% of the households in the study villages, mainly concentrating in Lagaip-Porgera, Wabag and Wapedamanda districts. Households mainly sell pigs and poultry products at the markets, some households also fish. The food crops are sold mostly at the local village markets which are usually located about one hour away from their home villages.

Intercropping is most common agricultural method used in all of the study villages. Crop rotation and polyculture are also common methods used by the households. 40% to 55% of the households also use agroforesty methods. Water harvesting is not commonly used in the study villages. Agriculture in Enga relies on commercial fertilizers as well as manure to replenish soil's nutrients. The household interviewed mostly use chicken and pig manure including death leaves and grass for fertilising the soil.

All the women focus group (WFG) respondents in the study villages are subsistent farmers and they are responsible for the food crop production for family consumption. Local sales of garden produce at markets or roadside stalls are the preserve of women. The gardening activities that are normally undertaken by women and girls in all of the study villages mainly include planting crops, sowing seeds, seed selection and procurement, watering, weeding, pruning, harvesting, cleaning, drying, packing and transporting. Women and girls are also responsible for many agricultural activities like planting/sowing, raising nursery plants, weeding, application of fertilizer and pesticides, crop protection, application of organic matter, harvesting, threshing, cleaning, drying, transporting produce to home, selling excess produce and maintenance. Women and girls also take care of livestock such as pigs, chicken and goats in the study villages.

[1] The surveys were conducted in Luguteges and Pindak villages in Kandep district, Pandai and Par villages in Kompiam district, Nanglum and Tukusanda villages in Lagaip-Porgera, Birip and Lukitap villages in Wabag and Mambisanda and Yakaedes villages in Wapenamanda district.

The types of women's businesses/income generating activities fall mainly in the category of informal economy focusing on subsistence gardening and some cash crops (coffee, selling of betel nuts), and selling of livestock (chicken, pigs, goats) in the study villages. Many women also make bilumis. Coffee production activities are undertaken by some female respondents in Lukitap, Birip, Par, Pandai, Mambisanda and Yakaedes villages, but due to drop in coffee prices women have started facing difficulties in their coffee production activities. The biggest incomes are mainly derived from selling livestock (poultry K400-K430, goats K300-K400 per month).

All the studied households rely on their own production to satisfy their food requirements. 65% to 100% of the households are self-sufficient with regards to locally produced food. 60% to 100% of the all households are self-sufficient with regards to food. Mostly the food intake situation has gone worse in all of the households in the past five years. Most of the households in all study villages reported that climatic changes (floods, droughts) have affected negatively on their food supplies and worsened food shortage. The most common strategy of the households to cope with food shortages was to change the composition of their meals to simple, locally produced garden food and to borrow from relatives and friends.

Barriers to private sector investment as well as opportunities to strengthen subsistence agriculture commercial value chains to access domestic and international commodity markets

There are various systemic challenges such as traditional farming approaches resulting in low productivity, lack of quality inputs and extension services, poor access to markets and credit, and lack of supporting infrastructure for transportation hamper the growth of agriculture sector in Enga. Other major constraints to agriculture development include prevalent crime and lawlessness, and insecurity of land ownership and tenure. The sector has also been negatively impacted by climatic and seasonal conditions in recent times, such as dramatic changes in temperatures, the onset of crop pests and disease outbreaks.

Field surveys revealed that there are no groups, networks, or societies, etc. formed solely for women in the study villages. A Potato Cooperative Society exists in Tukusanda village in Lagaip-Porgera district and a coffee cooperative society in a study village of Birib in Wabag district. The respondents stated that they lack any information on establishing cooperatives or farmers groups. There is a need to support smallholder farmers and coffee farmers to establish/join to cooperative agriculture/coffee farming groups to improve their farming business. Improved support to key coffee industry bodies as well as strengthened links between producers, processors, buyers, and financers can help to improve market access and efficiencies through the supply chain. Farmers' groups and associations can play an important role to help members increase their access to supports of information, capital, and technology; bring benefits to members; and partly promote production, enhance productivity, and increase income.

The most pressing obstacles and challenges of farmers at the study villages are related to lack of extension services and proper markets. The pests and insects are also major threats to the livelihoods of rural families and their communities in most of the study villages. According to coffee farmers data the most critical challenges related to coffee farming are low prices in coffee sales, lack of markets and fertilizers, lack of training on coffee farming including increased incidence of pests affecting coffee crops and beans. Women respondent stated that their obstacles to farming are lack of land for gardening including insects and pests.

All the farmers, women and households interviewed mentioned the difficulties associated with obtaining credit and low prices of their crops. The provision of credit to the agriculture sector is regarded as a necessary mechanism to increase capitalization and output. The poor condition of roads represents a major bottleneck for farmers, coffee farmers' and households' capacity to access

more lucrative value chains. Also, poor transportation availability and high transportation cost was seen as an obstacle to access markets and agriculture development.

Farmers in Enga need support to adopt sustainable agricultural practices and encouragement to improve their resilience to climate change impacts and food security by diversifying their food crops produced, including introduction of fruit trees, like bananas, other vegetable crops and livestock. Due to climate change farmers at some study districts have already started to diversify their food crops and now cultivate new cash crops like bananas and carrots which they have not cultivated before due to unfavourable climatic conditions. Support is also needed to development of new small-scale family enterprises that will help enhance resilience to climate shocks in Enga. Moreover, livestock farming can improve diet of the households and promote an additional cash earning opportunity for them.

Overall, access to agricultural extension services by the households, farmers and women focus group respondents in the sample is almost unavailable. Generally, the most frequent type of extension received is to help farmers obtain seedlings. According to the survey data, coffee farmers have not received any extension services and they depend mainly on traditional knowledge to grow coffee. Local government should commit to invest in farmer organisations and stimulate them at a family group level. Moreover, public-private partnerships in extension could improve the performance of value chains and increase benefits going to smallholders. Private efforts to transfer knowledge and skills to smallholders have been effective and offer lessons for future efforts to strengthen value chains. Considerable returns could be gained from public-private partnerships to support extension in particular value chains.

The law and order situation in many study villages in Enga is a concern to farmers, particularly for the women farmers. Tribal fights and lack of security limit trade and reduce competitiveness to suppress agricultural development in many study villages. Land pressure/conflicts and shortage is becoming rampant in the densely populated valleys of the highlands including in study villages located in Kandep, Kompiam and Lagaip-Porgera districts. Also, the impacts of natural disasters and extreme climatic conditions due to climate change are inevitable and are highly variable across the study villages.

The lack of political will or initiative to support agricultural value chains at the farmer-end and to enhance the business enabling environment is seen as the most commonly referred to problem by farmers in the highlands. Based on the district authorities and stakeholders interview data a most common problem related to inadequate support to agriculture and agriculture value chain development is "Money Nogat Mentality"/lack of government funds in Enga and inadequate policy and plans for agriculture sector development in province year in year out including limited capacity of local authorities.

<u>Market study of the financial services sector to identify climate investment opportunities for coffee producers in Enga province</u>

Coffee is grown in the study villages of Lukitap and Birip in Wabag, Par and Pandai in Kompiam, and Mambisanda and Yakaedes in Wapenamanda district. The size of coffee farms varies from one to four hectares in the study villages. Traditional farming is the main method coffee farmers continue use for coffee farming (nursery, transplanting, pruning and growing). Most of the coffee farmers practice agroforestry methods for coffee farming and some farmers have constructed small drainage systems. All interviewed coffee farmers stated that the quality of coffee is currently low due to insects destroying the coffee beans. Few farmers use pesticides to prevent insects for destroying

the coffee beans and plants due to high price of the pesticides and lack of information on proper and safe use of them.

The Coffee Industry Corporation (CIC) has identified areas with potential for new developments and Enga is one of these locations to increase coffee production. The CIC has various activities in Enga including coffee component of Productive Partnerships in Agriculture Project (PPAP), and Wabag district coffee rehabilitation and nursery project at study village of Birip[2]. According to the coffee farmers focus group, CIC and Coffee Cooperative members interview data the biggest problems related to coffee business are a) climate change, which is intensifying the incidence of diseases and pests affecting coffee plants and beans, b) low prices in coffee sales, c) lack of funds and incentives for improving farming methods/practices, d) lack of competitive coffee buying markets, and e) lack of training and capacity building on coffee farming activities. Other challenges are unsustainable grower groups, and lack of partnerships. Also, lawlessness and land tenure systems are threats to coffee production inhibiting new investment in coffee.

The interviewed coffee farmers' awareness of sustainable farming practices and efficient on-farm processing with regards to coffee production is low. Moreover, their business skills are at very low level and training on these issues are highly needed to plan and develop their business activities and access to finance in order to elevate their coffee business. The establishment of field nurseries and instruction on routine crop management and replanting will dramatically improve productivity and plant health.

Intercropping in the coffee farming systems can enhance revenue earnings of coffee farmers in Enga and it can also reduce pests, fixes soil nutrients and reduce erosion. It presents an opportunity to retain coffee farming skill while earning additional revenue from the same plot of land. Crops like avocado, banana, oranges, black pepper, macadamia, and many more can be grown productively alongside coffee. Integrated Farming System such as apiculture development and intercropping vegetables or other valuable tree crops needs further support in coffee farming. By identifying and developing culturally acceptable and nutrient efficient coffee-vegetable intercropping systems can contribute to increase of coffee yields and incomes and improve income-earning opportunities for women in Enga.

One opportunity to improve climate investment opportunities of coffee producers in Enga is to develop and implement productive partnerships by the integration of smallholder producers, producer organizations and micro, small and medium enterprises into performing, remunerative and diversified value chains in the coffee sector. A good example of this is the Productive Partnerships in Agriculture Project (PPAP), which model can be used as a basis and further developed suitable for local circumstances to make the quality of coffee production of coffee farmers better in Enga.

Wabag District Coffee Growers Coffee Cooperative Society[3] was found in only one study village of Birip in Wabag district. There is a need to support coffee farmers to establish/join to cooperative coffee farming groups to improve their coffee farming business in Enga. Social organization, like Coffee Cooperatives and Societies/Associations are necessary for small coffee producers to access markets, technologies or support programmes, and to help farmers recover or respond to global changes. Organization of individual farmers into cooperative farming groups following standardized

[2] For more information, please visit: https://emtv.com.pg/reviving-coffee-industry-in-enga/

[3] According to the interview data this cooperative is not operating effectively because of misuse of funds. Currently, the coffee nursery is over-grown and nobody is interested to transplant.

practices will reduce the incidence of defects that are lowering coffee value. This must be accompanied by education, incentives for performance, and facilitation to succeed.

The coffee farmers' focus group data revealed that the main obstacles to coffee farming are low prices in coffee sales and lack of competitive coffee markets. Markets (or buyers) are available in nearly all study villages however transportation costs are high and markets are not competitive. Several farmers in Yakaedes, Par and Pandai villages have decided to abandon the coffee farming due to low price. The transportation is also poor affecting negatively to coffee farming.

There are currently no incentives available to coffee farmers according to the interview data. None of the farmers have access to micro-credit. Labour investments in coffee have declined in some coffee growing areas in Wabag, Wapenamanda and Kompiam districts with good access to markets and a range of alternative livelihood options in which to invest labour. Some women have been shifting their labour out of coffee to the lucrative fresh food sector, e.g. potatoes because they can obtain better returns on their labour as they have greater control over the income they earn. There is a need to improve farmer's access to micro-credit in order to facilitate adaptation, i.e. organic, substitute crops, new varieties, shading, etc.

Identify capacity issues of farmers, coffee farmers and women groups and develop some capacity building topics on climate resilient approaches and agricultural techniques

The research and the findings from the study villages reveal men and women have clearly defined roles in rural livelihoods. Therefore, they also have different extension and training needs, but extension and training in rural livelihoods has focused on the needs of men. Extension and training are generally targeted at the formal commercial sector, where men dominate. Women are further constrained from taking advantage of extension and training schemes due to their relatively poor literacy and educational levels. Further, women are sometimes excluded from extension and training for cultural reasons. Women are sometimes unable to attend training because of the high workloads associated with their roles in economic livelihoods and gardening, in addition to household chores, childcare and community care.

Women focus group respondents would like to receive training on crop cultivation practices, climate resilient agricultural practices and pest control/management. Other main potential capacity building topics/themes for women based on the field surveys/interviews and desk review are intercropping and agroforestry; improved garden techniques; methods/practices to mitigate and adapt agriculture to climate change; livestock farming; use of pesticides and improved knowledge of their use; improved access to credit from financial institutions and markets; establishment of women groups/associations to foster exchange of knowledge and sharing of ideas and equipment; Family-based approach to agriculture business, and literacy skills, nutrition and health training.

The research and studies clearly indicate the need to develop gender-sensitive training when planning initiatives and projects in Enga. Another important issue is working also with men in order raise their awareness on gender equity. Strengthening women's economic opportunity in agriculture requires more than improving access to land, finance, markets, and transport, however, or simply 'adding' activities to women's already busy lives. A failure to consider the changes needed for both women and men in household responsibilities and local norms and values can lead to pushback or, even worse, backlash. This is important issue to consider when developing different initiatives for farmers in Enga. Another women's training issue is the importance to train and nominate woman leaders to conduct training on e.g. food and nutrition security. Also, inclusive training targeted for both men and women on gender equity and adult literacy is highly needed as was highlighted in the interviews with the provincial stakeholders.

Family-based approach is potential method/capacity building topic to be introduced to households in Enga. Implementing family-based approach will establish the principles of inclusive household-level action plans, where the whole family is involved in decision making, around project investments and partnership implementation, that is, (a) extension/technical inputs and training delivered through/in line with the family teams-based approach and financial literacy and business development services for households; (b) business development services to maximize partnership arrangements and support identification of practices that support women and men working together in business; and (c) community-level support for inclusive business partnerships and identification of capacities, priorities, and participant households.

The training needs identified by the farmers' group respondents were related to sustainable farming methods, pest control, finance and marketing issues. Other main potential capacity building topics/themes for farmers based on the field surveys/interviews and desk review are modern agricultural techniques and sustainable farming; introduction of new farming practices to protect food and cash crops against frost, hailstorms, drought and high rainfalls; market access; introduction to new seeds/planting materials, irrigation and water harvesting; climate resilient fish farming; family-based approach; gender equality and gender-based violence; and improve the capacity of young men and women to engage in productive income generating activities, etc.

The capacity building and training needs identified by coffee farmer survey participants were coffee cultivation practices, financial literacy and pest control. Other potential capacity building topics/themes for coffee farmers based on the field surveys and desk review are improving access to funds/credit and incentives and competitive markets, e.g. by enhancing establishment of coffee farming organisations; improvement/management of coffee quality through the adoption of more efficient and environmentally-friendly post-harvest and processing technology; integration of food crops in coffee farming; organic coffee farming; gender equality issues; female Coffee Farmer Cooperative training; and organise 'direct trade' relationships between coffee producer groups and specialty coffee buyers, etc.

It seems the main issue to deliver the previous (and upcoming) agriculture sector development plans has been the lack of capacity (human, technical and financial management) of the Enga provincial government. There is a great need to strengthen the availability of trained manpower at the district and provincial level through training, local participation and technical assistance. The planning processes also need reinforcement to ensure effective coordination of project planning and implementation. Planning processes also need to support small-farmers to respond to social-ecological changes (climate change impacts, population growth) which they will need to respond in Enga.

1 INTRODUCTION

1.1 Enga Province Context

Enga occupies 11,800 km^2 of the PNG highlands and there are 295,031 inhabitants. The Central Range, in the north of the province, is part of the main divide of PNG. The Lagaip River drains into the Fly River and Coral Sea, while the Lai River drains into the Sepik River and Bismarck Sea. The upper valleys of both rivers support very high population densities and intensive agriculture with continuous cultivation in some places. These areas are some of the most densely settled in the country. There are large swamp areas and intensive agriculture around Kandep in the south of the province. Altitude varies from 400m at the Yuat River in the northeast of the province, to over 3,700 meters along the Central Range. More people in Enga live above 2,000 meters than in any other province. These environments are prone to frost and disruptions to subsistence food supply. The upper altitudinal limit of agriculture is around 2,800 meters. Average annual rainfall varies between 2,300 and 3,800mm, increasing from south to north.[4]

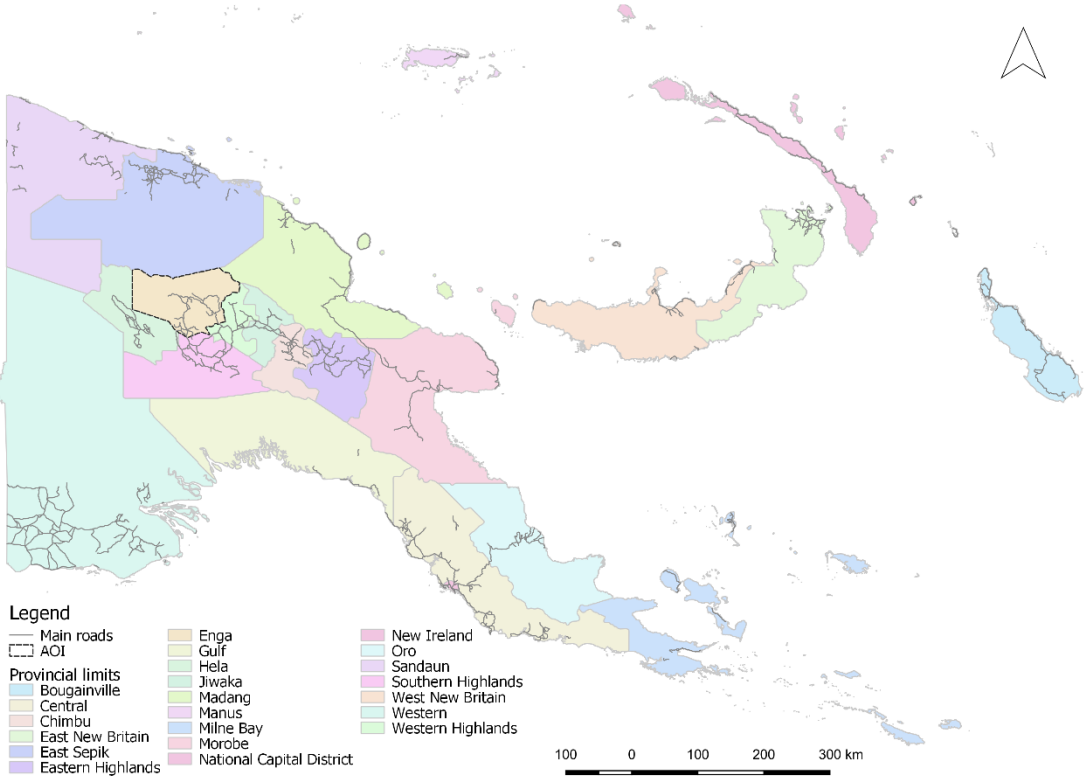

Figure 1. Provincial limits in Papua New Guinea

[4] Hanson L.W., Allen B.J., Bourke R.M. & McCarthy T.J. 2001. Papua New Guinea Rural Development Handbook. The Australian National University.

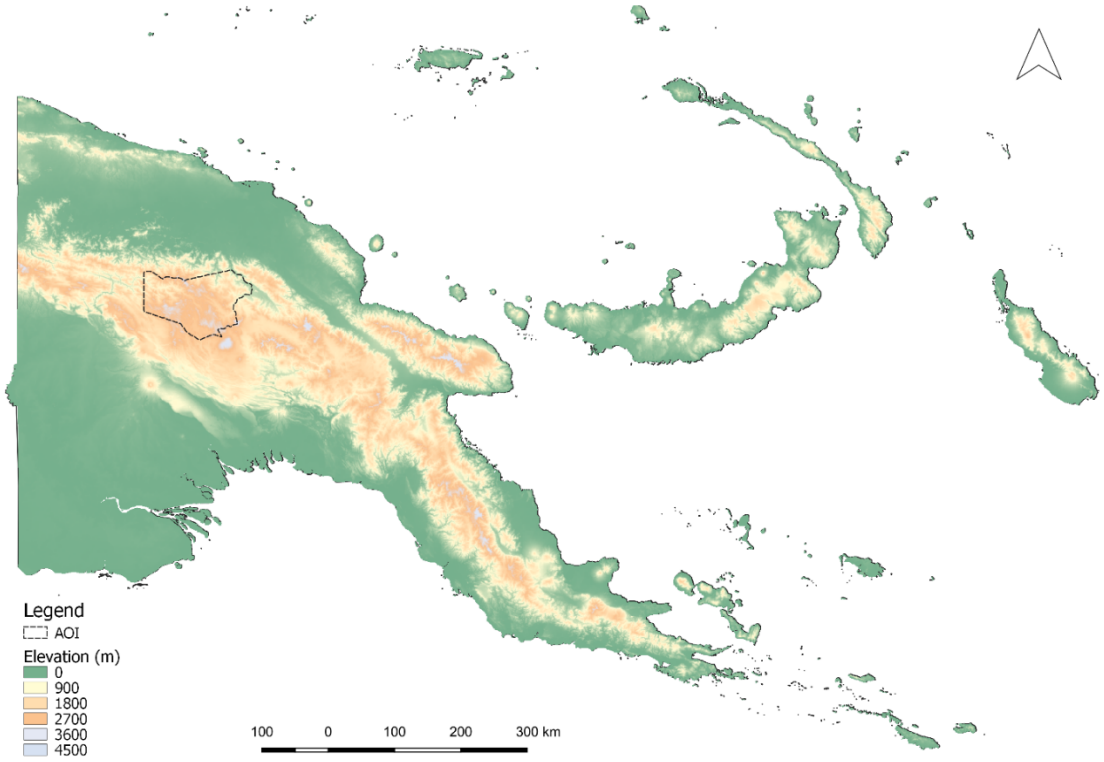

Figure 2. Elevation gradient in Papua New Guinea and Enga Province (dashed polygon)

The five districts in Enga are Kandep, Kompiam-Ambum, Lagaip-Porgera, Wabag and Wapenamanda. The main language spoken in Enga Province by all the Engan's is the Enga Pii language. Population densities are highest in Wabag with 58,9 persons/km^2, while the Kompiam-Ambum District has the lowest density of only 15,0 persons/km^2. More than half of the area of the province is unoccupied mountains.

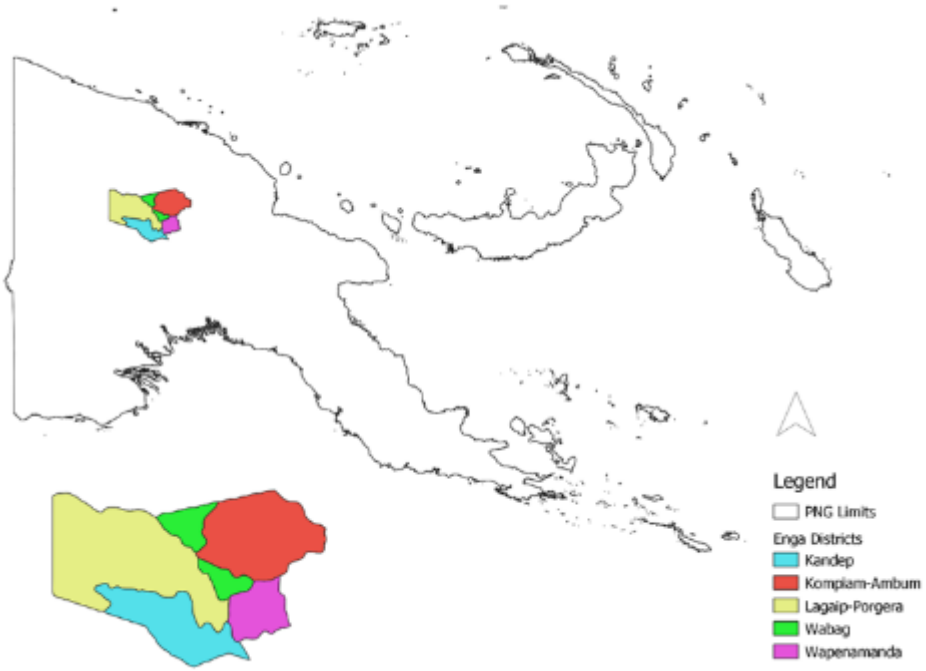

Figure 3. Districts in Enga Province

Enga is a resource rich province, but most Engan communities are facing difficulties in accessing basic services including social services, markets and transportation. People's incomes range between very low and moderate[5]. Agriculture provides only a low to moderate source of income for the province, earned from the sale of coffee, food and firewood. Most of the coffee is grown around Wabag, Wapenamanda and Kompiam in areas below 2,100 meters, which is the upper altitudinal limit of Arabica coffee. People in the higher areas around Kandep and Laiagam sell small amounts of potato and firewood. People in the north of the province have few cash-earning opportunities. Cultivated areas are very prone to both drought and frost, which can seriously affect food security.[6] The Porgera gold mine has had a major economic impact locally and nationally over its life to date. The people of the Enga province have benefited from Porgera mine in the form of royalties; compensation for occupation, relocation and environmental impacts; donations; external education and internal training; community projects and infrastructure; business development contracts; and wages[7].

Figure 4. Mixed-crop farmer in Birip in Wabag distict (Source: FinnOC, 2022)

A branch of the Highlands Highway runs from Mt. Hagen up to Wapenamanda and Wabag and the Porgera Goldmine. Another road connects Kandep with Southern Highlands Province. Those living in the north of the province are very remote and require more than a day's travel to reach a service centre. 62.5 percent of the province population live within 5km of a national road. The overall literacy rate for the Enga province is 35.0 percent with a male literacy rate of 40.2 percent and female

[5] Very low income (0–20 kina/person/year), Low income (21–40 kina/person/year), Moderate income (41–100 kina/person/year) (Hanson et. al 2001).
[6] Hanson L.W., et al. 2001.
[7] Fallon, J. 2020. Economic Impact of the Porgera Gold Mine: 1990-2019 and Loss of Income from Suspension of Operation. Institute of National Affairs. Available at: http://inapng.com/wp-content/uploads/2020/12/Economic-Impact-Porgera-v4.pdf

literacy rate of 29.5 percent[8]. The vision of Enga Provincial Management Corporate Plan (2018-2022) is for Enga to be "Literate, Healthy, Wealthy, Happy and Economically Self-Sustaining" by the year 2050.

Figure 5. Elementary school children in Lukitap village in Wabag (Source: FinnOC, 2022)

Regarding the universal basic education indicators, the net admission rate is 14.8 percent, gross enrolment rate 64.3 percent and net enrolment rate 51.3 percent in the province. The life expectancy at birth in Enga is 52.5 years. The under-five mortality rate in the Enga Province is 97 per 1,000. Under one-year infant mortality rate is 69 per 1,000. Furthermore, the child mortality rate is 28 between ages 1-4 per 1,000.[9]

1.2 Objectives of the assignment

In November 2020, UNDP PNG Country Office and European Union signed Contribution Agreement to implement the project "Strengthening Integrated Sustainable Landscape Management in Enga Province Papua New Guinea" for the period 2021- 2026. The project will support the country in its continuing efforts to address climate change. It will assist in strengthening sustainable and inclusive economic development of the Enga Province of Papua New Guinea (PNG) by three components/objectives:

i) improving climate change mitigation and adaption.
ii) strengthening food and nutrition security and
iii) improving biodiversity and land/forest conservation.

[8] National Research Institute, 2010. Papua New Guinea District and Provincial Profiles. Boroko, NCD, Papua New Guinea.

[9] Ibid.

The Project will achieve the objectives by delivering innovative approach to rural development that brings together government systems, the private sector and community groups to establish models for climate compatible green growth.

The current assignment is intended to closely work with the Climate Change and Development Authority (CCDA) as the lead government agency and project partner and Enga Provincial Government to undertake feasibility studies within the above three project components and set baseline for implementation of project activities on the ground.

Under the overall supervision of the UNDP International Technical Advisor and the technical guidance of the CCDA and in close coordination with Enga Provincial Administration, the FinnOC will be responsible for conducting feasibility studies of the above mentioned three components.

As per TOR, the FinnOC will be responsible for conducting feasibility studies of the following three components:

Component 1: Improved climate change mitigation and adaptation. This component will focus principally on delivering improvements in the status of climate change mitigation and adaption by strengthening its integration into the development planning framework, supporting the development and early implementation of climate compatible provincial and district development plans, including the development of effective financing mechanisms to support climate mitigation, adaptation and disaster risk management activities.

Component 2: Strengthened food and nutrition security. This component will focus on strengthening food and nutritional security within Enga through engagement with both key commercial value chains and subsistence farmers to improve cultivation techniques and help integrate new crops and produce within production systems.

Component 3: Improved Biodiversity and land/forest ecosystems conservation, restoration and sustainable use. This component focuses on enhanced action on conservation, restoration and sustainable use of high value areas within the landscape. These will be achieved through combining an enhanced mandate and capacity of environmental officers at the provincial level as part of Conservation and Environment Protection Agency's (CEPA) decentralization process, with strengthening and coordination of provincial environment, climate change and forest management committees and their work with economic development committees, and targeted action at the community level to establish Community Conservation Areas and undertake reforestation, rehabilitation and woodlot development activities.

This report focuses on Component 2: Strengthened food and nutrition security. The aim of the component is to:

- Conduct an assessment study of barriers to private sector investment as well as opportunities to strengthen subsistence agriculture commercial value chains to access domestic and international commodity markets.
- Conduct market study of the financial services sector to identify climate investment opportunities for coffee producers in Enga province.
- Identify and analyse capacity issues as well as develop capacity building topics for farmers and women groups on climate resilient approaches and agricultural techniques.
- Review of current Provincial and District Development Plan and propose options to strengthen food and nutrition security in provincial development planning.

This report on Strengthened food and nutrition security is organized around eight chapters. The first Chapter provides introduction to the project and Enga context including study objectives. The Chapter two discusses the study approach and methods, data collection issues, tools for data gathering, and stakeholders engagement to the study.

The Chapter three describes food and nutritional security situation in study villages in Enga based on the data collected from the households. The data provides general overview of households' availability, access, utilization and stability of food and nutrition.

The Chapter four will report the different barriers to private sector investment as well as opportunities to strengthen subsistence agriculture commercial value chains to access domestic and international commodity markets. The assessment is based on literature/desk review, data collected from the field, mainly farmer's and coffee producer's data including district authorities interview data.

The different alternatives of climate investment opportunities for coffee production are described in Chapter five. Data collected from the field, mainly Coffee Industry Corporation/association interview data, coffee producer's data, data on existing studies are also used for the analysis.

The aim of the Chapter six of the report is to describe farmers and women's current agricultural practices, and farmers and women's capacity to adopt improved cultivation techniques and help integrate new crops. Based on this analysis different capacity building topics have been developed and introduced on climate resilient approaches and agricultural techniques.

Chapter seven provides some findings on preliminary components of different development sectors of Enga's provincial development plan (2022-2030) based on discussions with provincial authorities. Chapter eight provides some recommendations for the project based on the field findings on strengthening food and nutrition security and to improve climate compatible coffee production in Enga. There are four appendices in the report.

2 METHODOLOGY

2.1 Data collection on the ground

This section presents specific methods that were utilized for the baseline data collection/feasibility studies in Enga. The chapter discusses the survey tools, the data collection process, and the sampling issues.

2.1.1 Survey tools

To uncover the issues related to climate change mitigation and adaption, food and nutrition security including biodiversity and land/forest conservation in Enga, a total of four study tools (questionnaires) were developed and employed together with social sampling methods to collect both quantitative and qualitative data relating to the study parameters. The FinnOC developed the following survey instruments used for the study: a) farmers focus group survey, b) women's focus group survey, c) coffee producers' questionnaire, and d) household survey. Also, a discussion guideline was developed targeted to district and provincial authorities.

The methods and tools for the feasibility studies were developed in close collaboration with the UNDPt. These survey tools were used to collect the baseline data from five districts of Enga Province. Annex 1. Survey tools presents each of the questionnaires used.

2.1.1.1 Farmers focus group survey

Farmers focus group survey aimed at revealing subsistence farmers' characteristics of crop production, cultivation/farming practices/agricultural techniques, issues related to e.g. experimentation with unfamiliar crops, available agricultural extension services, perception of climate risk, farmer's vulnerability and adaptation measures and capacities regarding climate-induced threats (natural disasters), food security issues, access to finance and markets, the positive and negative impacts of the climate change perceived by the farmers, climate shocks and coping strategies, problems faced by farmers, etc.

Figure 6. Farmers focus group held in Birip village in Wabag district (Source: FinnOC, 2022)

2.1.1.2 Household survey

The household (HH) surveys described livelihoods of the households. The topics covered by the HH survey included household characteristics (size and composition, education); livelihood, income generation and expenditure; household assets; access to services (health, schools), markets, and infrastructure (transport, power, water) including finance; transport, poverty and vulnerability (e.g. climate shocks and coping strategies, coping strategies of decreased food availability); nutritional status and food security (amount of food obtained, methods of food acquisition, etc); state of the environment, etc. Household surveys were conducted in each study village by interviewing both the male and female household members to gather also gender data. The sample size of the HH surveys varied based on the village population. The research team used non-systematic random sampling of HHs. The percentage of households selected for the study villages was around 10-40 percent depending on the size of village population.

Figure 7. Household survey conducted in Pandai village in Kompiam district (Source: FinnOC, 2022)

2.1.1.3 Women's focus group discussion

The Guidelines for the Women's Focus Group Discussion (WFG) shed light on gender issues related to climate change and impacts/problems, women's vulnerability, and adaptive capacities to climate-induced threats. The aim of this survey tool was also to reveal and analyse capacity issues for women groups on climate resilient approaches and agricultural techniques.

Data was also collected about women's engagement in agricultural sub-sectors, women's groups and networks, household division of labour, financial management, the kinds of household, agricultural, garden, coffee production and other income generation activities, etc. The data collected through this study tool also revealed the positive and negative impacts the climate change on women and children including impacts on environment.

Figure 8. Women's focus group held in Pandai village in Kompiam district (Source: FinnOC, 2022)

2.1.1.4 Focus group of coffee producers

The FinnOC developed a survey questionnaire to interview coffee farmer's groups and coffee cooperatives. The survey tool aimed to inform issues related to the coffee farming like characteristics of plantations, coffee farming methods and technologies, effects of climate change on coffee production, climate change induced challenges to coffee farming, mitigation approaches to climate change impacts, market and logistics issues, quality control issues, climate investment opportunities, etc.

Figure 9. Coffee farmers participating to focus group survey in Mambisanda village in Wapenamanda district (Source: FinnOC, 2022)

2.1.1.5 Provincial authorities' discussion guideline

The FinnOC team developed a discussion guideline to obtain information regarding the authority/ /organisations interviewed in Enga, including the type of work they do and the role related to study themes of climate change mitigation and adaption, food and nutrition security and biodiversity and land/forest conservation; policies and strategies of the organisation and their relation to study themes, projects/interventions related to study themes, gender issues (organisations' gender focal point, constraints in reaching women and their empowerment, etc.)

Figure 10. Interview with Environment/Climate Change Officer, Enga Provincial Government in Wabag (Source: FinnOC, 2022)

2.2 Sampling strategy

One team of Research Assistants (three females and two males) with the support of the Team conducted the surveys in the field. The group surveyed two villages in each five districts. However, the team only visited and conducted one survey in the Lagaip part of the Lagaip-Porgera district due to difficult location, poor road condition and security reasons. The selection of study villages was done together with the Client, advised by the Environment/Climate Change Officer of Enga Provincial Government.

The researchers conducted one focus group of smallholder farmers, one focus group of coffee producers, and one women's focus group in each survey village. Household surveys were conducted in each study villages.

The team conducted the surveys in February 13 till March 6, 2022. The field work plan and schedule are presented in Annex 2. The list of people met during data collection is presented in Annex 4.

Before the data collection a village meeting/awareness of the upcoming survey were held in each survey village to explain the purpose of the survey to the village/community leaders and villagers in order to ensure smooth data collection.

Figure 11. Community meeting held at Yakaedes village in Wapedamanda district (Source: FinnOC, 2022)

The number of household surveys collected during the data collection trip totaled 456 households. In total ten women's focus group, coffee farmers and farmers focus group each and six coffee farmers focus group interviews were conducted.

Table 1. Sample sizes for study tools in Enga (Source: FinnOC, 2022)

District	Village	HH Surveys	WFG	Farmers focus group	Coffee farmers focus group
Kandep	Luguteges	27	1	1	-
	Pindak	34	1	1	-
Kompiam	Pandai	38	1	1	1
	Par	64	1	1	1
Lagaip-Porgera	Nanglum	36	1	1	-
	Tukusanda	43	1	1	-
Wabag	Birip	68	1	1	1
	Lukitap	43	1	1	1
Wapenamanda	Mambisanda	50	1	1	1
	Yakaedes	53	1	1	1
Grand Total		**456**	**10**	**10**	**6**

Coffee is not grown in the study villages of Luguteges, Pindak, Nanglum and Tukusanda and therefore the coffee farmers surveys were not conducted in these villages.

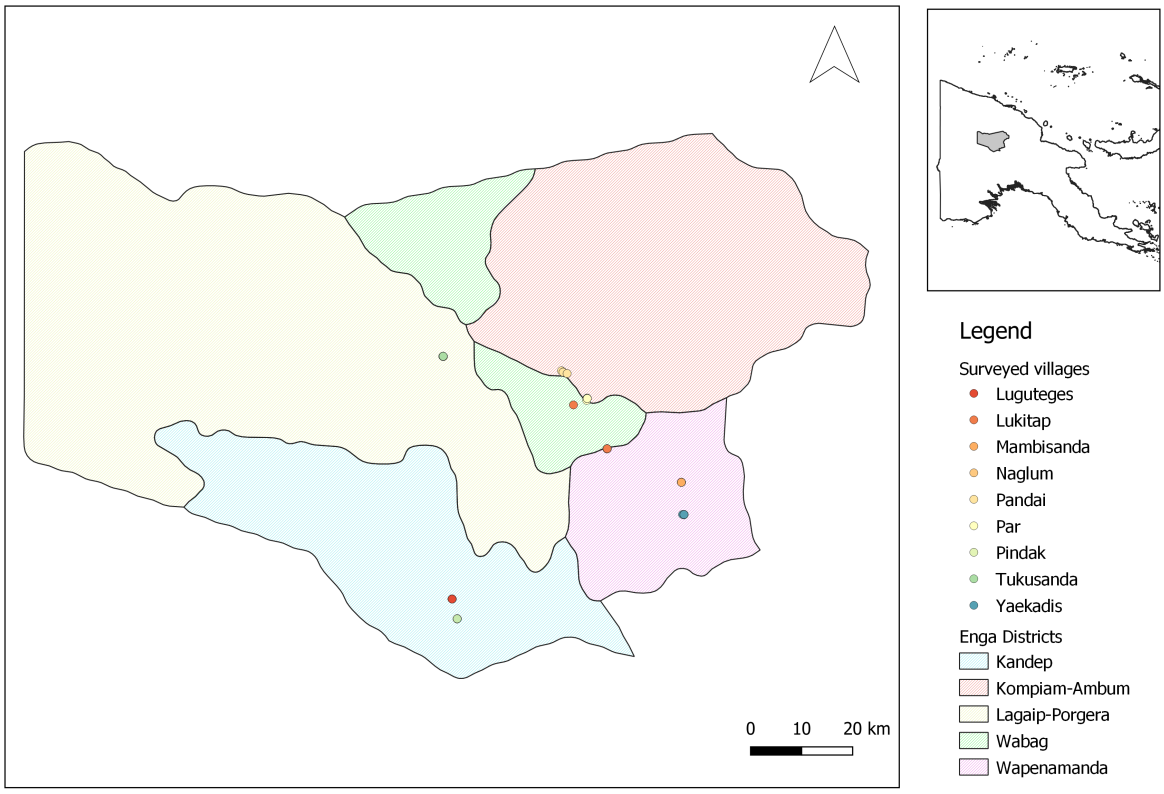

Figure 12. Location of the study villages in Enga Province (Source: FinnOC, 2022)

3 FOOD AND NUTRITIONAL SECURITY SITUATION IN ENGA

This Chapter describes food and nutritional security situation in ten study villages in Enga. Also, a brief introduction to food and nutritional security issues at national level is provided. The main survey tool to obtain food and nutritional security issues was the household survey. The data aims to reveal general overview of households' availability, access, utilization and stability of food and nutrition. The chapter also reports characteristics of farming of households including women's agricultural activities.

3.1 A brief overview of food and nutritional security issues in PNG

Agriculture accounts for about 20 per cent of GDP but sustains the livelihoods of 80 per cent of the active population in PNG. Small-scale farming systems dominate the sector, where food crops provide most of the food consumed in the country, and pigs, poultry and cash crops (mainly coffee, cocoa and copra) supplement income.

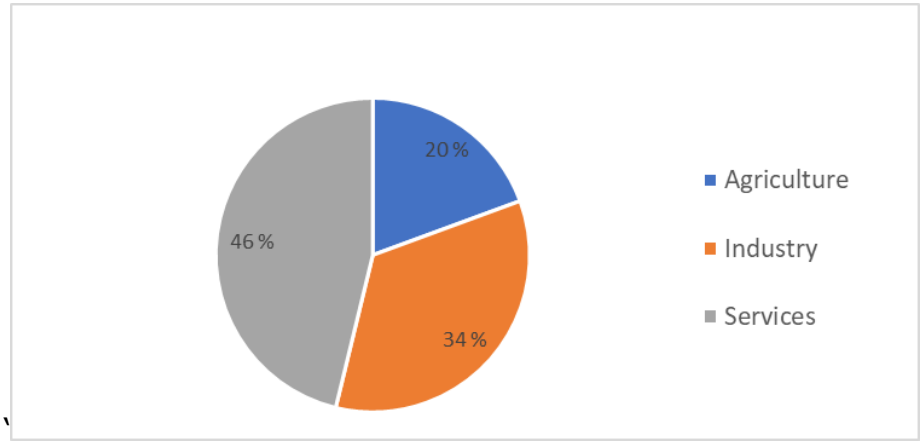

Figure 13. GDP by sector in Papua New Guinea in 2020[10]

Subsistence food production in traditional food gardens together with subsistence and artisanal fishing, hunting and food gathering continues to be the fundamental basis of food security in Papua New Guinea (PNG); providing resilience against external shocks, either economic (price spikes, global recession) or natural (cyclones, floods, droughts, pests and diseases, etc.). For the large majority of the population subsistence food production is by far the most important source of food and a growing portion of domestically grown food surplus is being marketed. Indeed, cash earned from selling fresh food is exceeded only by cash earned from coffee sales. The most commonly marketed fresh foods are sweet potato, other root crops, corn, peanuts, green vegetables such as aibika, cabbage, beans and amaranthus, fruit including pawpaw, pineapple, mango and watermelon, and nuts such as karuka and galip in PNG. Additionally, increasing amounts of domestically grown introduced vegetables are now being sold.[11]

According to the Australian Centre for International Agricultural Research (ACIAR) (2020) report[12] about 80% of the food energy consumed in PNG is produced in the nation, with the urban minority consuming a much higher proportion of imported food. The most important imported foods are rice (just over 300,000 t/year) currently sourced from China, wheat (from Australia) and sheep and beef meat (from New Zealand and Australia).

The following figure depicts people's different source of energy and protein by main food groups in PNG.

[10] Asian Development Bank, 2021. Key Indicators for Asia and the Pacific 2021. Available at: https://www.adb.org/publications/key-indicators-asia-and-pacific-2021
[11] Department of Agriculture and Livestock, 2018. Papua New Guinea National Food Security Policy 2018-2027. Available at: http://www.agriculture.gov.pg/wp-content/uploads/2018/12/National-Food-Security-Policy-2017-2027.pdf
[12] Robins L, Crimp S, van Wensveen M, Alders RG, Bourke RM, Butler J, Cosijn M, Davila F, Lal A, McCarthy JF, McWilliam A, Palo ASM, Thomson N, Warr P & Webb, M. 2020. COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action. ACIAR Technical Report 96, Canberra: 254 pp. ACIAR Technical Report No. 96 (TR096). Available at: https://www.aciar.gov.au/publication/covid-19-and-food-systems-indo-pacific/6-covid-19-and-food-systems-papua-new-guinea

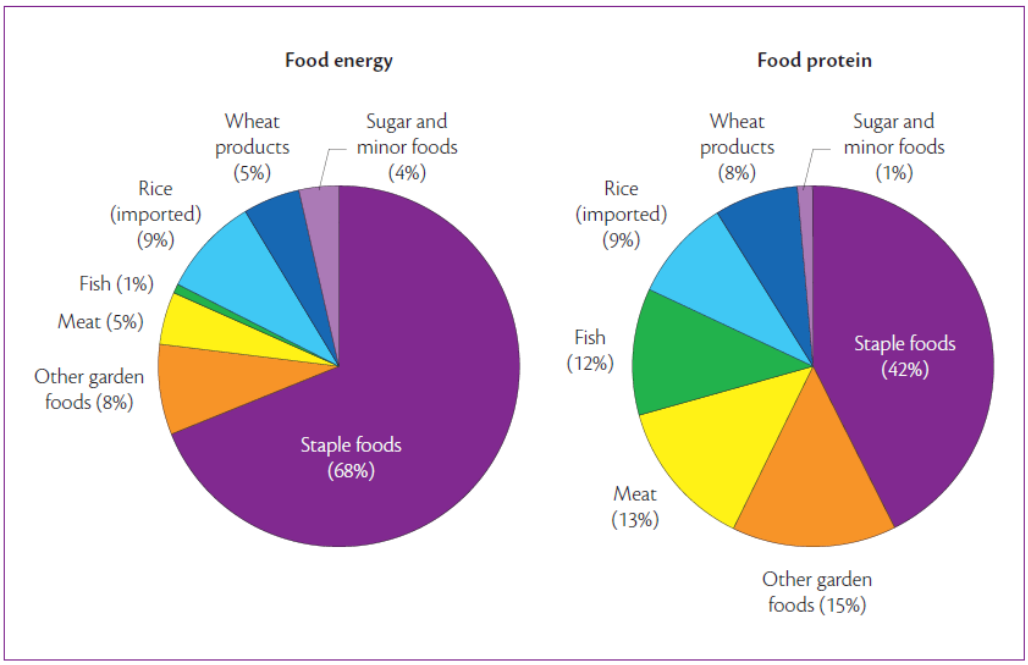

Figure 14. Source of energy and protein by main food groups, 2006.[13]

Food security can be defined as it exists when all people have, at all times, physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (reaffirmed definition at the World Food Summit, 2009). Overall, food security is high in PNG as most rural people have access to land and can grow most of their food requirements. In PNG threats to food security may arise from shortfalls in subsistence food production, very low cash income or both. The threats may be short term (such as those caused by an extreme climatic event) or long term (such as very low cash income and no access to land).[14]

However, high child stunting rates[15], and insufficient protein intake among rural populations suggest that food systems in PNG need to be improved to sufficiently meet the dietary needs of rural communities[16]. Also, the 2015 and 2016 El Niño brought extreme drought and frost to PNG which led to widespread crop damage. Over 40 percent of the population were affected, with nearly half a million people experiencing severe food shortages resulting in increased mortality and food and nutrition insecurity. Climate change is expected to increase the severity and frequency of extreme weather events.[17]

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[13] Bourke, M.R and Harwood, T. (Eds), 2009. Food and Agriculture in Papua New Guinea. Available at: https://press.anu.edu.au/publications/food-and-agriculture-papua-new-guinea
[14] Bourke, A. 2001. An Overview of Food Security in PNG. Available at: https://www.researchgate.net/publication/323004673_An_overview_of_food_security_in_Papua_New_Guinea
[15] The most recent Household Income Expenditure Survey (2010) estimated 49.5 percent of children under 5 years old are stunted (NSO, 2009/10).
[16] Schmidt, Emily; Gilbert, Rachel; Holtemeyer, Brian; Rosenbach, Gracie; and Benson, Todd. 2019. Papua New Guinea survey report: Rural household survey on food systems. IFPRI Discussion Paper 1801. Washington, DC: International Food Policy Research Institute (IFPRI). https://doi.org/10.2499/p15738coll2.133067
[17] World Bank, 2019.

Malnutrition is a serious issue in PNG which has negative implications for human development and the economy. Agriculture can improve nutrition outcomes through multiple pathways, including as a source of food, income, and women's empowerment. Increasing income is alone insufficient to achieve nutrition impacts. Evidence from a recent study by the International Food Policy Research Institute (IFPRI 2018) demonstrated that while calorie intake increased within non-poor households, diet quality remained insufficient: predominately based on starchy staple foods with little-to-no consumption of micronutrient rich foods such as animals source foods, fruits, and vegetables.[18]

Nearly half of all children (49.5%) under five years old have stunted growth, which indicates long-term malnutrition (UNICEF 2020), and many are wasted. A 2018 study in four lowland locations reported high levels of stunting and underweight in children (Benson et al 2019). Malnutrition is reported to directly cause or contribute to one-third (33%) of all children's deaths in hospitals (DoH 2015). Other demographic data compares unfavourably with most other nations outside of sub-Saharan Africa, including the rate of under-five child mortality (48 per 1,000 live births), infant mortality (38 per 1,000 live births) and the youth literacy rate for the 15–24 age group (68%) (NSO & ICF 2019, UNICEF 2020).[19]

The Papua New Guinea National Food Security Policy 2018-2027[20] guides resources to build sustainable food security for all Papua New Guineans by aiming to foster strong public-private partnerships and thus leverage agriculture's potential to promote enhanced nutrition and health by bringing profitable smallholder farming, efficient food value chains, women's income and child nutrition together. Successful implementation of the policy will contribute to advancing the nation towards the Vision 2050 of being a smart, wise, fair and happy society, and achieving the global Sustainable Development Goal 2 to end hunger, achieve food security and improved nutrition and promote sustainable agriculture.

In terms of nutrition security, there is a more pressing need for support to enhance productivity and sustainability of smallholder farming systems for the traditional staples and nutrient rich (particularly protein) foods - including, legumes, small livestock and aquaculture fish. Enhancing competitiveness and function of value chains for domestically produced protein rich foods will also be critical for livelihoods and food security.[21]

3.2 A brief overview of food and nutritional security issues in Enga

Agriculture is the dominant economic activity in Enga Province, characterized by smallholder farmers producing mostly subsistence crops for household consumption combined with some cash crops as a source of income. Estimates suggest that more than 90% of the province's population are engaged in producing food crops (NSO and ICF 2019). Agricultural productivity is generally low. Smallholder farming is characterized by mixing different yield crops—including sweet potatoes, Irish potatoes, yam, taro, banana and corn—and small trees as a source of firewood in gardens of five hectare or less (World Bank 2018). Coffee represents the major cash crop. Selling coffee, food crops, and firewood provides a source of low to moderate income for some smallholder farmers (World Bank

[18] Ibid.
[19] Robins L, et al. 2020.
[20] Department of Agriculture and Livestock, 2018. Papua New Guinea National Food Security Policy 2018-2027. Available at: http://www.agriculture.gov.pg/wp-content/uploads/2018/12/National-Food-Security-Policy-2017-2027.pdf
[21] Ibid.

2019). The population involved in commercial farming is very limited (Loukos, Arathoon and Zibi 2019).[22] The malnutrition rate of Enga increased from 16 percent to 25 percent between 2012 and 2016.[23]

The following table presents data on households engaged in different agricultural activities in Enga based on the Department of Agriculture and Livestock (DAL) (2018) data.

Table 2. Households engaged in agriculture in Enga.[24]

Households engaged in	Coffee for agriculture cash)	36.9% (with 34.4%
	Food crops for cash)	79.8% (with 9.3%
	Livestock	70.1% (with
8.5% for cash)		
	Poultry	20.2% (with
9.4% for cash)		

The only areas in the province that have high or very high land potential under natural conditions are the isolated areas around Kandep, Porgera and Kompiam. Most of the province has low potential land caused by combinations of steep slopes, poor soils, flooding, low temperatures, frost and frequent cloud cover. There are significant areas of strong agricultural pressure near Wabag, Lagaip and Kandep, caused by very intensive agriculture being practised in low potential environments. These areas are vulnerable to various forms of land degradation, declining crop production, frost and food shortages. The concentration of both population and agricultural activity at altitudes above 2,000 meters, in areas prone to drought and frost, seriously affects agricultural productivity and food security. The best potential for agricultural development is in the upper Porgera Valley, lower Sau Valley and lower Lai Valley, where there is moderate to high land potential, no agricultural pressure and reasonable access to markets.[25]

The Global Green Growth Institute (CGGI) (2021)[26] assessment shows that Enga Province is exposed to the adverse impacts of climate change, as evidenced in a rise in temperature and potential changes in rainfall. The province's population and economy are also extremely sensitive to these phenomena, given their dependence on sectors that experience considerable impacts from climate change—particularly agriculture. Socioeconomic conditions in the province—characterized by low income levels and a lack of essential infrastructure, including transportation, health, electricity, water, and sanitation—limit its capacity to adapt. These findings are also supported by the data collected from the study villages (see Appendix 3 – socioeconomic profile of study villages).

[22] GGGI, 2021. Climate-Resilient Green Growth in Enga Province. Available at: https://gggi.org/site/assets/uploads/2021/09/CRGG-Assessment-of-Enga-Province-Final-Report.pdf
[23] DAL, 2019.
[24] Ibid.
[25] Hanson L.W., et al. 2001.
[26] Ibid.

3.3 Field surveys regarding food and nutrition security

3.3.1 Characteristics of smallholder farming in study villages

Generally, the data collected from the field observed not big variability in livelihood activities, production systems, and food systems within the study villages visited.

Gardens are an integral part of local food systems in Enga. Households in study villages possess around five to ten gardens. Households see multiple gardens as a strategy to enhance household food security including increasing income and livelihood opportunities in study villages. Many studied households have plans to establish new gardens in the near future. They will establish the gardens mostly in forest land in Kandep and Kompiam districts. On the contrary, households situated in Lagaip-Porgera, Wabag and Wapedamanda districts are planning to establish their new gardens mostly to cleared land. In Nanglum village in Lagaip-Porgera district households (64%) are planning to establish their gardens to forest land.

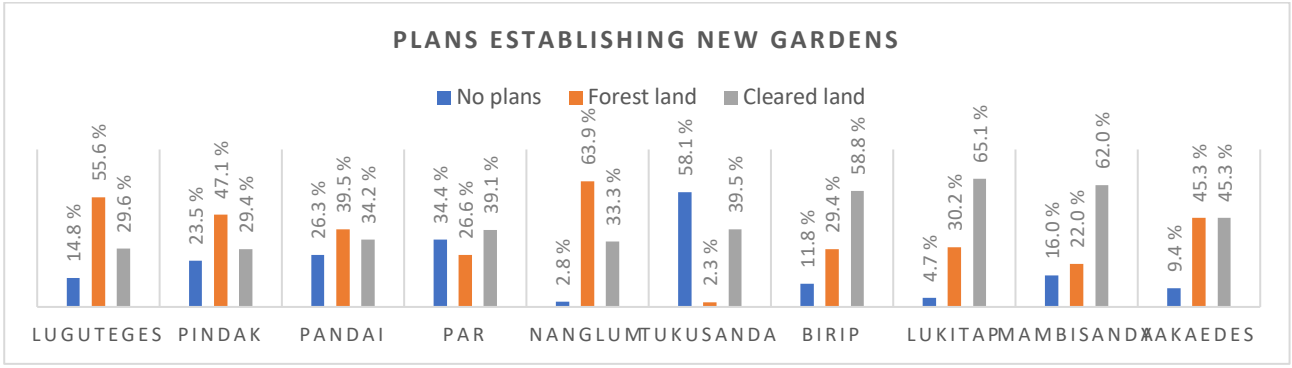

Figure 15. Households' plans to establish new gardens (Source: FinnOC)

The following figure presents a map showing the forest area in the study area.

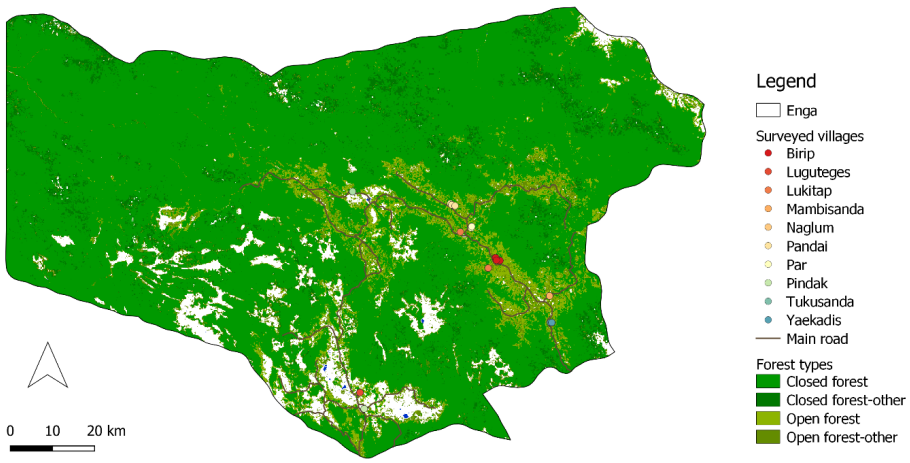

Figure 16. The forest area in the study area (Source: FinnOC, 2022).

According to household and farmers focus group data gardens contain a high diversity of different plants such as banana, kaukau, potatoes, taro, spring onion, beans, peans, corn, pawpaw, yam, peanuts, etc. Households engaged with poultry farming varies from 12% to 56% of the households in the study villages, mainly concentrating in Lagaip-Porgera, Wabag and Wapedamanda districts. Households mainly sell pigs and poultry products at the markets. Pig and poultry selling are practiced yearly. Some households also sell fish in Tukusanda village in Lagaip-Porgera and in Pindak village in Kandep.

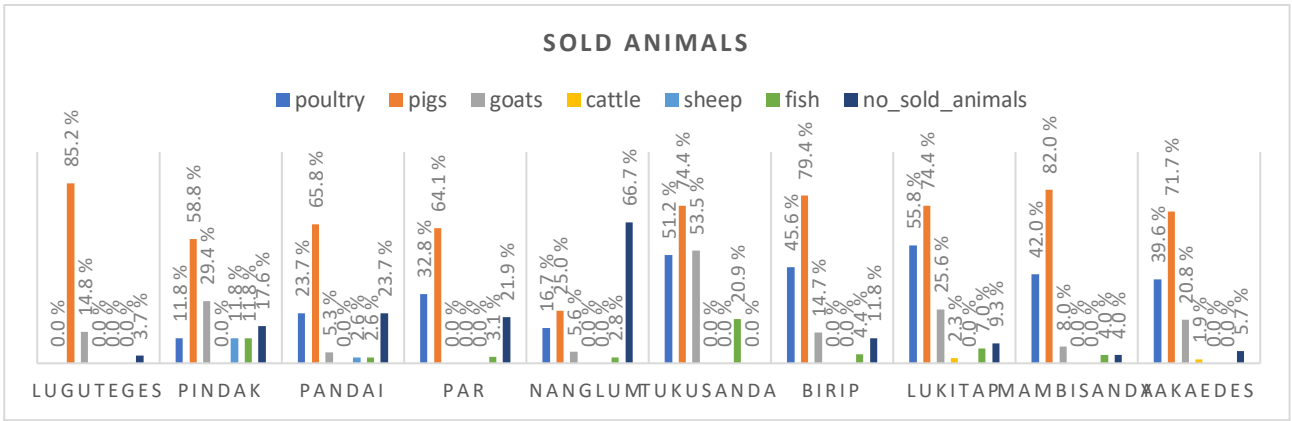

Figure 17. Livestock sold at the markets (Source: FinnOC)

The food crops are sold mostly at the local village markets which are usually located about one hour away from their home villages. Households at Lagaip-Porgera and Wabag districts also sell their produce in Wabag town market.

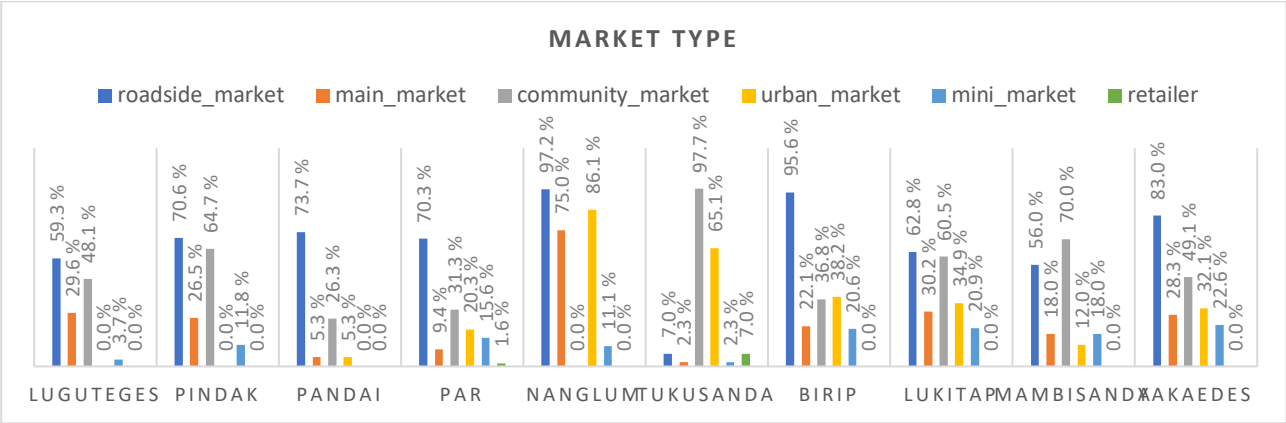

Figure 18. Place of selling garden produce (Source: FinnOC)

As can be seen from the figures below, women are more involved to farming and livestock activities compared to males.

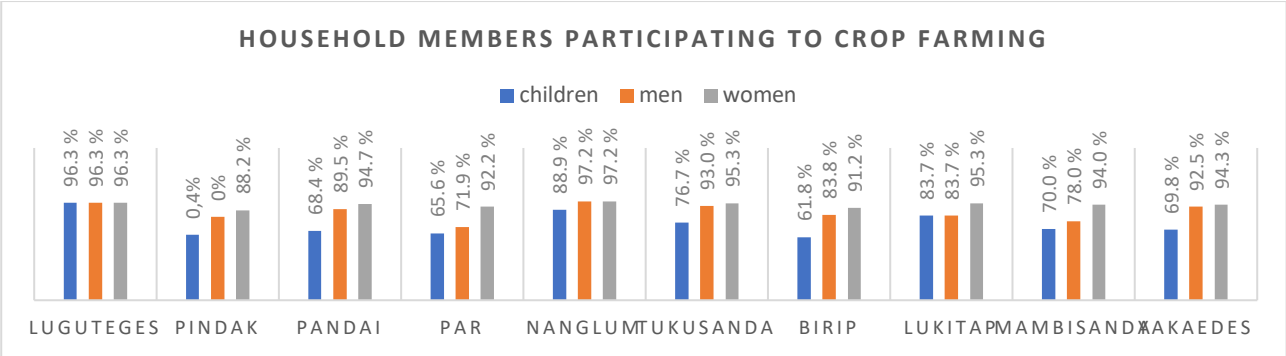

Figure 19. Household members participating to crop farming activities (Source: FinnOC)

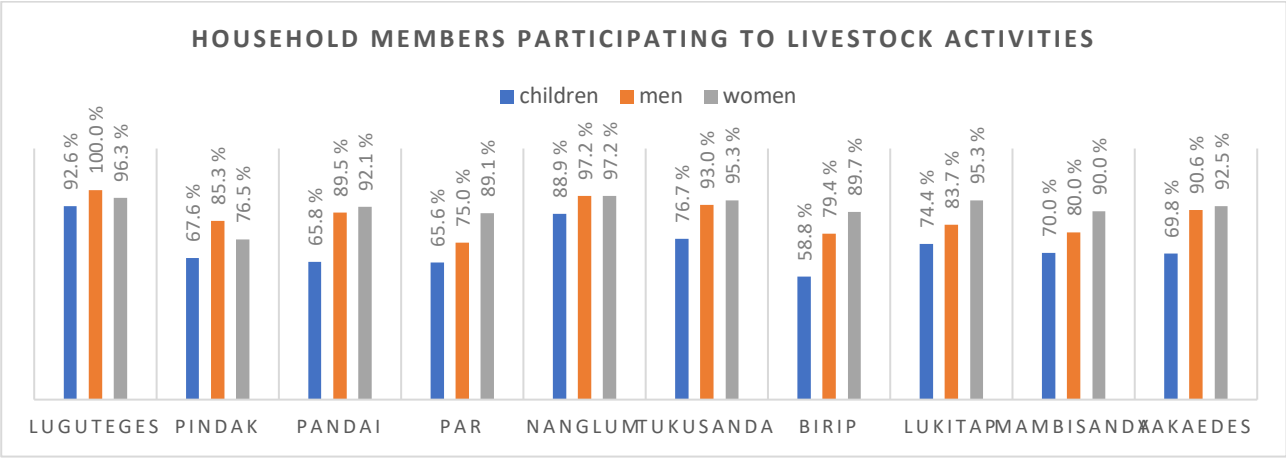

Figure 20. Household members participating to livestock farming activities (Source: FinnOC)

Intercropping is most common agricultural method used in all of the study villages. Crop rotation and polyculture are also common methods used by the households. 40% to 55% of the households

also use agroforesty methods. In Nanglum village, almost 92% of the household respondents use this method. Water harvesting is not commonly used in the study villages.

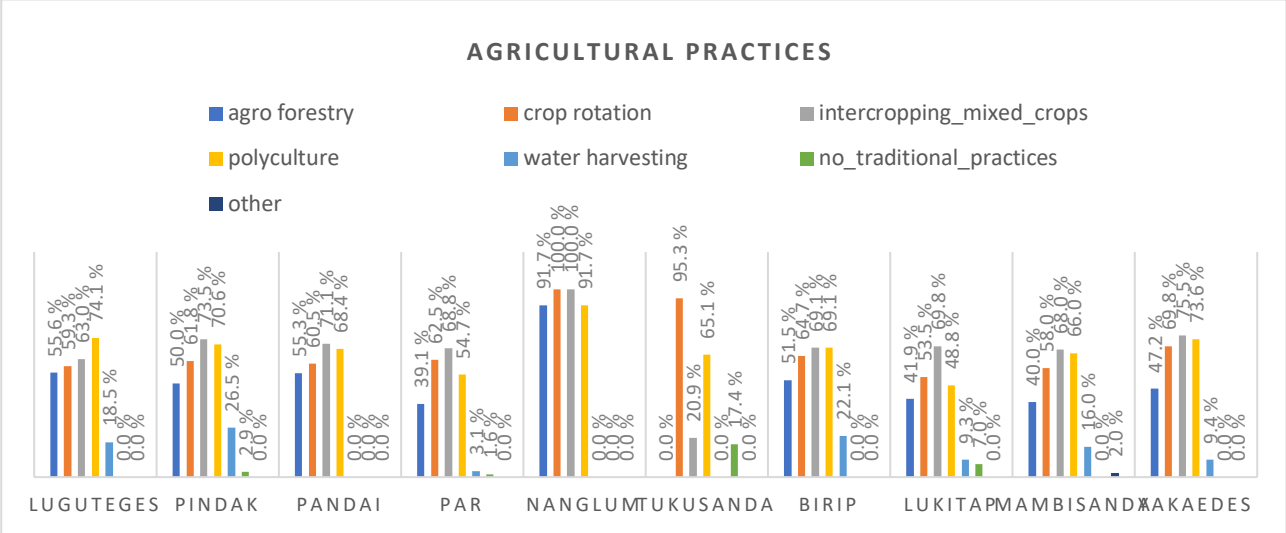

Figure 21. Agricultural methods used in the study villages (Source: FinnOC)

The household interviewed mostly use chicken and pig manure including dead leaves and grass for fertilising the soil. Households have not been informed about the negative effects of chemical pesticides and fertilizers on the environment, except only in Tukusanda village (44%) in Lagaip-Porgera.

3.3.2 Women's agricultural practices and income generation activities at the study sites

From daily work in producing food, women have an extensive knowledge of plants and the agricultural environment. They are highly skilled horticulturalists. Women contribute at least half of the labour to the production of food crops and cash crops from village gardens in PNG. Women therefore make a highly significant contribution, not only to household production, but also to the foreign earnings of PNG.[27] Moreover, women sell their surplus produce, generally at local markets, to generate income for their families. They have also ventured into small to medium enterprise activities. They own and operate a wide range of farm and non-farm microenterprises, mostly in the informal economy, which enable rural households to diversify and secure their income sources.[28]

In rural PNG, gender roles, and the associated gender division of labour, are strongly defined. In terms of rural livelihoods, women have the major role in food-crop production (and local food-crop marketing), and rearing pigs and chickens for subsistence, contribution to cultural events, reciprocity, and also sometimes for cash[29]. Where land use intensity is low, the balance between women's and men's labour is about the same, but the proportion of labour done by women increases with increasing land use intensity[30].

[27] Bourke, M.R and Harwood, T. (Eds), 2009. Food and Agriculture in Papua New Guinea. Available at: https://press.anu.edu.au/publications/food-and-agriculture-papua-new-guinea
[28] FAO. 2019. Country gender assessment of agriculture and the rural sector in Papua New Guinea. Port Moresby.
[29] Miranda Cahn & Mathias Liu, 2008. Women and rural livelihood training: a case study from Papua New Guinea, Gender & Development, 16:1, 133-146, DOI: 10.1080/13552070701876342
[30] Robins, L. et al. 2020.

All the women focus group (WFG) respondents in the study villages are subsistent farmers and they are responsible for the food crop production for family consumption. A horticulture system, where people devote most of their time to agricultural activities and gardening, is used in the study villages, as in most rural villages in Enga. Local sales of garden produce at markets or roadside stalls are the preserve of women. The gardening activities that are normally undertaken by women and girls in all of the study villages mainly include planting crops, sowing seeds, seed selection and procurement, watering, weeding, pruning, harvesting, cleaning, drying, packing and transporting.

Women and girls are also responsible for many agricultural activities like planting/sowing, raising nursery plants, weeding, application of fertilizer and pesticides, crop protection, application of organic matter, harvesting, threshing, cleaning, drying, transporting produce to home, selling excess produce and maintenance. Women and girls also take care of livestock such as pigs, chicken and goats in the study villages. Pigs are raised and looked after by many families in all study villages.

Figure 22. Villagers sell their pigs in order to meet community obligations like compensation, bride price payments, school fees and food (Source: FinnOC, 2022)

The types of women's businesses/income generating activities fall mainly in the category of informal economy focusing on subsistence gardening and some cash crops (coffee, betel nuts), and selling of livestock (chicken, pigs, goats) in the study villages. Many women also make bilums. Coffee production activities are undertaken by some female respondents in Lukitap, Birip, Par, Pandai, Mambisanda and Yakaedes villages, but due to drop in coffee prices women have started facing difficulties in their coffee production activities. The biggest incomes are mainly derived from selling livestock (poultry K400-K430, goats K300-K400 per month). However, the frequency of poultry selling is every 6 to 8 weeks and pig selling once in 1.5 to 2 years.

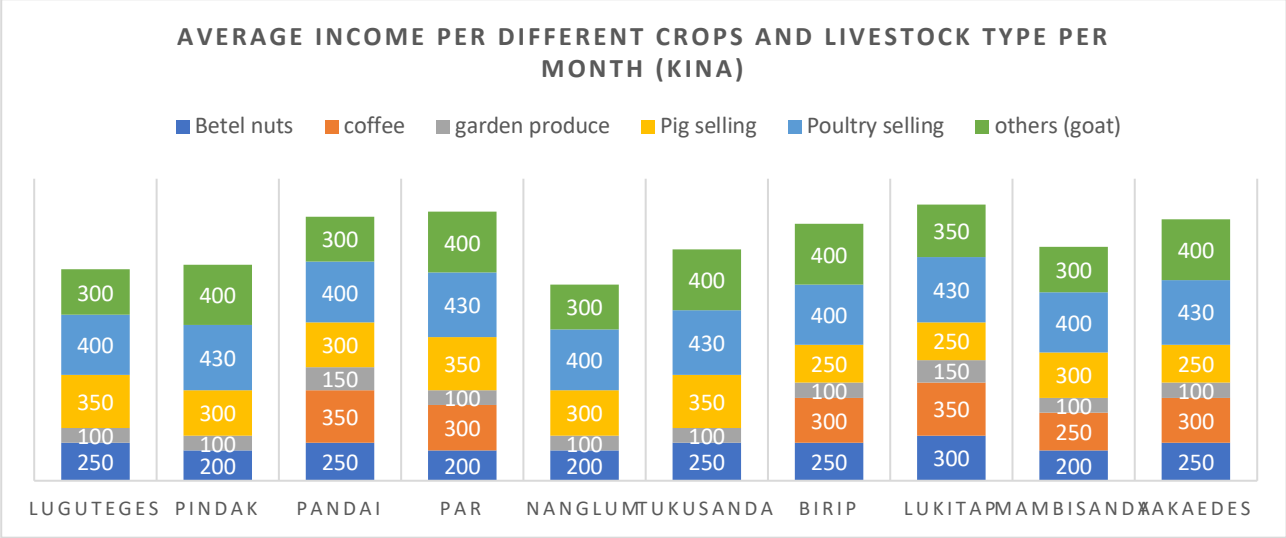

Figure 23. Average income per different crops and livestock type per month (Kina) (Source: FinnOC)

Women sell their garden produce two to three times and betel nuts three to four times per week. Coffee is sold four to six times per month.

Figure 24. Bilum weaving in Par village in Kompiam district (Source: FinnOC, 2022)

3.3.3 Characteristics of food and nutrition security at the study villages

All the studied households rely on their own production to satisfy their food requirements. 65% to 100% of the households are self-sufficient with regards to locally produced food. Over third of the households in both Pindak and Yakaedes villages reported not to be self-sufficient with regards to locally produced food.

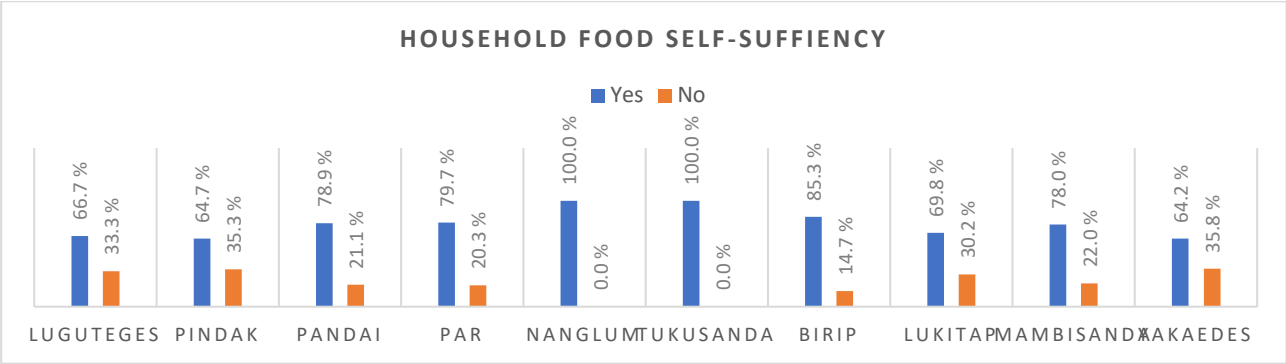

Figure 25. Food sufficiency of households (Source: FinnOC)

World Bank (2018) study on Household Allocation and Efficiency of Time in Papua New Guinea[31] also found that income per capita and food sufficiency rate is generally higher among households headed by a man, which can be attributed to the fact that men are more involved in profitable activities such as cocoa or coffee production. It is also a consequence of higher education among men than among women.

The households were asked if their basic daily food intake of their household is sufficient. 60% to 100% of the all household said that they are self-sufficient. In Lagaip-Porgera study villages all the households' daily food intake is sufficient whereas in other areas 20% to 41% of the households' food intake is not sufficient.

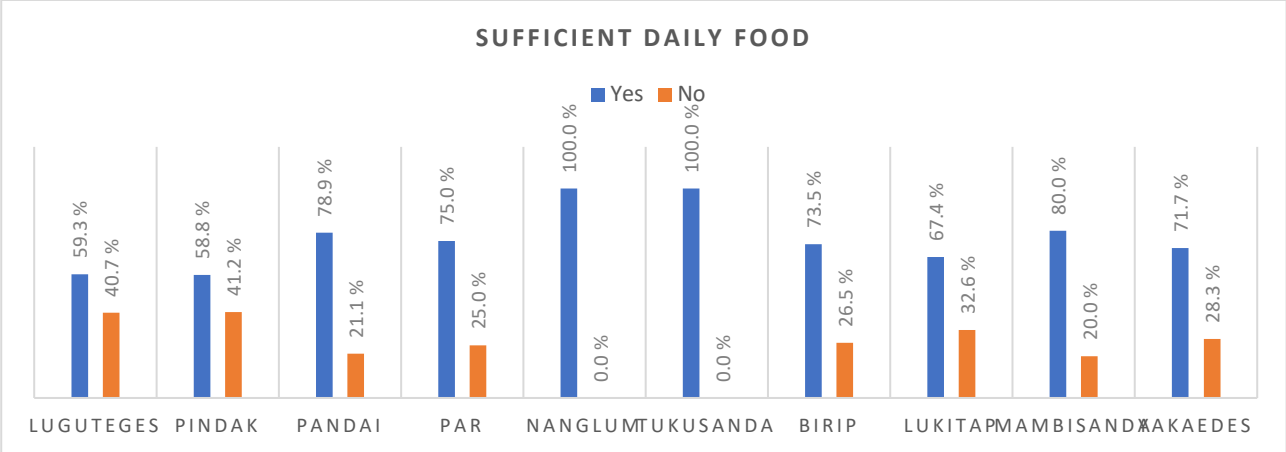

Figure 26. Sufficient food intake of the households (Source: FinnOC)

The households were also asked if their daily food intake of their household has improved in the past five years. Mostly the food intake situation has gone worse in all of the households. However, half of the respondents in Tukusanda village in Lagaip-Porgera stated that their food intake has improved.

[31] World Bank. 2018. Household Allocation of Time and Efficiency in Papua New Guinea. World Bank. 2018. Washington, DC: World Bank. Available at: https://documents1.worldbank.org/curated/en/113871538723729835/pdf/130527-4-10-2018-15-26-10-PNGReport.pdf

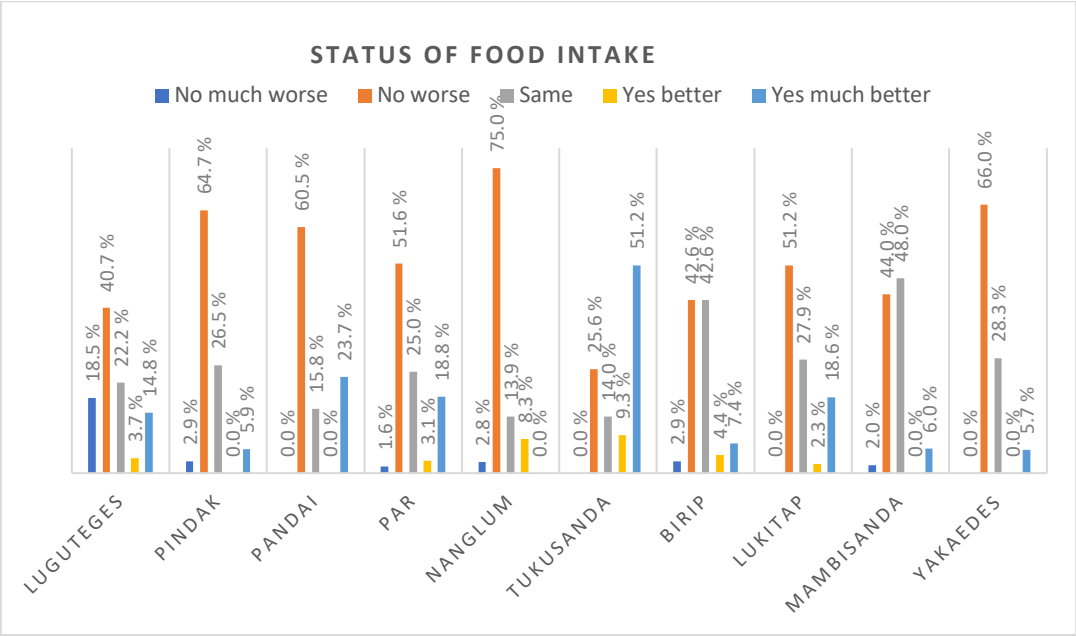

Figure 27. Status of food intake (Source: FinnOC)

The main climate change phenomena that will derive in impacts in Enga province are: (i) rise in temperatures and (ii) changes in rainfall patterns. These changes will increase the occurrence of droughts, frost events, floods and landslides in a spatially differentiated manner throughout Enga province. Most of the households in all study villages reported that climatic changes (floods, droughts) have affected negatively on their food supplies and worsened food shortage. In Tukusanda village in Lagaip-Porgera 23% of the households said that the climate has not impacted on food shortage.

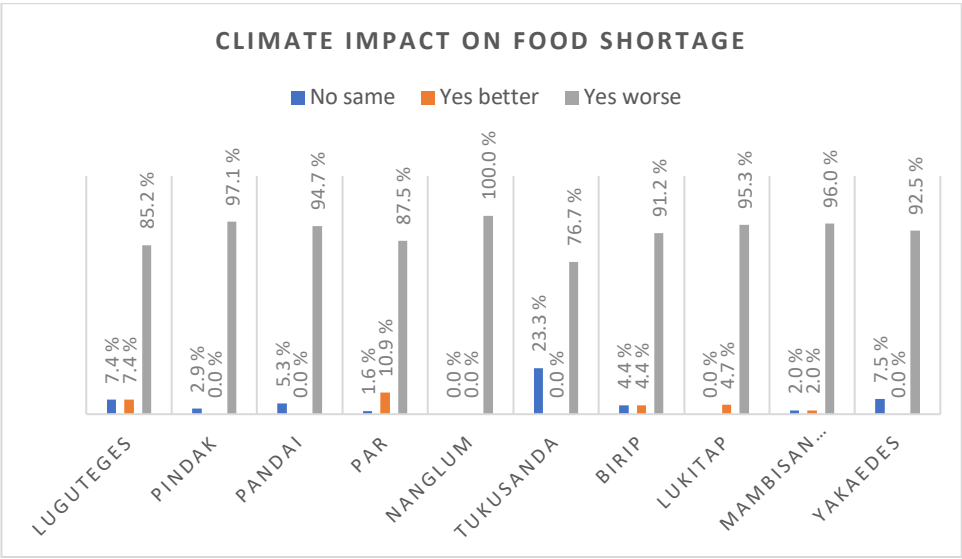

Figure 28. Climate impact on food shortage in households (Source: FinnOC)

The coping strategies used by households experiencing episodic food shortages were also examined by asking whether household had adjusted the the type and amount of food consumed or their diets, or had resorted to cut education and health expenses, or selling assets to cope with food insecurity.

The most common strategy to cope with food shortages was to change the composition of their meals to simple, locally produced garden food and to borrow from from relatives and friends.

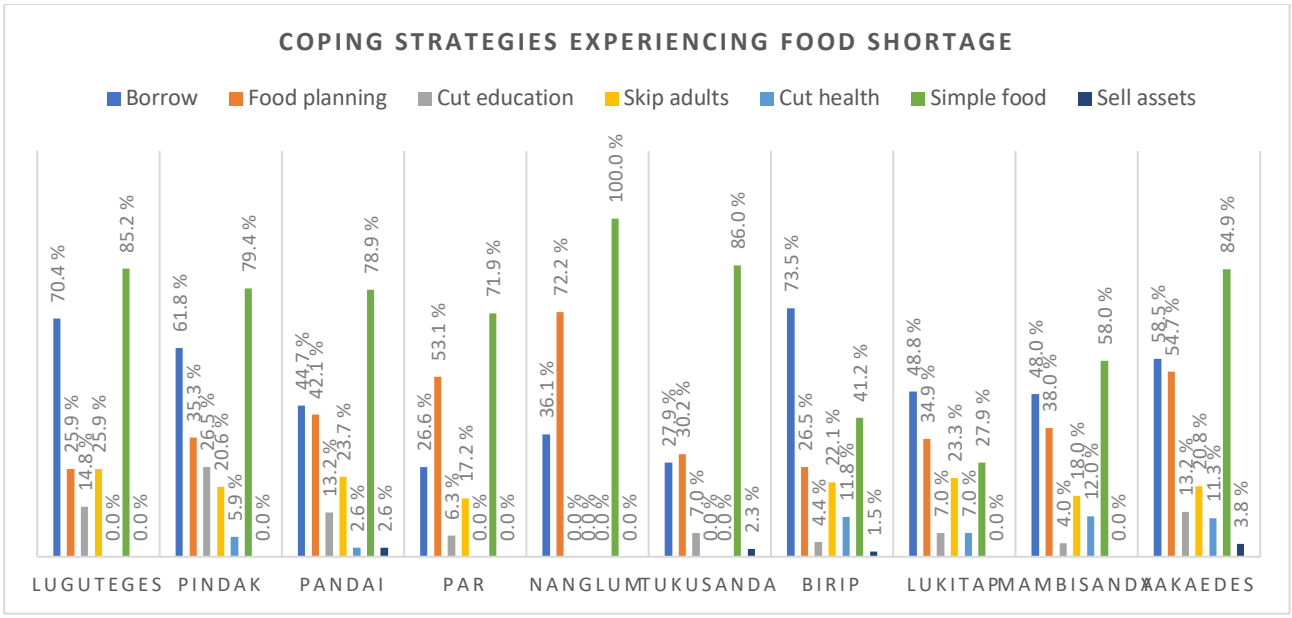

Figure 29. Coping strategies experiencing food shortage (Source: FinnOC)

4 ASSESSMENT STUDY OF BARRIERS TO PRIVATE SECTOR INVESTMENT AS WELL AS OPPORTUNITIES TO STRENGTHEN SUBSISTENCE AGRICULTURE COMMERCIAL VALUE CHAINS TO ACCESS DOMESTIC AND INTERNATIONAL COMMODITY MARKETS

This Chapter reports the different issues including barriers and opportunities to private sector investment to strengthen subsistence agriculture commercial value chains to access domestic and international commodity markets at the national and at the community level in Enga.

Some of the main barriers relate to constraints like limited market access, high transaction costs due to diseconomies of scale, lack of access to information and technologies due to poor extensions services, poor rural infrastructure, and lack of access to rural finance. The opportunities to strengthen agriculture commercial value chains relates to improving access to credit/finance and markets, improving agricultural practices/techniques, supporting formation of public–private partnerships, etc.

The assessment is based on literature/desk review and data collected from the field, mainly farmer's and coffee producers' including interviews with district authorities.

4.1 Introduction to subsistence agriculture commercial value chains in PNG

Agriculture drives socio-economic growth in PNG and is a significant contributor to the GDP. Agriculture accounts for approximately a third of GDP and employs 80 per cent of the working population in the country. The sector is dominated by smallholder farming systems.[32] The sector is historically based on subsistence and semi-subsistence farming, with limited commercial farming activity focused on export-oriented cash crops. Production is predominantly carried out by smallholders working 'customary land' using subsistence agriculture methods. There are various systemic challenges such as traditional farming approaches resulting in low productivity, lack of quality inputs and extension services, poor access to markets and credit, and lack of supporting infrastructure for transportation hamper the growth of agriculture sector in PNG.[33]

Agricultural value-chain promotion can make important contributions to the reduction of poverty and to the improvement of food security in rural regions including Enga in Papua New Guinea. Agricultural value chains encompass the flow of products, knowledge and information between smallholder farmers and consumers. They offer the opportunity to capture added value at each stage of the production, marketing and consumption process. Value chains consist of different actors at each stage of production where value is added. In a well-managed value chain, the value of the end-product is often greater than the sum of individual value additions. By joining together, the participants in a value chain increase competitiveness and are better able to maintain

[32] IFAD. Papua New Guinea. Available at: https://www.ifad.org/web/operations/country/id/papua_new_guinea
[33] UNDP, 2016. Seeding Social Enterprise in Papua New Guinea. Available at: https://papuanewguinea.un.org/sites/default/files/2019-10/SEEDING%20SOCIAL%20ENTERPRISE%20IN%20PNG%20FINAL10072015_web%20version.pdf

competitiveness through innovation.[34] A typical agricultural value chain consists of the following actors presented in the following figure.

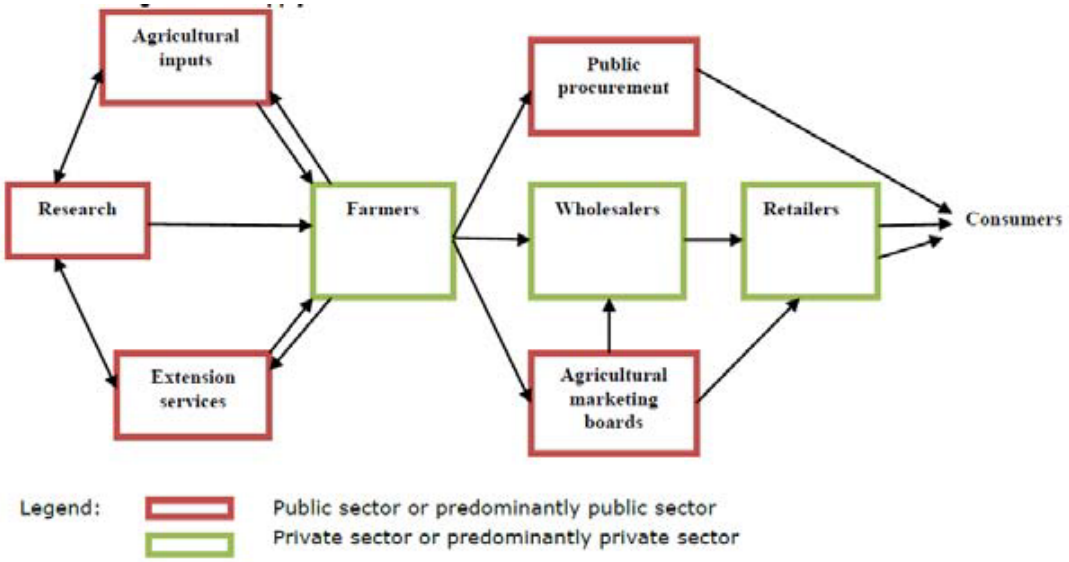

Figure 30. Traditional Agricultural Supply Chain in Low-Income Countries.[35]

Several constraints to develop agriculture value chains in PNG can be detected. Agriculture has under-performed and obstacles exist to making agriculture a modernised and efficient industry in the country. This is due primarily to low productivity, largely reflecting inadequate research and development, poor application of technological improvements and lack of scale economies inherent in smallholder farming. There are also number of other challenges, including fluctuations in supply, which is a result of a fragmented post-harvest system that lacks sufficient handling and storage facilities. Supply is also influenced by the fact that production is dominated by small, independent growers that are widely dispersed and have limited access to basic infrastructure, creating difficulties in accessing markets. The sector has also been negatively impacted by climatic and seasonal conditions in recent times, such as dramatic changes in temperatures, the onset of crop pests and disease outbreaks.[36] Other major constraints include inadequate transport and marketing infrastructure facilities, unreliable and expensive utilities, poor extension and veterinary services, prevalent crime and lawlessness, and insecurity of land ownership and tenure.[37]

Agribusiness enterprises and traders are critical for communicating market demand to producers and establishing value chains that effectively link them to the market. However, building long-term relationships with smallholder farmers involves considerable transaction costs on the part of the agribusiness. These include: identifying producers; reaching them in difficult access areas;

[34] Asian Development Bank, 2016. Support for Agricultural Value Chain Development. Available at: https://www.adb.org/sites/default/files/evaluation-document/35898/files/eks-agriculturalvaluechain.pdf
[35] Asian Development Bank, 2016.
[36] Oxford Business Group. Agri-business projects seek to diversify output in PNG. Available at: https://oxfordbusinessgroup.com/analysis/steady-evolution-agri-business-projects-seek-diversify-output-and-ease-dependence-imports
[37] Forman, S. 2019. Project Information Document-Integrated Safeguards Data Sheet - PNG Agriculture Commercialization and Diversification Project - P166222. Washington, D.C: World Bank Group. http://documents.worldbank.org/curated/en/515591557831365246/Project-Information-Document-Integrated-Safeguards-Data-Sheet-PNG-Agriculture-Commercialization-and-Diversification-Project-P166222

establishing farmer groups; and introducing good agricultural practices. The public sector plays a critical role in strengthening smallholder competitiveness through support for better technology transfer and improved organization. In addition, there is a need for critical infrastructure where supply chains have been broken due to deteriorating roads that no longer permit farmers to cost-effectively bring their products to market. However, weak capacity to deliver services and limited outreach in rural areas including in Enga severely limits public intervention. Strengthening public institutions is an important step, but will not be sufficient to reach the majority of Papuan farmers or to reach them consistently.[38]

With regards to the coffee sector, the majority of coffee is under the production of smallholder farmers with low productivity, and diseconomies of scale, and the main constraint is the limited capacity of the country to reliably meet market demand in quantity and quality. The development of coffee production as an agribusiness for Papuan including Engan smallholder farmers is limited due to several constraints. These include: high transaction costs due to diseconomies of scale, limited market access, poor rural infrastructure, and lack of access to rural finance.[39] Other constraints include labour shortages, lack of tools, equipment and farm inputs (particularly labour shortages and inefficiencies), prolonged parchment storage in poor conditions and low levels of technical knowledge of farmers regarding coffee husbandry and post-harvest processing[40]. Labour supply constraints in coffee production are, in part, an outcome of the competing demands on the time and labour of smallholder families as they pursue a wide range of subsistence, social, church and cultural activities. They also arise from the underutilisation of family labour due to intra- and inter-household conflict that prevent labour from being deployed and adequately remunerated, and the limited use of labour mobilisation strategies like hired labour to address labour shortages.[41]

Gender inequality in the coffee sector contributes to low productivity and can act as barrier to agricultural value chain development. Women in coffee producing areas suffer disproportionately, working longer hours than men and receiving less than a third of their income. In 2015, less than ten per cent of women farmers had access to extension services and only five percent of the farmers who received extension training were women. The meaningful involvement of women in the coffee industry is necessary to ensure the quality of the final coffee product.[42]

The table below also captures some crosscutting issues, some of which have already discussed earlier in this section that directly or indirectly impacts on the value chains. In addition to production, postharvest and marketing issues are other socio-economic and enabling environment issues which have a significant bearing on the performance of most agricultural value chains in the Highlands regions including Enga Province.

[38] World Bank, 2010. Papua New Guinea - Productive Partnerships in Agriculture Project (English). Washington, D.C.: World Bank Group. Available at: http://documents.worldbank.org/curated/en/526321468285326877/Papua-New-Guinea-Productive-Partnerships-in-Agriculture-Project

[39] Forman, S. 2019.

[40] ACIAR, 2017. Improving livelihoods of smallholder families through increased productivity of coffee-based farming systems in the highlands of Papua New Guinea. Available at: https://www.aciar.gov.au/project/asem-2008-036

[41] Ibid.

[42] CARE, 2017. CARE International in PNG Coffee Industry Support Project Mid-term Evaluation Report. Available at: https://www.careevaluations.org/wp-content/uploads/CISP-EvaluationReport_approved.pdf

Table 3. Cross-cutting issues affecting agricultural production and marketing in the Highlands.[43]

No	General/cross-cutting issues	Magnitude
1.	Poor transport infrastructure (roads and bridges)	Most remotes parts of EHP, Chimbu, Jiwaka, Enga, Hela and SHP which are key production areas supporting these value chains
2.	Increasing law and order issues affecting agricultural activities	Highlands-wide (tribal fights remain a major constraint in most parts of Enga and Hela)
3.	Lack of access to financial services/credit facilities	Highlands-wide
4.	High level of illiteracy among farmers	Highly variable but more common in remote rural locations
5.	Land pressure and shortage	EHP, Chimbu, Jiwaka, WHP and Enga (common in the fertile valleys)
6.	Natural disasters (drought, frost, floods, landslip/landslide, etc)	Highly variable in the highlands
7.	Lack of political support or initiatives by local MPs	Highly variable in the highlands

However, there are also plenty of reasons to be optimistic. Efforts to boost self-sufficiency, reduce imports, improve farm productivity, diversify crops and encourage investment in value-added processing will all lay the foundation for sustainable agriculture sector growth in PNG.[44]

[43] Okrupa, M., Aku, R., Sar, S., Ovah, R. & HatiIdentifying, H. 2019. Value Chain Constraints for Sweetpotato, Irish potato and Bulb onion in the Highlands of Papua New Guinea. Available at: https://www.academia.edu/41014492/Identifying_Value_Chain_Constraints_for_Sweetpotato_Irish_potato_and_Bulb_onion_in_the_Highlands_of_Papua_New_Guinea

[44] Oxford Business Group.

4.2 Field survey results on factors/issues affecting Agricultural Value Chain Development in study villages

This section discusses the factors/issues that affect agricultural value chain development in Enga. Some of the major factors/issues are agricultural organisations, access to finance and markets, diversification of farming systems and sustainable agricultural practices, and extension services.

The findings of the farmers, coffee farmers and women's focus group discussion including interviews with the district officers and members of the coffee cooperatives in study villages for the agricultural value chain theme show strong similarities in the issues, constraints and opportunities as at the national level described above.

4.2.1 Organisations - farmer groups, cooperatives

The development of organizations that will provide the critical mass to reduce transaction costs and provide structure for governance is pivotal to the development of value chains. Organizations refer to formal or informal groups, associations, and cooperatives of value chain stakeholders. According to the World Bank's (2008) Agriculture for Development report[45] organizations form a major part of institutional reconstruction, and can use collective action and linkages to strengthen the position of smallholders in markets. Organizations can also contribute to the value chain approach by improving competitiveness by strengthening bargaining power to reduce transaction costs for inputs and outputs. Organizations are also a mechanism for providing disenfranchised groups with a voice in the policy process. To sum up, farmers' groups and associations can play an important role to help members increase their access to supports of information, capital, and technology; bring benefits to members; and partly promote production, enhance productivity, and increase income.

Community-based groups, including cooperatives[46], are becoming increasingly influential stakeholders within the coffee industry in PNG. The PNG Coffee Industry Corporation reports more than 300 cooperatives are registered; however, many of these are informal and lack the structure and governance to operate effectively. There is not a strong history of functioning organised farmer groups or cooperatives in PNG, and most cooperatives are characterised by weak leadership, poor management skills and a lack of accountability leading to governance issues. Women are largely absent from positions of leadership in community groups and cooperatives resulting in few positive role-models for women's meaningful participation in group activities, and women's voice being absent in decision-making processes. As such, the majority of cooperatives in PNG do not conform to internationally recognised standards in relation to cooperative set-up and structure. There are however, a number of larger, well-established cooperatives that are influential in the industry and can potentially provide a model for replication by other farmer groups.[47]

Based on the farmers survey data a Potato Cooperative Society exists in Tukusanda village in Lagaip-Porgera district with forty members. In Tukusanda village, the farmers stated that as a being a member of the Tumbiem Samu Farmers Cooperative Society they are receiving potato seedlings from the Fresh Food Products in partnership with National Agriculture Research Institution (NARI).

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[45] World Bank, 2008. Agriculture for Development. World Development Report 2008. Washington, DC.
[46] Cooperatives are people-centred enterprises owned, controlled and run by and for their members to realise their common economic, social, and cultural needs and aspirations.
[47] CARE, 2017. CARE International in PNG Coffee Industry Support Project. Mid-term Evaluation Report. Available at: https://www.dfat.gov.au/sites/default/files/png-coffee-industry-support-project-evaluation-report.pdf

A coffee cooperative society was established in a study village of Birip in Wabag district. It also assists women coffee farmers to make nurseries for planting of new coffee trees. According to the interview data this cooperative is not operating effectively because of misuse of funds. Field surveys also revealed that there are no groups, networks, or societies, etc. formed for women in the study villages. However, joining a farmer organization can also help women. When backed by the strength of an organization, women may be more successful in negotiating better deals.

The respondents stated that they lack any information on establishing cooperatives or farmers groups. There is a need to support smallholder farmers and coffee farmers to establish/join to cooperative agriculture/coffee farming groups to improve their farming business.

Improved support to key coffee industry bodies as well as strengthened links between producers, processors, buyers, and financers can help to improve market access and efficiencies through the supply chain. Principles related to democratic governance, member control, autonomy, cooperation amongst cooperatives, and education and training are vitally important for the success and efficiency of coffee cooperatives. These speak to the capacity of cooperatives to become competitive in terms of productivity and the quality of the coffee produced and processed, given the resources and decision under their control, and their capacity to improve the wellbeing of their members and the communities of their members, while remaining competitive. [48]

4.2.2 Access to finance

In PNG including in Enga study villages, most subsistence agriculturists or farmer groups earn low income to mobilise sufficient capital or access credit to adopt new agricultural technologies, build basic marketing infrastructure, and obtain working capital for a variety of business activities. A similar situation occurs for other value chain stakeholders, although at a different scale. Access to credit is a key requirement for all participants in a value chain. The benefits related to credit delivery to producers are derived from the use of more inputs with a corresponding increase in outputs[49]. The provision of credit to the agriculture sector is regarded as a necessary mechanism to increase capitalization and output.

Based on the focus group data from study villages, no women, farmers or coffee farmers focus group respondents are involved in micro credit service supply.

4.2.3 Market access infrastructure

Deteriorated market access infrastructure (roads and market structures) significantly reduces farmgate prices, when it does not result in significant product losses, poor product quality, or total lack of market opportunities. Poor transport infrastructure is also associated with higher levels of law and order issues and directly affects linkages between subsistence farmers and the private sector in PNG including in Enga Province.

In the value chain context, the benefits of upgrading roads are derived from reduced impact damage and loss of quality from shorter transit times. By upgrading the deteriorated feeder roads can

[48] For more information, see The National Research Institute (NARI), 2020. Productivity of Coffee Farmer's Cooperatives in the Eastern Highlands Province of Papua New Guinea: Evidence from Survey Data. Available at: https://pngnri.org/images/Publications/Discussion_Paper_177.pdf
[49] Asian Development Bank, 2016.

improve access to markets for farmers, by cutting time and cost of transport and increase the quality of the transported products, besides having many other positive externalities for the communities[50]. Other supporting infrastructure, such as storage facilities and transport logistics, would also increase selling options and contribute to benefits that accrue from rural roads[51].

Most of the farmers and households interviewed mentioned the difficulties associated with obtaining credit and access to market (poor condition of roads) and also low prices of their crops. Based on the field survey data the poor condition of roads represents a major bottleneck for farmers, coffee farmers' and households' capacity to access more lucrative value chains. Also, poor transportation availability and high transportation cost was seen as an obstacle to access markets and agriculture development. For example, in Lagaip-Porgera study villages, farmers need to pay for freight K20 and for PMV (public motor vehicle) fare K20 while they earn K80 for bag of potatoes leaving the profit small.

4.2.4 Diversification of farming systems and sustainable agricultural practices

The subsistence farmers in PNG mostly follow the 'mixed cropping or mixed farming' system where diversity of food crops, fruits and nuts and vegetables are inter-planted with each other in a mixed manner often at very high densities. Apart from coffee as the main cash crop in the Highlands region including Enga, few farmers have ventured into integrated food farming systems involving various crops and livestock to sustain their livelihoods socio-economically. Utilizing improved seeds or planting materials with other farm inputs, they can produce high yield crops on *"trial and error basis"*. They eventually can become experts in specific fresh produce value chain system over time.[52]

Support is also needed to development of new small-scale family enterprises that will help enhance resilience to climate shocks in Enga. Moreover, livestock farming can improve diet of the households and promote an additional cash earning opportunity for them.

[50] See Department of Agriculture and Livestock, 2019. Environmental and Social Baseline Report and Impact Assessment for the PNG Agriculture Commercialization and Diversification Project (PACD). Prepared for the http://www.agriculture.gov.pg/wp-content/uploads/2019/05/PACD-ESMF-Vol-2-Baseline-Report-final.pdf
[51] Asian Development Bank, 2016.
[52] Okrupa, M. et al. 2019.

Figure 31. Farmer presenting mixed cropping in Tukusanda village in Lagaip-Porgera district (Source: FinnOC, 2022)

Farmers in Enga need support and encouragement to improve their resilience to climate change impacts and food security by diversifying their food crops produced, including introduction of fruit trees, like bananas, other vegetable crops and livestock. This is also underlined by the Papua New Guinea National Food Security Policy 2016-2025[53] which is aiming at diversification of domestic food production to improve household access to a wider range of nutritionally adequate foods. Due to climate change farmers at some study districts have already started to diversify their food crops and now cultivate new cash crops like bananas and carrots which they have not cultivated before due to unfavourable climatic conditions. Due to warming climate, farmers also in Lagaip-Porgera district are now able to grow carrots, broccoli and onions. However, these farmers need to have markets which need to be developed and improved.

According to Global Green Growth Institute (GGGI) (2019) study agricultural techniques have not improved in response to the detrimental impacts of intensified land use caused by subsistence agriculture, affecting the livelihoods of a large share of the country's population. Communities need support to adopt sustainable agricultural practices. Notably, this should include approaches to increase resilience toward natural hazards, pests, and diseases, as suggested in Papua New Guinea's National REDD+ Strategy (GoPNG 2017b). Sustainable agricultural practices aim to maximize the use of natural processes and ecosystems, reduce excessive use of external inorganic inputs, enhance the diversity of production, tailor production intensity to the capacity of the landscape, and use a mix of traditional and new technologies (IFAD 2012).[54]

The field data also revealed that the households/farmers have no knowledge of land use planning, how land can best be managed to produce the food (garden produce, cash crops) required, while at the same time safeguarding the environment.

4.2.5 Extension services

A large unsatisfied demand for information exists on many aspects of food, cash crop and animal production and marketing, as well as for face-to-face contact with extension agents in PNG including in Enga[55]. Most subsistence farmers and households in Enga and in whole PNG are affected by poor access to extension services. Some agricultural extension services are provided through Department of Agriculture and Livestock (DAL), donor-funded projects, nongovernmental organizations, churches, and the private sector. Extension services supporting coffee growers/smallholders has been limited, provided by a small number of agents from Coffee Industry Corporation (CIC) responsible for serving the entire country, and others regionally from numerous NGO projects including but not limited to Productive Partnerships in Agriculture Project (PPAP)[56]. The quality and availability of extension provided by the Government has greatly declined.

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[53] GoPNG, 2015. Papua New Guinea National Food Security Policy 2016-2025. Department of Agriculture and Livestock Available at: https://png-data.sprep.org/system/files/Draft%202%20National%20Food%20Security%20Policy%20Document%20November%20%202015-correct%20photo.pdf

[54] GGGI, 2019. Green Growth Potential Assessment Papua New Guinea Country Report. Available at: https://gggi.org/site/assets/uploads/2019/07/GGPA-PNG-Report_FINAL.pdf

[55] Bourke, R. & Harwood, T. (Eds), 2009.

[56] Pacific Horticultural & Agricultural Market Access Plus Program, 2020. Papua New Guinea Coffee Market Study. Available at: https://phamaplus.com.au/wp-content/uploads/2019/10/PNG_Coffee_Market_Study_Final_e-copy.pdf

Agricultural services have been largely decentralized through the provinces based on local development priorities that are determined largely through political will rather than sectoral development priorities. This process has resulted in limited government funding allocation to agricultural extension services. Various agencies such as the Coffee Industry Corporation, the Oil Palm Industry Corporation, and the National Agriculture Research Institute provide a network of offices throughout the country but with limited coverage. At the district level, extension staff report to district managers for their activities and receive little direct support from agricultural officers at provincial headquarters. In consequence, agriculture sector production, processing, and marketing operate at below optimum levels and farmers do not have access to services that could assist in improving productivity, quality, and income.[57]

Overall, access to agricultural extension services by the households, farmers and WFGs in the sample is almost unavailable. Generally, the most frequent type of extension received is to help farmers obtain seedlings. The few extension services to farmers are mainly provided by National Agriculture Research Institute and Fresh Food Producers. According to the survey data, coffee farmers have not received any extension services and they depend mainly on traditional knowledge to grow coffee.

Public-private partnerships in extension could improve the performance of value chains and increase benefits going to smallholders. Private efforts to transfer knowledge and skills to smallholders have been effective and offer lessons for future efforts to strengthen value chains. Considerable returns could be gained from public-private partnerships to support extension in particular value chains.

4.2.6 The most critical obstacles to farming activities perceived by the study participants

The women, farmers and coffee farmers focus group participants were asked about the most critical obstacles to their farming activities. Clearly the most pressing obstacles and challenges of farmers are related to lack of extension services and proper markets. The pests and insects are also major threats to the livelihoods of rural families and their communities in most of the study villages. According to coffee farmers data the most critical challenges related to coffee farming are low prices in coffee sales, lack of markets and fertilizers, lack of training on coffee farming including increased incidence of pests affecting coffee crops and beans. Women respondent stated that their obstacles to farming are lack of land for gardening including insects and pests. In Lagaip-Porgera and Kandep area women farmers are also suffering from frost which impacts negatively their farming and gardening activities. 100% of household respondents in Kandep did experience impacts on frosts in food production.

[57] Asian Development Bank, 2013. Papua New Guinea: Smallholder Support Services Pilot Project. Performance Evaluation Report. Available at: https://www.oecd.org/derec/adb/Papua-New-Guinea-Smallholder-Support-Project.pdf

Figure 32. Destroyed plants by pests in Yakaedes village (Source: FinnOC, 2022)

The following tables summarize the main obstacles of each focus groups in each study villages.

Table 4. The most critical obstacles to farming according to farmers focus group participants (Source: FinnOC)

Village	No of participants	Main obstacles to farming activities
Birip (Wabag)	6	Lack of extension services Lack of proper markets Lack of fertilizers More pests affecting coffee crops and beans
Lukitap (Wabag)	5	Lack of extension services Lack of proper markets Lack of fertilizers More pests affecting coffee crops and beans
Mambisanda (Wapenamanda)	6	Lack of extension and capacity building services from the government Lack of resource centre Lack of proper markets Lack of fertilizers
Yakaedes (Wapenamanda)	5	Lack of extension and services from the government Lack of resource centre Lack of fertilizers
Par (Kompiam)	6	Lack of extension services Lack of proper markets Effects of climate change Land shortage Pests and insects
Pandai (Kompiam)	6	Lack of extension services Lack of proper markets Effects of climate change Land shortage Pests and insects
Nanglum (Lagaip-Porgera)	7	Lack of extension services Lack of proper markets Low potatoes prices
Tukusanda (Lagaip-Porgera)	7	Lack of extension services Lack of proper markets Pests and insects Low potatoes prices
Luguteges (Kandep)	6	Lack of extension services Pest and food insects Lack of resource centre Lack of fertilizers
Pindak (Kandep)	6	Lack of extension services Lack of proper markets Effects of climate change Land shortage Pests and insects

Table 5. The most critical obstacles to farming according to coffee farmers focus group participants (Source: FinnOC)

Village	No of participants	Main obstacles to farming activities
Birip (Wabag)	5	More pests affecting coffee plants and beans Low prices in coffee sales Lack of funds and incentives for improving practices Lack of competitive coffee buying markets
Lukitap (Wabag)	7	Lack of agricultural training Low prices in coffee sales Lack of funds and incentives for improving practices Lack of proper markets
Mambisanda (Wapenamanda)	5	Low prices in coffee sales Lack of training and capacity building on coffee farming Lack of proper markets Lack of fertilizers Lack of agriculture / coffee extension activities
Yakaedes (Wapenamanda)	6	Low prices in coffee sales Lack of fertilizers Lack of training on coffee farming Lack of markets
Par (Kompiam)	6	Low prices in coffee sales Lack of proper markets Lack of coffee farming training More pests affecting coffee crops and beans
Pandai (Kompiam)	5	Low prices in coffee sales Lack of proper markets Lack of incentives and government farming extension activities Lack of coffee farming training

Table 6. The most critical obstacles to farming according to women's focus group participants (Source: FinnOC)

Village	No of participants	Main obstacles to farming activities
Birip (Wabag)	5	Pest infestation Lack of land area More rainfall Expensive fertilizers Lack of proper markets / accessibility
Lukitap (Wabag)	9	Crop pest infestation Expensive fertilizers Lack of land for gardening More rainfall
Mambisanda (Wapenamanda)	5	Crop pest infestation Expensive fertilizers Lack of land for gardening Lack of markets More rainfall
Yakaedes (Wapenamanda)	5	Lack of markets Lack of land for gardening More food pests and insects More rainfall Expensive fertilizers Lack of resource centre
Par (Kompiam)	5	More insects and pests More rainfall Lack of markets Lack of land for gardening
Pandai (Kompiam)	6	More insects and pests More rainfall Lack of markets Lack of land for gardening
Nanglum (Lagaip-Porgera)	6	Frost events Food pests Lack of proper markets Lack of land for farming
Tukusanda (Lagaip-Porgera)	5	Frost events Food pests Lack of proper markets Lack of land for farming Lack of resource centres
Luguteges (Kandep)	9	Frost events Food pests Lack of proper markets Lack of land for farming Lack of resource centres
Pindak (Kandep)	5	Frost events Food pests Lack of proper markets Lack of land for farming

The household were also asked about their difficulties facing with regards to establishing new garden. The analysis reveals several and more varied challenges facing small-scale farmers in Enga. The biggest problems relate to low agricultural prices and lack of markets in study villages in Kandep,

Kompiam and Lagaip-Porgera districts whereas climate change was seen a serious obstacle to establish gardens in Wabag and Wapedamanda study villages. Lack of pesticides was seen also a significant problem in all of the studied households (except in Lukitap village (35%) in Wabag district. 37% to 68% of all the studied households also reported shortage of labour. Nearly third of the households said that tribal conflicts cause problems in Kandep district.

4.2.7 Crosscutting issues

The agriculture value chains in the provinces of the Highlands including Enga face several challenges limiting their development. The law and order situation in most parts of the highlands including in many study villages in Enga is also a concern to farmers, particularly for the women farmers. Tribal fights and lack of security limit trade and reduce competitiveness to suppress agricultural development in many study villages. Land pressure/conflicts and shortage is becoming rampant in the densely populated valleys of the highlands including in study villages located in Kandep, Kompiam and Lagaip-Porgera districts that support most agricultural value chains. Such added pressure may reduce the carrying capacity of these landscapes and thereby may impact negatively on production[58].

The impacts of natural disasters and extreme climatic conditions due to climate change are inevitable and are highly variable across the study villages. The lack of political will or initiative to support agricultural value chains at the farmer-end and to enhance the business enabling environment is seen as the most commonly referred to problem by farmers in the highlands[59]. Based on the district authorities and stakeholders interview data a most common problem related to inadequate support to agriculture and agriculture value chain development is "Money Nogat Mentality"/lack of government funds in Enga and inadequate policy and plans for agriculture sector development in province year in year out. It seems that one of the biggest issues to private sector investment to strengthen subsistence agriculture commercial value chains to access domestic and international commodity markets is to incorporate new plans and programs to the five-year strategic plan and to cover market sources. Other challenges which restrict value chain development is the limited capacity of local decision makers and support functions in Enga. Local decision makers do not have sufficient technical resources to select relevant strategic orientations and do not have sufficient financial resources to implement them.

4.2.8 Summary of the proposed agricultural techniques/practices and initiatives

The following table presents and summarises some agricultural techniques/practices, initiatives and training topics which could be introduced to the communities in Enga to improve food security, agricultural productivity and resilience including access to value chains. The proposed actions are based on the desk review and data gathered from the field (district authorities' interviews, farmers and women's focus group interviews, including coffee farmers focus group interviews).

[58] See Okrupa, M. et al. 2019.
[59] Ibid.

Table 7. Agricultural practices and initiatives proposed for farmers in Enga (Source: FinnOC, 2022)

Type of agriculture techniques / practices / initiatives
• Crop rotation and integrated cropping
• Introduce quality nutritious crops such as peanut, new kaukau, vines peas and strawberries using crop rotation methods
• The fallow agriculture land/ fallow system
• Water harvesting and irrigation to provide water for crops
• Integration of livestock (sheep, cattle) and poultry activities into home gardening
• Introduce proper uses of fertilizers and pesticides
• Supply of seedlings to farmers, also new seedlings like corn and drought-tolerant varieties like cabbage and cassava (tapiok)
• Building food storage facilities (food/vegetable depots) in each climate change prone districts and processing facilities to improve food security
• Climate resilient fish-pond farming
• Farm business management skills, financial literacy, bookkeeping
• Improve small-scale farmers' access to savings and credit by providing rural financial services through sustainable, replicable microfinance interventions
• Farmer's access to competitive and markets, e.g. by establishing farmers organisations/groups
• Establish livestock and cash crop seedling distribution centres
• Establish base-camps for plant breeding and variety trials for smallholder farmers
• Create a SME revolving finance to assist farmers in increasing productions and quality of livestock and cash crops
• Promote food security through expanded smallholder village base productions
• Awareness on land use planning
• Improve access of land for agriculture, use of GPS-application for field mapping and farm planning
• Increase expenditure on extension services and agriculture research centres
• Public–private partnerships to provide extension services
• Restore wheat growing in swampland
• Introduce rice planting in swampland
• Increase productions at smallholder farmer levels
• Agroforestry

• Buyer arrangements with private sector to encourage large scale productions
• Improve transport system for buying and selling
• Improve transport system for coffee buyers
• Refurbish old coffee factory
• Introductions to how to manage Fall armyworm (invasive insect pest) and African Swine Fever (affects all domesticated and wild pigs). This is a major emerging biosecurity issue for farmers in Enga province
• Awareness on social and economic values trees, environment and forest ecosystems

5 MARKET STUDY OF THE FINANCIAL SERVICES SECTOR TO IDENTIFY CLIMATE INVESTMENT OPPORTUNITIES FOR COFFEE PRODUCERS IN ENGA PROVINCE

The issues related to climate investment opportunities for coffee farmers are discussed in this chapter. The analysis is be based on desk review, e.g. existing studies, project and policy documents. Also, data collected from the field, mainly members of the Coffee Industry Corporation and Coffee Cooperative Society interview data and coffee farmers focus group data is used for the analysis.

5.1 Introduction to coffee sector issues

Coffee is the second most significant agriculture cash crop after oil palm in terms of its economic importance to PNG. Coffee production, primarily done by smallholders, is the backbone of the rural economy and accounts for 30% of the total labour force. It is a rural based cash crop cultivated by over 500,000 households which translates to more than 2.5 million people in the Highlands and Coastal Regions of PNG. These people depend on coffee as the main cash crop to sustain their rural livelihoods.[60]

The vast majority of coffee produced in PNG is grown by smallholders on farms averaging one hectare whose livelihoods depend on a successful coffee crop. A typical smallholder garden will produce around 700-1,000 kg of coffee from a garden of around one hectare. Most will produce cherry to parchment using simple hand pulpers and sun drying. The parchment is then sold to roadside buyers or directly to the factory.[61] In PNG, the quality and productivity of coffee has been declining and smallholder farmers' yields are 50-60% below their potential. Hence, improving productivity and price realization can have a significant impact on household incomes. However, many smallholder producers including Engan coffee farmers are constrained by gaps in knowledge and understanding of good agricultural practices, limited financial inclusion, difficulties in accessing high quality inputs and technical advice, poor transport links and market infrastructure, and continued dependence on middlemen.[62]

Papua New Guinea is an important regional producer with significant potential for coffee yield uplifts and increase in national supply. PNG is the 5th largest producer in Asia[63]. Smallholders produce 95 percent of the coffee in PNG, and the industry has seen a general increase in the value of coffee exports over the past decade. PNG coffee production averaged 995,000 bags (59,700 tons) valued at PGK 500 million per year over the last decade, although this can be heavily affected by factors such as diseases, climate, and even election cycles.[64] Arabica coffee is PNG's most important export

[60] Coffee Industry Corporation Ltd, 2020. The National Coffee Development Roadmap 2020 - 2030. Available at: https://www.businessadvantagepng.com/wp-content/uploads/2020/07/Finalised-NCDR-2020-2030.pdf
[61] Department of Agriculture and Livestock, 2019.
[62] Asian Development Bank, 2019. Olam International Limited: Inclusive, Sustainable, and Connected Coffee Value Chain Subproject 4: Papua New Guinea PNG. Technical Assistance Report. Available at: 51139-006: OLAM International Limited - Inclusive, Sustainable, and Connected Coffee Value Chain (Subproject 4): (adb.org)
[63] USAID, 2017. USAID Bureau for Food Security Country Data Sheets for Coffee Renovation and Rehabilitation November 2017. Country Data Sheets for Coffee Renovation and Rehabilitation.
[64] World Bank, 2019. Papua New Guinea - Agriculture Commercialization and Diversification Project (English). Washington, D.C.: World Bank Group. Available at:

crop in terms of its economic and social impact. However, productivity it low. This is largely due to a lack of replanting, limited incentives for smallholder farmers, and poor access to markets[65].

All coffee stakeholders in PNG from cultivation through export stand to profit from cooperative collaboration toward a common national goal of strengthening performance, profitability, and sustainability of the industry[66]. The National Coffee Development Roadmap 2020 – 2030[67] (NCDR) envisions for a *"Prosperous coffee farming households and communities; in a dynamic, competitive and sustainable coffee industry". T*he Mission Statement of the NCDR is *"to increase incomes, for female and male coffee farmers through improved value chain; including productivity, production and market access*". The NCDR is intrinsically aligned to GoPNG overarching policy pillars embracing the agriculture sector and the national economy: (a) MTDP III 2018 - 2022; (b) Development Strategic Plan (DSP) 2010 - 2030; (c) Vision 2010 - 2050; (d) National Food Security Policy 2018 - 2028, (e) National E - Agriculture Strategy 2017 - 2023, and (f) National Agriculture Sector Plan 2020 - 2029. The "Take Back PNG" vision provides a practical dimension to ensuring citizens take pride in entrepreneurial activities or public services.

According to NCDR (2020) in terms of provincial production, Eastern Highlands Province (50,2%) is ranked as the highest coffee producer with many family units engaged in cultivating the economic tree crop for their livelihood and socioeconomic welfare and obligations. Western Highlands Province (18,7%) lost its premier position when Jiwaka Province (11,9%) was created, with the production statistics being shared between the two provinces. The two provinces host some of the largest plantations in the country. Enga Province (1.64%) which is an emerging coffee growing hubs and zones in PNG need sustained reach to optimise productivity potential with new adaptable coffee varieties that can thrive in diverse climatic conditions and resilient to climate change phenomena.

The coffee industry has been on the decline in recent years due to negligence, poor management, legacy issues and other challenges. The main challenges are: climate change, which is intensifying the incidence of diseases and pests, volatile coffee prices, lawlessness, poor extension services; unsustainable grower groups, lack of partnerships, land tenure problems inhibiting new investment in coffee, lack of incentives to diversify into the high value differentiated products and inaccessible rural roads. On plantations and blocks, business leaders are not conscious of the effects of the indigenous economy on their operations and as a result company resources have been diverted into the pursuit of the 'big men' status, which is counterproductive to business. Furthermore, policy failures in the coffee industry have contributed to its decline.[68] Moreover, many coffee farmers live in rural areas with limited access to wet milling, transportation, or storage facilities, which leads to quality defects. Quality control at the points where coffee cherries and parchment are sold to mills or intermediary trading agents is also inconsistent, further reducing downstream value.[69]

There are also critical nationwide issues that inhibit economic development across all industries not limited to coffee, including: crime (theft, public security), inadequate infrastructure, and land tenure disputes. Combined, these conditions inhibit incentives and available credit for long-term business investments that allow an economy to flourish. These challenges can act as significant barriers

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http://documents.worldbank.org/curated/en/863671587866519411/Papua-New-Guinea-Agriculture-Commercialization-and-Diversification-Project

[65] World Bank, 2022. Papua New Guinea: Productive Partnerships in Agriculture Project. Available at: http://documents.worldbank.org/curated/en/526321468285326877/Papua-New-Guinea-Productive-Partnerships-in-Agriculture-Project

[66] Pacific Horticultural & Agricultural Market Access Plus Program, 2020.

[67] Coffee Industry Corporation Ltd, 2020.

[68] Ibid.

[69] Pacific Horticultural & Agricultural Market Access Plus Program, 2020.

inhibiting improvement of the coffee sector for the purpose of providing supporting testimony in future policymaking.[70]

5.2 Field survey results regarding climate investment issues for coffee producers in Enga province

Coffee represents the major cash crop in Enga. Selling coffee, food crops, and firewood provides a source of low to moderate income for some smallholder farmers. The population involved in commercial farming is very limited in Enga.[71] Coffee farming is an integral part of farming systems and rural livelihoods in many study villages and it plays a critical role in helping households meet their cash requirements.

5.2.1 Coffee farming in study villages

Coffee is grown in the study villages of Lukitap, Birip, Par, Pandai, Mambisanda and Yakaedes. The size of coffee farms varies from one to four hectares in the study villages. Traditional farming is the main method coffee farmers continue use for coffee farming (nursery, transplanting, pruning and growing). Most of the coffee farmers practice agroforestry methods for coffee farming (bananas planted to give shade to coffee plants) and some farmers have constructed small drainage systems. All interviewed coffee farmers stated that the quality of coffee is currently low due to insects destroying the coffee beans. Few farmers use pesticides to prevent insects for destroying the coffee beans and plants due to high price of the pesticides and lack of information on proper and safe use of them.

According to the coffee farmers focus group data the biggest problems related to coffee business are a) pests affecting coffee plants and beans, b) low prices in coffee sales, c) lack of funds and incentives for improving farming methods/practices, and d) lack of competitive coffee buying markets. In study villages in Wapenamanda and Kompiam districts, coffee farmers also mentioned lack of training and capacity building on coffee farming activities as big obstacle to coffee farming. Lack of fertilizes was also named in study villages in Wapenamanda district.

Based on interview data on the CIC and Coffee Cooperative members the impacts of climate change to coffee sector in Enga mainly relates to increase in incidences of diseases and pests that are adversely affecting coffee production. Also, lawlessness and land tenure systems are threats to coffee production. The changes in farming spaces will exert pressure on land use; thus, livelihood strategies will have to modify, thereby causing social instability. Consequently, some farmers will be forced to abandon coffee and adopt new cash crops, or will have to migrate, depending on land availability, into new locations. Regions where land access is limited could experience social conflict as a result of migration. Furthermore, climate change is intensifying the incidence of pests and diseases such as coffee berry borer and coffee leaf rust and thus negatively affecting coffee production.

[70] Ibid.
[71] GGGI, 2021.

Figure 33. Coffee farming converted to crop garden in Birip village in Wabag (Source: FinnOC, 2022)

5.2.2 Improved farming practices and business skills

Based on the literature review and data from the field, coffee farmers' awareness of sustainable farming practices and efficient on-farm processing with regards to coffee production is low. Moreover, most of the interviewed coffee farmers stated that their business skills are at very low level and training on these issues are highly needed to plan and develop their business activities and access to finance in order to elevate their coffee business.

The establishment of field nurseries and instruction on routine crop management and replanting will dramatically improve productivity and plant health. The USAID (2017)[72] estimates that around 90% of total land is in need of renovation and rehabilitation due to old coffee trees and bad current practices in PNG. Some are decades older than the recommended 30-year life cycle for arabica species[73]. The recent outbreak of Coffee Berry Borer, an endemic beetle, increases renovation and rehabilitation need. Tribal fights in Enga can contribute to planting of new coffee trees as during the tribal fights all the coffee trees are cut down and it would be easier to plant new coffee trees then. However, tribal fighting usually contributes to food supply problems.

[72] USAID, 2017.
[73] Pacific Horticultural & Agricultural Market Access Plus Program, 2020.

Figure 34. Coffee nursery in Birip village in Wabag (Source: FinnOC, 2022)

Another farming practice where coffee farmers need more awareness is on weed control as it has potential for greatly increasing coffee yields in the short-run and significantly complementing other short-run yield improving practices. Another practice that needs to be introduced to the coffee farmers is the use of shade trees as it can lower weed control costs.[74]

Agriculture in Enga relies on commercial fertilizers as well as manure to replenish soil's nutrients. The CIC is encouraging small holder farmers to grow coffee organically with minimal use of chemicals. Organic farming helps to preserve the soil and water and under certain circumstances can be related to a higher quality in the production of the coffee cherry. Proper application of organic farming principles and practices are highly needed in Enga.

To sum up, in the coffee sector, activities which support the adoption of sustainability practices can be identified as: training on good farming practices; the production of improved planting material to increase their availability for replanting; replanting and coffee garden rejuvenation programs; market-driven diversification of coffee-farming systems; and management of quality through the adoption of more efficient and environmentally-friendly post-harvest and processing technology.

5.2.3 Intercropping / Integrated farming systems

Intercropping in the coffee farming systems can enhance revenue earnings of coffee farmers in Enga. It presents an opportunity to retain coffee farming skill while earning additional revenue from the same plot of land. Crops like avocado, banana, oranges, black pepper, macadamia, and many more can be grown productively alongside coffee (PDG, 2016)[75]. For example, in Birip village in Wabag district the subsistence farmers besides their coffee growing activities have started buy seedlings from Department of Agriculture and Livestock and stores to plant onions and carrots seedlings to improve their livelihoods and financial sustainability.

[74] For more information, see Tsidell, C. 1990. Evaluating techniques for weed control in coffee in Papua New Guinea. Available at: https://www.researchgate.net/publication/254235862_Evaluating_techniques_for_weed_control_in_coffee_in_Papua_New_Guinea

[75] Pacific Horticultural & Agricultural Market Access Plus Program, 2020.

Figure 35. Banana growing alongside with coffee trees in Birip village in Wabag (Source: FinnOC, 2022)

Crop variety not only provides financial stability, but reduces pests, fixes soil nutrients and reduces erosion. In recent years honey has been popular within the Latin American coffee industry as a high value product that can be farmed in coffee areas. (Mares, Nadworny, & Paull, 2016). Attracting bees to farmlands improves fertilization of crops and increasing coffee flowering.[76] The Coffee Industry Corporation (CIC) is also supporting intercropping system with food and leguminous and other economic tree crops (eucalyptus). Integrated Farming System such as apiculture development and intercropping vegetables or other valuable tree crops is supported and needs further support in coffee farming.

Figure 36. Beekeeping in Lukitap village in Kandep (Source: FinnOC, 2022)

[76] Ibid.

Intercropping/integrated farming system development in Enga can build on the work of the ACIAR Project[77] which is aiming to increase returns for labour from the crop, particularly for women. Using combinations of extension methods tested earlier in the project, the project facilitates the development and adoption of culturally acceptable and nutrient-efficient coffee–vegetable intercropping systems and develop a model for the use of a demucilager by farmer groups. It was demonstrated that intercropping with fertilised vegetables was an effective means of delivering nutrients to coffee trees. This is particularly important in areas experiencing land pressures and where nutrient depletion risks are greater. By identifying and developing culturally acceptable and nutrient efficient coffee-vegetable intercropping systems can contribute to increase of coffee yields and incomes and improve income-earning opportunities for women.

5.2.4 Productive Partnerships in coffee sector

One opportunity to improve climate investment opportunities of coffee producers in Enga is to develop and implement productive partnerships by the integration of smallholder producers, producer organizations (POs) and micro, small and medium enterprises (MSMEs) into performing, remunerative and diversified value chains in the coffee sector. A good example of this is the Productive Partnerships in Agriculture Project (PPAP)[78]—co-financed by the World Bank, International Fund for Agricultural Development (IFAD), and European Union (EU)—is demonstrating, in the coffee and cocoa sectors, that a productive partnership model can help overcome some of these bottlenecks and facilitate the integration of smallholder farmers into effective supply and value chains and link them to markets, which remains a priority for the GoPNG. In the PPAP model, farmers join a partnership coordinated by a lead partner (LP) (the private sector in 70 percent of cases) through a small fee. The LP accesses a grant from the project to purchase tools and seedlings (including innovative cocoa clones) for distribution to farmers, to renovate processing facilities, or to organize training on a broad range of topics such as technical processes, gender dimensions, HIV-AIDS prevention, and nutrition. This increased proximity between LPs and smallholder farmers has greatly benefited participating farmers, who have almost doubled their annual yield, doubled their incomes, and begun using improved coffee management practices. The productive partnership model of the PPAP can be used as a basis and further developed suitable for local circumstances to make the quality of coffee production of coffee farmers better in Enga.

5.2.5 Coffee platforms

Another area to strengthen climate compatible coffee production in Papua New Guinea and in Enga is to support coffee producers in increasing their access to high value international markets by supporting market linkages through key national and provincial platforms, improving the regulatory and institutional environment for trade and increasing awareness of producers and processors of international certification standards and market requirements as well as improving level of traceability within coffee production and processing. This can be achieved by reinforcing the National Coffee platform to bring together buyers, producers, aggregators, processers and financers with support to reform to existing regulations on the coffee sector and by establishing Enga coffee platform withing structure of existing committees. These platforms can provide a forum for multi-stakeholder coordination as well as planning for coffee sector and they can act as the knowledge point for different actors to collectively address the challenges facing the coffee sector. There is a

[77] ACIAR, 2017.
[78] World Bank. PNG Productive Partnerships in Agriculture. Available at: https://projects.worldbank.org/en/projects-operations/project-detail/P110959

need to provide administrative support to these platforms, support resource mobilization efforts, facilitate knowledge building and knowledge sharing with all stakeholders.

5.2.6 Organisations for coffee farmers

Social organization, like Coffee Cooperatives and Societies/Associations are necessary for small coffee producers to access markets, technologies or support programmes, and to help farmers recover or respond to global changes[79]. Organization of individual farmers into cooperative farming groups following standardized practices will reduce the incidence of defects that are lowering coffee value. This must be accompanied by education, incentives for performance, and facilitation to succeed.[80]

A coffee cooperative society was found in only one study village of Birip in Wabag district. According to the interview data this cooperative is not operating effectively because of misuse of funds. There is a need to support coffee farmers to establish/join to cooperative coffee farming groups to improve their coffee farming business.

5.2.7 Improving access to markets and finance

The coffee farmers focus group data revealed that farmers in all study villages where coffee is grown found the main obstacles to coffee farming low prices in coffee sales and lack of competitive coffee markets. Markets (or buyers) are available in nearly all study villages however transportation costs are high and markets are not competitive. Several farmers in Yakaedes, Par and Pandai villages have decided to abandon the coffee farming due to low price. The transportation is also poor affecting negatively to coffee farming in these villages.

Figure 37. Roadside market at Pindak village in Kandep (Source: FinnOC, 2022)

[79] International Trade Centre, 2010. Climate Change and the Coffee Industry. Available at: https://www.intracen.org/uploadedFiles/intracenorg/Content/Exporters/Sectors/Fair_trade_and_environmental_exports/Climate_change/Climate-Coffee-Ch-13-MS-ID-3-2-2010ff_1.pdf

[80] Pacific Horticultural & Agricultural Market Access Plus Program, 2020.

According to ACIAR (2017) study it is likely that labour investments in coffee have declined in some coffee growing areas with good access to markets and a range of alternative livelihood options in which to invest labour. Some women have been shifting their labour out of coffee to the lucrative fresh food sector because they can obtain better returns on their labour as they have greater control over the income they earn. It is possible that the expansion of commercial vegetable and fruit production in accessible sites and its demands on land and family labour may be at the expense of coffee production.[81] This has also eventuated in several study villages in Wabag, Wapenamanda and Kompiam districts as women has abandoned coffee production due to low prices of coffee and started to cultivate e.g. potatoes. World Bank (2018) study on Household Allocation of Time and Efficiency in PNG[82] also found that there are strong economic incentives for women to commit labour to vegetable and fruit production because they are confident that their labor efforts in food production for markets will be rewarded through controlling the income they earn.

There are currently no incentives available to coffee farmers according to the interview data. None of the farmers have access to micro-credit. However, in Birip village in Wabag district the GoPNG is currently supporting the coffee sector with the price support initiative (K10 million) to increase coffee prices at K6 per kilogram for parchment coffee in Highlands[83]. This has encouraged villagers in Birip to once again to start engaging with coffee farming. There is a need to improve farmer's access to micro-credit in order to facilitate adaptation, i.e. organic, substitute crops, new varieties, shading, etc.

The following table presents some agricultural techniques/practices and initiatives which could be introduced to the communities in Enga to improve climate compatible coffee production. The proposed actions are based on the desk review and data gathered from the field (district authorities and coffee sector authorities interviews and coffee farmers focus group interviews).

Table 8. Actions to improve climate compatible coffee production in Enga (Source: FinnOC, 2022)

Type of techniques/practices/actions related to improve coffee production
• Support coffee farmer's access to competitive and markets, e.g. by establishing coffee farming organisations
• Improve / management of coffee quality through the adoption of more efficient and environmentally-friendly post-harvest and processing technology
• Coffee Farm Management Techniques
• Integration of food crops in coffee farming
• Intercropping with fertilised vegetables
• The establishment of field nurseries and instruction on routine crop management and replanting
• Build on work of Productive Partnerships in Agriculture Project (PPAP)
• Use of pesticides and improved knowledge of their use
• Improve quality of coffee beans e.g. by sun drying
• Weed control including use of shade trees
• Use of demucilagers (mini wet mills) as a potential strategy for improving returns to labour through increased productivity and better-quality parchment
• Support organic coffee farming

[81] ACIAR, 2017.
[82] World Bank. 2018.
[83] See PNG buzz news. Fields replaced with coffee gardens in Wabag district. Available at: https://pngbuzz.com/png-news/8572

• Support/training on coffee farming business management skills
• Coffee farmer's access to credit / financing opportunities in order to facilitate adaptation, i.e. organic, substitute crops, new varieties, shading, etc.
• Improved support to key coffee industry bodies as well as strengthened links between producers, processors, buyers, and financers
• Enhance the establishment of Coffee Cooperatives and Societies/Associations/groups at the local level
• Youth training on coffee seedlings and nursery distributions
• Youth Tree Planting Scheme
• Open coffee buyer depots in focal points
• Reinforce National Coffee platform by providing administrative support to the Platform, supporting resource mobilization efforts, facilitating of knowledge building and knowledge sharing with all stakeholders
• Establish Enga Coffee platform within structure of existing committees by providing administrative support and supporting resource mobilization efforts

With respect to carbon market opportunities, gaining access to carbon credits must be preceded by establishing greenhouse gas emission baselines and monitoring carbon sequestration rates. However, there is a policy and mechanistic vacuum in PNG on coffee carbon trade. There is no policy and mechanism in PNG pertaining to the incorporation of coffee carbon biomass into the international coffee carbon trade (credit) machinations. The rates of CO^2 sequestration and storage in the different varieties of coffee are unknown. Also, the amount of carbon sequestered by coffee trees in PNG is unknown.[84]

The voluntary carbon market system is a potential option for credits from coffee production as land-use or agricultural mitigation projects are very limited in their eligibility for the mandatory markets like the Clean Development Mechanism (CDM). Nevertheless, the voluntary route is more appropriate for small or medium sized initiatives (projects) that may lack the capacity and knowledge to develop fully fledged CDM type coffee carbon credits. Furthermore, the application process is often too costly and complex for small and medium enterprises[85], such as most of the stakeholders in Enga Province.

[84] Sinebare, T., Numu, P., Gonapa, B.M., et. al. 2019. *Turbo Charging Papua New Guinea Coffee: Increasing Revenue Streams, Carbon Biomass Determination and Climate Change Mitigation*. Conference: Climate Change: Our Environment, Livelihoods and Sustainability At: University of Goroka, EHP, Papua New Guinea. Available at: https://www.researchgate.net/publication/335569718_Turbo_Charging_Papua_New_Guinea_Coffee_Increasing_Revenue_Streams_Carbon_Biomass_Determination_and_Climate_Change_Mitigation

[85] GGGI, 2021.

6 IDENTIFICATION AND ANALYSIS OF CAPACITY ISSUES AS WELL AS DEVELOP CAPACITY BUILDING TOPICS FOR FARMERS AND WOMEN GROUPS ON CLIMATE RESILIENT APPROACHES AND AGRICULTURAL TECHNIQUES

The aim of this section of the report is to identify capacity issues of farmers, coffee farmers and women groups and develop some capacity building topics on climate resilient approaches and agricultural techniques based on the field data and literature review.

6.1 Introduction to capacity and training issues in the agriculture sector

Both new and existing agricultural techniques and technologies play vital roles in climate risk management. Technologies that are relevant to climate change adaptation include improved seed and crop varieties that can tolerate or are resistant to drought, heat, salt, insects or pests. New technology is important but farmers also already possess valuable knowledge and seed varieties, and local and traditional knowledge of crop management and ecosystem services can support adaptation to climate change by marginal rural and indigenous communities. The value of local innovations that do not need external inputs should not be underestimated, especially because they can easily be scaled up in similar ecosystems. Promoting, revitalizing and scaling up existing technologies and strengthening the deployment of new ones is a straightforward pathway for scaling

up because when technologies are successful, they are spontaneously taken up by the private sector.[86]

According to Global Green Growth Institute (GGGI) (2019)[87] assessment, agricultural techniques have not improved in response to the detrimental impacts of intensified land use caused by subsistence agriculture, affecting the livelihoods of a large share of the country's population. It is recommended for the Government of Papua New Guinea to strengthen extension services, providing support to communities to adopt sustainable agricultural practices. Notably, this should include approaches to increase resilience toward natural hazards, pests, and diseases, as suggested in Papua New Guinea's National REDD+ Strategy (GoPNG 2017b). Sustainable agricultural practices aim to maximize the use of natural processes and ecosystems, reduce excessive use of external inorganic inputs, enhance the diversity of production, tailor production intensity to the capacity of the landscape, and use a mix of traditional and new technologies (IFAD 2012).

Such an agricultural modernization will require increasing public expenditures on extension services and agricultural research in areas, such as the introduction of adapted seeds and crops resistant to drought, heat, pests, and diseases (IFAD 2012). An appropriate system of crop rotation, low-tillage, and application of manure as fertilizer can improve soil structure and fertility (IFAD 2012; Pretty and Bharucha 2014). These approaches are diverse, and their application requires expertise. When introduced, it is important to consider existing local knowledge, innovations, and seed varieties already accessible to farmers. Accounting for these conditions will help scale up and strengthen the deployment of such modern practices (IFAD 2012). Improving practices of subsistence agriculture has the potential to deliver significant co-benefits, including reducing deforestation and forest degradation, curbing carbon emissions, increasing food security, and contributing to poverty alleviation (Babon and Gowae 2013).[88]

6.2 Field survey results from focus group discussions

This section presents the results from different focus group discussion by revealing the capacity issues and training needs of women, farmer and coffee farmers focus group respondents.

6.2.1 Capacity issues and training needs of women focus group participants

Papua New Guinea faces persisting institutional and governance challenges in creating an enabling environment for promoting and enhancing women's participation in food value chains (NARI, 2002). Gender disparities are seen in access to and control over key agricultural and rural resources and services, knowledge, opportunities and markets. Rural women are major contributors to the economy – on farms, at home and in the community – but their rights are not properly recognized and they have not benefitted equally from past economic growth. They are systematically excluded from access to resources, essential services, and decision-making.[89]

As the research and the findings from the study villages reveal men and women have clearly defined roles in rural livelihoods. Therefore, they also have different extension and training needs, but

[86] IFAD, 2015. Climate-resilient agricultural development. Scaling up note. Available at: https://www.ifad.org/documents/38714170/40237450/climate_sun.pdf/15655fe0-d06f-434e-b4ea-df9017c93ef2
[87] GGGI, 2019.
[88] Ibid.
[89] FAO. 2019. Country gender assessment of agriculture and the rural sector in Papua New Guinea. Port Moresby.

extension and training in rural livelihoods has focused on the needs of men, creating an 'invisible barrier' for women (Peters 1986; Saito and Spurling 1992, 2 in Miranda Cahn & Mathias Liu, 2008).

According to study on Women and rural livelihood training in PNG (2008)[90] women are often excluded because policy makers do not recognise the importance of the subsistence and informal sectors (FairbairnDunlop 1997), and extension and training are targeted at the formal commercial sector, where men dominate (Rennie 1991). Women are further constrained from taking advantage of extension and training schemes due to their relatively poor literacy and educational levels (Leach 1998). Further, women are sometimes excluded from extension and training for cultural reasons. Contact between unrelated men and women is often not culturally acceptable in PNG, making extension and training for women difficult, if the trainers and extension staff are men. Only a limited number of women have the education and qualifications to enable them to become trainers and/or agricultural extension staff (Rennie 1991). Travelling to training courses can be difficult for women, in the context of very remote villages, limited transport, and fears about safety. If a bus fare is required to reach a training course, it is likely to be the men who attend the course, not the women. Women may also be fearful of their husbands, who disapprove of their activities (Byford 2002). Women are sometimes unable to attend training because of the high workloads associated with their roles in economic livelihoods and gardening, in addition to household chores, childcare and community care. This is made even more difficult if the courses are held over several days. This study clearly indicates the need to develop *gender-sensitive training* when planning initiatives and projects in Enga.

Also, a major lesson to be drawn from the Do No Harm in PNG[91] research is the crucial importance of *working with men*. The role of women in PNG's agriculture sector shows how the gender inequalities contribute to the underperformance of the agriculture sector. The study focused in particular on coffee, cocoa, and fresh produce supply chains—found that gender-specific barriers to accessing key services (such as extension and finance) and insecurity affect the quality of the final product. The report noted that strengthening women's economic opportunity in agriculture requires more than improving access to land, finance, markets, and transport, however, or simply 'adding' activities to women's already busy lives. A failure to consider the changes needed for both women and men in household responsibilities and local norms and values can lead to pushback or, even worse, backlash. This is important issue to consider when developing different initiatives for farmers in Enga.
Another women's training issue is the importance to *train and nominate woman leaders* to conduct training on e.g. food and nutrition security. Also, inclusive training targeted for both men and women on gender equity and adult literacy is highly needed as was highlighted in the interviews with the provincial stakeholders.

Lack of training, including in post-harvest skills such as food preservation, proper packaging and storage, is another constraint affecting women. Additionally, women generally do not have the collateral to access credit from financial institutions to purchase high-cost farming equipment and supplies such as water tanks, pumps and pipes for proper irrigation. Other inputs such as tools, seedlings, planting materials and rice mills are also expensive to buy. Lack of or limited access to information on various issues also affects rural women and their families' livelihoods. This includes information related to adequate nutrition, sanitation and general health care, as well as information on economic opportunities and basic financial services.[92]

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[90] Cahn, M. & Liu, M. 2008. 2
[91] Eves, R. 2019. Do No Harm Research: Papua New Guinea. https://www.researchgate.net/publication/323257872_Do_No_Harm_Research_Papua_New_Guinea

The following table presents the different capacity building and training needs identified by women focus group participants. Crop cultivation practices, climate resilient agricultural practices and pest control/management are the most wanted training themes of women focus group respondents.

Table 9. Capacity building / training needs identified by women focus group participants (Source: FinnOC)

Village	No of participants	Capacity building / training needs
Birip (Wabag)	5	Training on crop farming, crossbreeding Training on crop protection Training on pest control Training on climate change
Lukitap (Wabag)	9	Training on new crop farming Training on the usage of fertilizers
Mambisanda (Wapenamanda)	5	Training on new crop farming Training on the usage of fertilizers Training on climate change issues
Yakaedes (Wapenamanda)	5	Training on pest control Training on new crops Training on sustainable farming
Par (Kompiam)	5	Training on farming Training on usage and supply of pesticides and fertilizers
Pandai (Kompiam)	6	Training on pest control Training on new crops Training on climate change adaptation
Nanglum (Lagaip-Porgera)	6	Training on climate change issues Training of financial issues and marketing
Tukusanda (Lagaip-Porgera)	5	Training on innovative crop farming (adapted to frosts)
Luguteges (Kandep)	9	Training on innovative crop farming (adapted to frosts)
Pindak (Kandep)	5	Training on innovative crop farming (adapted to frosts) Training on climate change issues

The following table provide some potential capacity building topics/themes for women based on the field surveys/interviews and desk review.

Table 10. Potential capacity building topics for women (Source: FinnOC)

Capacity building topics
• Intercropping and agroforestry
• Improved garden techniques
• Methods, practices to mitigate and adapt agriculture to climate change
• Livestock farming (chicken, goats, pigs)
• Use of pesticides and improved knowledge of their use
• Introduction to new seeds/planting materials, e.g. new "kaukau" and sweet potato vine to farmers to breeding crops in less time
• Post-harvest skills such as food preservation, proper packaging and storage
• Improve access to credit from financial institutions and markets
• Literacy skills training
• Nutrition and sanitation and general health care
• Business, marketing and entrepreneurship including modules on book-keeping
• Crop protection
• Weed control including use of shade trees
• Establishment of women groups/associations to foster exchange of knowledge and sharing of ideas and equipment
• Family-based approach to agriculture business
• Youth Economic Empowerment in Agriculture

6.2.2 Capacity issues and training needs of farmers and coffee farmers focus group participants

Family-based approach is potential method/capacity building topic to be introduced to households in Enga. Households that work cooperatively and harmoniously as a family, tend to have higher production (Curry and Koczberski 2004; Curry et al. 2007). Harmonious relationships among family members help ensure their ongoing commitment to and participation in export crop production.[93] Implementing family-based approach will establish the principles of inclusive household-level action plans, where the whole family is involved in decision making, around project investments and partnership implementation, that is, (a) extension/technical inputs and training delivered through/in line with the family teams-based approach and financial literacy and business development services for households; (b) business development services to maximize partnership arrangements and support identification of practices that support women and men working together in business; and (c) community-level support for inclusive business partnerships and identification of capacities, priorities, and participant households.

[93] ACIAR, 2017.

The following table shows the capacity building and training needs identified by farmers focus group survey participants. The most needed training needs identified by the farmers are related to sustainable farming methods, pest control, finance and marketing issues.

Table 11. Capacity building/training needs identified by farmers focus group respondents (Source: FinnOC)

Village	No of participants	Capacity building / training needs
Birip (Wabag)	6	Training on sustainable farming and food security Training on pest control
Lukitap (Wabag)	11	Training of farming Training on pest control
Mambisanda (Wapenamanda)	6	Training on farming and food security Training on pest control
Yakaedes (Wapenamanda)	5	Training on farming and food security, specially for women Training on pest control
Par (Kompiam)	6	Training on climate change and environmental issues Training on pest control Training on sustainable farming Training on financial and market issues
Pandai (Kompiam)	5	Training on climate change issues Training on pest control Training on sustainable farming Training on financial and market issues
Nanglum (Lagaip-Porgera)	7	Training on crop protection Training on sustainable farming
Tukusanda (Lagaip-Porgera)	7	Training on crop protection Training on sustainable farming
Luguteges (Kandep)	6	Training on pest control Training on sustainable farming, including women
Pindak (Kandep)	6	Training on climate change issues Training on pest control Training on sustainable farming, including women

The table below provides some potential capacity building topics/themes for farmers based on the field surveys and desk review.

Table 12. Potential capacity building topics for small-scale farmers (Source: FinnOC)

Capacity building topics
• Modern agricultural techniques, sustainable farming
• Introduction of new farming practices to protect food and cash crops against frost, hailstorms, drought and high rainfalls
• Market access
• Introduction to new seeds/planting materials, e.g. new "kaukau" sweet potato vine to farmers to breeding crops in less time
• Use of pesticides and improved knowledge of their use
• Weed control including use of shade trees
• Irrigation and water harvesting
• Climate change
• Climate resilient fish farming
• Family-based approach
• Gender equality and gender-based violence
• Nutrition and health
• Improve the capacity of young men and women to engage in productive income generating activities, like tree seedlings nursery, fish farming, piggery and poultry
• Provide incentives for smallholder farmers to borrow funds at reduced interest rates to increase productions

The following table below depicts the capacity building and training needs identified by coffee farmer survey participants. Coffee cultivation practices, financial literacy and pest control are the most wanted training themes of the coffee farmers.

Table 13. Capacity building / training needs identified by coffee farmers focus group participants (Source: FinnOC)

Village	No of participants	Capacity building/training needs
Birip (Wabag)	5	More agriculture training, specially for women Training on financial literacy
Lukitap (Wabag)	7	More agriculture training
Mambisanda (Wapenamanda)	5	More agriculture training Training on financial literacy

Yakaedes (Wapenamanda)	6	Training on financial literacy Training of food security Training of climate change Training on agriculture
Par (Kompiam)	6	Training on financial literacy Training on pest control Training on coffee farming for women
Pandai (Kompiam)	5	Training on book-keeping and financial literacy Training on pest control Training on fertilizer management

The following table provide some potential capacity building topics/themes for coffee farmers based on the field surveys and desk review.

Table 14. Potential capacity building topics for coffee farmers (Source: FinnOC)

Capacity building topics
• Coffee farming business management skills including book-keeping and financial literacy
• Improving access to funds/credit and incentives and competitive markets, e.g. by enhancing establishment of coffee farming organisations
• Improvement/management of coffee quality through the adoption of more efficient and environmentally-friendly post-harvest and processing technology (e.g, selective picking, sun drying)
• Integration of food crops, e.g. fertilized vegetables etc. in coffee farming
• Training on routine crop management and replanting
• Use of pesticides and improved knowledge of their use
• Weed control including use of shade trees
• Organic coffee farming
• Gender equality issues
• Female Coffee Farmer Cooperative training
• Organise 'direct trade' relationships between coffee producer groups and specialty coffee buyers
• Revive fresh vegetable market depot network in all districts so storing and cooling facilities can help women farmers to sell directly at those centres

7 REVIEW OF CURRENT PROVINCIAL AND DISTRICT DEVELOPMENT PLAN AND PROPOSE OPTIONS TO STRENGTHEN FOOD AND NUTRITION SECURITY IN PROVINCIAL DEVELOPMENT PLANNING

During the scoping and field survey phase, the consultant team requested provincial development plans for Enga. The consultant team was informed that the 2022-2030 development plan is still being drafted and hence, it could not be incorporated and analysed in the present report. Nevertheless, during discussions with provincial authorities some components of the drafted development plans were shared as well as previous plans.

For the Agriculture and Livestock branch, the strategic direction for Enga from the 2011-2015 development plan was to develop and grow the agriculture sector (food crop, cash crop and livestock), manufacturing, forestry, inland fisheries and eco-tourism sectors. Key areas which the plans focused on were: (i) Promotion of household food security and commercial food crops through expanded smallholder productions, (ii) Development of commercial cash crops using high potential agricultural land, and (iii) Land rehabilitation and land tenure reform for poor households and new commercial farming enterprise.

It seems the main issue to deliver the previous (and upcoming) agriculture sector development plans has been the lack of capacity (human, technical and financial management) of the Enga provincial government. There is a great need to strengthen the availability of trained manpower at the district and provincial level through training, local participation and technical assistance. The planning processes also need reinforcement to ensure effective coordination of project planning and implementation. Planning processes also need to support small-farmers to respond to social-ecological changes (climate change impacts, population growth) which they will need to respond in Enga. Moreover, the Provincial government has not managed to solve land related arrangements and dispute management systems sufficiently to allow greater efficiency in land use and unlock land for agricultural development.

For the Commerce branch, the five-year development plan from the 2011-2015 was to redirect profits from non-renewable resources into supporting agriculture, forestry, tourism and inland freshwater fisheries. The aim is to grow and expand commercial activities and industry in the five districts. Key areas which the plans focused on were (i) Promote local economic empowerment through small business development and community-based tourism initiatives. Contribute to GDP growth through increased job creation, redistribution and transformation using tourism and improving seasonality patterns; (ii) To promote and maintain cultural education.

For the community development branch, the key areas of focus in 2011-2015 Development Plans were: (i) Create partnership between NGOs, donor agencies, churches, CBOs, and private companies for community development sector, (ii) Mobilise youth and women's group to address law and order and social problems affecting communities and ambitions to curb tribal fighting in the province, (iii) Mobilize women and youth to participate in development programs, township clean-up and economic projects for rural areas. (iv) Ensure Gender equality and equity in community-based activities and (v) Improve social security and harmony of village people.

Table 15. Some preliminary components of Enga's Provincial Development Plan (2022-2030)

Priority sectors / areas	Initiatives
Forestry / Biodiversity	- Implementation of REDD+ activities at provincial level - Giving out tree seedlings to all farmers to plant along the river Lai together with Department of Forestry (as natural barriers against flooding events) - Giving women tree seedlings to make nursery to start tree planting - Community engagement to make nursery for the seedlings of trees (*Eucalyptus*)
Energy	- Promotion of solar energy initiatives - Implementation of hydroelectric power plants in all Enga districts - Feasibility study regarding whether Lomban hydroelectric plant in Wabag can power the new hospital being built

Agriculture and Livestock / Food and Nutrition Security	- Crop rotation and integrated cropping - Poultry Processing Plan to encourage households to go into chicken raising - Support increase of fallow arable land - Introduction of new "kaukau" and sweet potato vine to farmers to breeding crops in less time - Issuing new corn seedlings to farmers - Supply of seedlings to farmers - Create a SME revolving finance to assist farmers in increasing productions and quality of livestock and cash crops. - Establish livestock and cash crop seedling distribution centres - Establish base-camps for plant breeding and variety trials for smallholder farmers - Support coffee production - Support water harvesting and irrigation - Improve access of land for agriculture - Increase expenditure on extension services and agriculture research base camps and trailing to help small holder farmers - Building food storage facilities (food/vegetable depots) and processing facilities to improve food security - Enhancing agroforestry to support food security - Promote food security through expanded smallholder village base productions - Establish soft finance as seed money for helping smallholder farmers to starting agrobusiness enterprise - Support SMART Family Business approach developed by the Community Development Branch of Provincial Authority to create enabling environment for resilient communities to improve food security and farming methods and to address law and order issues in the wards by networking with different actors and other branches of Enga Provincial Government

8 RECOMMENDATIONS

Smallholder farming plays a crucial role in sustaining the food and nutrition security and livelihoods of communities in Enga. Agriculture productivity of Engan farmers is low. To support and bolster food and nutrition security strengthening resilience against climate change in the agriculture sector need to focus on improving productivity. This is also underlined in Papua New Guinea National Food Security Policy 2018-2027, which emphasizes enhancement of productivity and sustainability of smallholder farming systems for the traditional staples and nutrient rich (particularly protein) foods - including, legumes, small livestock and aquaculture fish. Local government should commit to invest in farmer organisations and stimulate them at a family group level. One of the most important constraints to improving agriculture and the availability of government services in the province is the lack of an adequate transportation network which need to be upgraded.

This study has proposed some agricultural techniques/practices and initiatives which could be introduced to the communities in Enga to improve agricultural productivity, food security, and resilience including access to value chains. These are presented in the following table. The left column presents the outputs of the Strengthening Integrated Sustainable Landscape Management in Enga Province Papua New Guinea and the right column actions recommended.

Output: Community based agricultural extension and research system established and sustained	**Type of agriculture techniques / practices / initiatives recommended**
Baseline information on subsistence agriculture collected	- Promote participant-led research approach by supporting lead farmers and women to provide information and feedback on subsistence agriculture / agriculture techniques - Work closely with National Agricultural Research Institute (NARI), Fresh Produce Development Authority (FPDA) as well as provincial and local NGOs to collect baseline data - Utilize climate compatible agricultural development materials based on climate hazard and adaptation assessments (developed under Component 1)
Training materials appropriate to Enga's diverse altitudinal range developed	*Pre-cultivation* training materials can for instance include: • Introduce quality nutritious crops such as peanut, new kaukau, vines peas and strawberries using crop rotation methods • Awareness on land use planning • Improve access of land for agriculture, use of GPS-application for field mapping and farm planning • The fallow agriculture land/ fallow system • Mulching Training materials related to c*ultivation* can for instance include: • Introduction of new farming practices to protect food and cash crops against frost, hailstorms, drought and high rainfalls • Crop rotation and integrated cropping • Water harvesting and irrigation to provide water for crops

	• Introduce appropriate and sustainable use of fertilizers and pesticides • Agroforestry • Introduction to new seeds/planting materials, e.g. new "kaukau" sweet potato vine to farmers to breeding crops in less time • Weed control including use of shade trees • Irrigation and water harvesting • Climate resilient fish farming • Restore wheat growing in swampland • Introduce rice planting in swampland Training materials related to *harvesting* may include: • Suitable time of harvest • Methods of harvest • Immediate storing and pre-cooling *Post-Harvest* training materials can include: • Enhance farmer's access to competitive and markets, e.g. by establishing farmers organisations/groups • Improve transport system for buying and selling • Building food storage facilities (food/vegetable depots) and processing facilities to improve food security • Improve post-harvest skills such as food preservation, proper packaging and storage
Enhanced capacity of lead farmers to develop climate compatible techniques	- Develop training curriculum for lead farmers on pre-cultivation, cultivation, harvesting and post-harvest covering most prominent crops for each - Use participatory approach: Lead farmers can also act as participatory researchers providing feedback on uptake of techniques and results with groups being brought together on an annual basis to share results and review training approaches and agricultural techniques used
Monitoring and feedback process for lead farmers established	- Establishing and ensuring regular communication and information flow in the implementation - Develop follow up protocol, e.g follow up visits - Simple and user friendly data collection tools to be developed that will be used at all levels (progress reports, etc.)
Establishment of nurseries for fruit tree production	- Establish fruit trees, other cash crop seedling including livestock distribution centres - Establish base-camps for plant breeding and variety trials for smallholder farmers - Supply of tree seedlings to farmers
Developed women's nutrition programme	- Intercropping and agroforestry - Improved garden techniques - Livestock farming (chicken, goats, pigs) - Use of pesticides and improved knowledge of their use

	- Introduction to new seeds/planting materials, e.g. new "kaukau" and sweet potato vine to farmers to breeding crops in less time - Post-harvest skills such as food preservation, proper packaging and storage - Improve access to credit from financial institutions and markets - Literacy skills training - Nutrition and sanitation and general health care - Business, marketing and entrepreneurship including modules on book-keeping - Crop protection - Weed control including use of shade trees - Establishment of women groups/associations to foster exchange of knowledge and sharing of ideas and equipment - Family-based approach to agriculture business - Youth Economic Empowerment in Agriculture
Diversified and climate resistant agricultural production systems established	- Work with Department of Agriculture and Livestock to introduce new agriculture production and monitoring systems and improve the existing ones - Improve farmers business linkages by arranging business to business meetings for increased marketing opportunities - Support Family-based approach to agriculture business - Support farmer's access to competitive and markets, e.g. by establishing farmers organisations/groups - Develop farm to market guides that ensure diversification and climate-resilient production - Building food storage facilities (food/vegetable depots) in each climate change prone districts and processing facilities to improve food security - Improve small-scale farmers' access to savings and credit by providing rural financial services through sustainable, replicable microfinance interventions

As the coffee production is important source of income to many Engan farmers, the adoption of new technologies and farming practices are important to improve coffee quality and total production. The study has identified some coffee cultivation techniques/practices and initiatives (see table below) which can support the adoption of sustainability practices and to improve climate compatible coffee production in Enga. The left column presents the outputs of the Strengthening Integrated Sustainable Landscape Management in Enga Province Papua New Guinea and the right column actions recommended.

Output: Coffee production climate proofed	Type of techniques/practices/actions related to improve coffee production recommended
Climate smart coffee production developed and expanded	- Identification of communities that want to expand their coffee production and help and support them develop low-value grant proposals to be submitted to UNDP

Increased capacity for high quality coffee production developed	- Develop training curriculum for coffee farmers on pre-cultivation, cultivation, harvesting and post-harvest, special focus on female coffee farmers *Pre-cultivation* training materials can for instance include: • Awareness on land use planning • Improve access of land for coffee farming, use of GPS-application for field mapping and coffee farm planning • Improve coffee tree management practices including practicing rejuvenation and pruning • Use of fertilizers • The establishment of field nurseries and instruction on routine crop management and replanting • Mulching Training materials related to c*ultivation* can for example include: • Integration of multiple crops into the coffee farming systems • Weed control including use of shade trees • Organic coffee farming • Water harvesting and irrigation to provide water for crops • Agroforestry • Use of pesticides and improved knowledge of their use • Irrigation and water harvesting Training materials related to *harvesting* may include: • Suitable time of harvest • Improve harvesting practice (e.g. harvest red ripen cherries) • Use of demucilagers (mini wet mills) as a potential strategy for improving returns to labour through increased productivity and better-quality parchment *Post-Harvest* training materials can include: • Improve post-harvest skills related to pulping, wet processing, drying, hulling, cleaning, sorting, grading, storage, roasting, grinding to maintain good coffee quality • Enhance farmer's access to competitive markets, e.g. by establishing coffee farmers organisations/groups • Improve transport system for buying and selling • Organise 'direct trade' relationships between coffee producer groups and specialty coffee buyers - Use participatory approach: Lead coffee farmers can also act as participatory researchers providing feedback on uptake of techniques and results with groups being brought together on an annual basis to share results and review training approaches and coffee cultivation used - Work closely with National Agricultural Research Institute (NARI) which can support research elements as well as technical support; Fresh Produce Development Authority (FPDA) as well as provincial and local NGOs
Increased capacity for business planning, development and access to finance amongst coffee producers, processors and aggregators	- The training for coffee processors and aggregators (coffee cooperatives, groups, associations) focusing on the post-harvest stage of coffee production. The training should be in line with training curriculum related to post-harvest for coffee farmers above - Support coffee farmer's access to competitive and markets, e.g. by establishing coffee farming organisations - Coffee farming business management skills including book-keeping and financial literacy

National Coffee platform strengthened to bring together buyers, producers, aggregators, processers and financers with support to reform to existing regulations on the coffee sector	- Provide administrative support to the Platform, supporting resource mobilization efforts, facilitating of knowledge building and knowledge sharing with all stakeholders
Enga coffee platform established within structure of existing committees	- Provide administrative support and supporting resource mobilization efforts
Increased awareness of and use of sustainability standards for coffee production as well as capacity for traceability of coffee through supply chain	- Enhance the ability to identify and trace the origin, distribution, location and application of coffee and materials through supply chains - Support a traceability system with appropriate records to ensure both vertical and horizontal traceability of coffee. Vertical traceability of coffee should be to farm level; farm records to enable horizontal traceability of key processes to be held on farms in a farmer file and also at the group level
Improved payment systems for coffee production to increase access to finance and distribution of finance through the value chain including at household level developed	- Enhance financing or (partial) prepayment systems in contractual terms, allowing the producer to incur expenses prior to harvest

It seems the main issue to deliver the previous (and upcoming) agriculture sector development plans has been the lack of capacity (human, technical and financial management) of the Enga provincial government. There is a great need to strengthen the availability of trained manpower at the district and provincial level through training, local participation and technical assistance. The planning processes also need reinforcement to ensure effective coordination of project planning and implementation. Planning processes also need to support small-farmers to respond to social-ecological changes (climate change impacts, population growth) which they will need to respond in Enga.

Moreover, based on the desk review and field data, more research is required into climate-resilient crops and agricultural techniques—including options for intercropping and agroforestry—that are suitable for specific locations in Enga Province. This study has also partly revealed what farmers and women themselves see as challenges and opportunities for their agriculture related activities. However, more research is needed on this subject.

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A. ANNEXES

a. Annex 1. Survey tools

i. Focus group discussion with coffee farmers

The following interview guideline is used as a guide for semi-structured interviews for coffee farmers focus groups in Enga.

We represent "The Strengthening Integrated Sustainable Landscape Management in Enga Province Papua New Guinea" for the period 2021- 2025" that is implemented jointly by the UNDP in partnership with Enga Provincial Administration, Climate Change and Development Authority with the financial support from EU. We would like your assistance in providing us with information about coffee production issues related to climate change mitigation and adaption, food and nutrition security and biodiversity and land/forest conservation.

The farmers focus group interviews should include 6-7 farmers engaged in cultivating of coffee. Try to include also women coffee farmers.

Please take some photos of the discussion and 1 to 2 photos of farmer's coffee farming activities. Please circle the answer for multiple choice questions. You will have to use a notebook to record outcome of the discussion. Also, audio record the interviews (it the interviewees allows it). The Senior Research Assistant will conduct this survey and write a FGD report.

Date of the interview:_____

Name of village and district _____

The names and phone numbers of coffee farmer participants

Name	The size of coffee plantation (ha)	Other agricultural activities	Phone number	Age of respondent

1. Can you please describe the different agricultural practices that are related to or that are carried out as part of coffee growing? (e.g. soil, water, and pest control, irrigation, crop diversification, etc.)

_____

_____

_____

_____

_____

_____

2. How would you describe the quality of your coffee in terms of yield?_____

_____

_____

_____

_____

_____

_____

3. How would you describe your access to markets (buyers) ?_____

_____

_____

_____

_____

_____

4. Can you describe your market and finance strategies related to coffee farming? What do you think of your coffee market a) good or b) bad, and how does that financially affect your coffee farming?

_____

_____

_____

_____

_____

_____

5. Are there any incentives available for coffee farmers? Have you received any? If yes, please describe_____

_____

_____

_____

_____

_____

_____

6. Are there any coffee farmers groups/cooperatives/societies formed in your district/LLG? Yes/No. If Yes, please specify_____

_____

_____

_____

_____

_____

_____

7. Are you a member of any coffee farmers group or Coffee Cooperative Society? Yes/No. If Yes, please specify to which groups (Name of the Coffee Cooperative), and how many group members?_____

_____

_____

_____

_____

_____

_____

8. If you are a member of a Coffee Cooperative Society/group, please state the 1st principal lines of business activity for your cooperative, e.g. growing, processing, marketing and/or exporting coffee, farm supply, provide security, transportation, (others specify)._____

_____

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_____

9. What are the benefits/downsizes of belonging to a cooperative coffee farmer group?

_____

_____

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_____

10. Are coffee farmers involved in micro credit service supply or are they provided by any incentives? Yes/No. If Yes, in what ways?_____

_____

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11. Are there now or earlier been any extension workers in agriculture in this community? If yes, what kind of extension services do they provide?_____

_____

_____

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_____

_____

12. In your opinion, what is the most critical obstacle to your coffee farming activities? (Seek consensus among them and prioritise the list)

1. _____
2. _____
3. _____
4. _____

13. Have you noticed any long-term shifts in temperature on your coffee farm? Yes No

If yes, warmer or cooler? _____

14. Have you noticed any long-term shifts in precipitation on your coffee farm? Yes No

If yes, drier or wetter? _____

15. What adjustments in your farming have you made to these long-term shifts, such as using different varieties, or adding irrigation?

16. How do you predict the weather next season? (Use past season weather, expert opinions, radio, etc.)

17. What strategies do you use to adapt your farm to the changes in weather from year to year?

18. What kind of negative impacts the climate change and natural disasters have on coffee farming activities?

_____

19. Have you received any kind of training or awareness on climate change adaptation/mitigation and/or on improved agricultural practices? Yes/No. If yes, by whom and what type of awareness/education?

_____

_____

_____

_____

_____

_____

20. In what areas do you need help in to increase your knowledge and improve your coffee farming activity? (e.g. practical education on bookkeeping, financial literacy and credit improve the economic performance, etc.)_____

_____

_____

_____

_____

_____

_____

21. Has the climate change and related natural shocks caused any land conflicts and lack of land for coffee farming activities? Yes/No. If Yes, please describe.

_____

_____

_____

_____

_____

_____

22. Can you describe your ways to cope with climate-induced disasters and threats related to your coffee farming activities?_____

23. Can you name any means how to strengthen and empower rural women in the coffee growing sector?

THANK THE COFFEE FARMERS FOR THEIR TIME!

Observations

ii. Focus group discussion with farmers

The following interview guideline is used as a guide for semi-structured interviews for farmers focus groups in Enga.

We represent "The Strengthening Integrated Sustainable Landscape Management in Enga Province Papua New Guinea" for the period 2021- 2025" that is implemented jointly by the UNDP in partnership with Enga Provincial Administration, Climate Change and Development Authority with the financial support from EU. We would like your assistance in providing us with information about coffee production issues related to climate change mitigation and adaption, food and nutrition security and biodiversity and land/forest conservation.

The farmers focus group interviews should include 6-7 farmers engaged in cultivating of cash crops, garden crops, other agricultural activities.

Please take some photos of the discussion and 1 to 2 photos of farmers' farming/agricultural activities. Please circle the answer for multiple choice questions. You will have to use a notebook to record outcome of the discussion. Also, audio record the interviews (it the interviewees allows it). The Senior Research Assistant will conduct this survey and write a FGD report.

Date of the interview:_____

Name of village and district _____

The names and phone numbers of farmer participants

Name	Agricultural activities	Phone number	Age of respondent

1. What type of farming do you do in this village? List the main crops grown in this village?

_____

_____

_____

_____

_____

2. What kind of farming/cultivation practices you use in this village?_____

_____

_____

_____

_____

_____

3. Have you noticed change in crop yield since you started farming?

_____

_____

_____

_____

_____

4. What do you think caused this?

_____

_____

_____

_____

_____

5. What do you do when there is not enough food for consumption and selling?

_____

_____

_____

_____

_____

_____

6. Have you practiced agroforestry (use of forest simultaneously for food, cash crop and timber)? If yes, please specify._____

_____

_____

_____

_____

_____

_____

7. Have you noticed any long-term shifts in temperature on your farm? _____ (Yes/No) If yes, warmer or cooler? _____

8. Have you noticed any long-term shifts in precipitation on your farm? _____ (Yes/No) If yes, drier or wetter? _____

9. What do you think caused those changes mentioned above?

_____

_____

_____

_____

_____

10. What adjustments in your farming have you made to these long-term shifts, such as using different crop varieties, or adding irrigation?

11. How do you predict the weather next season? (Use past season weather, expert opinions, radio, etc)

12. What strategies do you use to adapt your farm to the changes in weather from year to year?

13. Are there any farmers groups, networks, societies etc. formed in this village? Yes/No. If Yes, please specify_____

14. If you belong to a farmer group, what are the benefits/downsizes to belonging to a farmer group?_____

_____

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_____

15. Are farmers involved in micro credit service supply? Yes/No. If Yes, in what ways?

_____

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16. Do they teach you about environmental problems, farming practices and how to sustain cash crops?

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17. Are there now or earlier been any extension workers in agriculture in this community? If yes, what kind of extension services do they provide?_____

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18. In your opinion, what is the most critical obstacle to your farming activities? (Seek consensus among them and prioritise the list)

1. _____
2. _____
3. _____
4. _____

19. What kind of negative impacts does climate change and natural disasters have on farming/agricultural activities?

20. Crop Biodiversity. Have you introduced new cash crops?

21. Do you allow wild crops to grow in your land?

22. How do your preserve seedlings?

23. What are some ways to ensure that you have enough food during bad times, e.g. very dry seasons, disasters, etc. in your community?_____

24. What are the different roles women and men play to ensure that there is sufficient food for individual families or households?_____

25. Have you received any kind of training or awareness on climate change adaptation/mitigation or improved agricultural practices? Yes/No. If yes, by whom and what type of awareness/education?

26. What areas do you need help in to increase your knowledge and improve your farming activity?_____

_____

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27. Has the climate change and related natural shocks caused any land conflicts? Yes/No. If Yes, please describe.

_____

_____

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_____

_____

_____

28. Have you been involved in adopting new/unfamiliar crops and farming methods? Yes/No. If yes, please explain?_____

_____

_____

_____

_____

_____

_____

29. Agroecology benefiting biodiversity. Are you practicing tradition farming? In what ways?

a) legume planting after other cash crops are harvested

b) mix-farming methods

c) planting plants that benefit each other

d) planting wild traditional food crops

e) reduced use of fertilizer/chemicals

g) others. Which

_____

30. Can you describe your ways to cope with climate-induced disasters and threats?

_____

_____

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32. Can you name any means how to strengthen and empower rural women in the agricultural sector?_____

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THANK THE FARMERS FOR THEIR TIME!

Observations

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iii. Focus group discussion with women

The following interview guideline is used as a guide for semi-structured interviews for women's focus groups in Enga.

We represent "the Strengthening Integrated Sustainable Landscape Management in Enga Province Papua New Guinea" for the period 2021- 2026" that is conducted jointly by the UNDP in partnership with the EU. We would like your assistance in providing us with information about gender issues related to climate change mitigation and adaption, food and nutrition security and biodiversity and land/forest conservation.

The women focus group interviews should include 6-7 women engaged in cultivating of cash crops, garden crops, and in other agricultural activities.

Please take some photos of the discussion and 1 to 2 photos of their businesses and farming activities. Please circle the answer for multiple choice questions. You will have to use a notebook to record outcome of the discussion. Also, audio record the interviews (it the interviewees allows it). The Senior Research Assistant will conduct this survey and write a FGD report.

Date of the interview:_____

Name of village and district _____

The names and phone numbers of women participants

Name	Position (i.e. single mother, head of women branch of Catholic church, etc.)	Agricultural activities	Phone number	Age of respondent


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1. What kind of agricultural activities are undertaken by women and girls? a) land preparation, b) planting/sowing, c) raising nursery plants, d) weeding, e) application of fertilizer, f) crop protection (pests, diseases, fencing), g) application of organic matter, h) harvesting, i) threshing, j) cleaning, k) drying, l) transport produce to home, m) selling excess produce, n) maintenance, o) other, please specify_____

_____

_____

2. What kind of garden activities are normally undertaken by women and girls? a) planting, b) sowing seeds, c) seed selection and procurement, d) watering, e) removal of excess growth, f) pruning, g) harvesting, h) cleaning, i) drying, j) packing, k) transport to home, l) other_____

_____

_____

3. What kind of coffee production activities are undertaken by women and girls? a) picking the coffee cherries, b) pulping, c) drying and storage, d) transporting and selling, e) other, please specify_____

_____

_____

4. What kind of bilum making activities are undertaken by women and girls? a) harvesting fibre, b) preparation, c) coloring, d) weaving, e) selling, f) other, please specify_____

_____

5. What are the income generation activities undertaken by women and girls in this village?_____

_____

_____

_____

6. Which of the above (Q1 to Q5) activities will impact from climate change?_____

Can you explain how?_____

_____

_____

_____

_____

7. What is the average income per week? (gather data for each agricultural/farming activities)

Agricultural type	**Average income per month (Kina)**	**How many times agricultural activity per week or year**
Betel nuts		
Coffee		
Garden produce		
Pig selling		
Poultry sale		
Finance-credit scheme		
Others, please specify		

8. Are there any groups, networks, societies etc. formed for women in this village? Yes/No. If Yes, please specify_____

_____

_____

_____

9. How have the activities provided by these groups (if any) helped women's participation in the improvement of food security or agricultural activities?_____

_____

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10. Are women involved in micro credit service supply? Yes/No. If Yes, in what ways?_____

_____

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11. Are there now or earlier been any extension workers in agriculture in this community? If yes, what kind of extension services do they provide?_____

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12. In your opinion, what is the most critical obstacle to your farming activities? (Seek consensus among them and prioritise the list)

1. _____
2. _____
3. _____
4. _____

13. What kind of negative impacts the climate change and natural disasters have on a) women and children? And b) on farming activities?

_____

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14. What are some ways you and your community/families ensure that you have enough food during bad times, e.g. very dry seasons, disasters, etc.? (e.g. borrowing from wantoks, reduce expenditures on health/education, use of savings, etc.)_____

_____

_____

_____

_____

_____

15. What areas do you need help in to increase your knowledge and improve your farming activity?_____

_____

_____

_____

_____

16. Have you received any kind of training or awareness on climate change adaptation/mitigation or improved agricultural activities? Yes/No. If yes, by whom and what type of awareness/education?

_____

_____

_____

_____

_____

17. Has the climate change and related natural shocks caused any land conflicts? Yes/No. If Yes, please describe.

_____

_____

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_____

_____

18. Are women involved in adopting new/unfamiliar crops and farming methods? Yes/No. If yes, please explain?_____

_____

_____

_____

_____

19. What are the social and cultural issues that are not promotive for women vis-à-vis men engagement in new farming activities?_____

_____

_____

_____

_____

20. Can you name any means how to strengthen and empower rural women in the agricultural sector?_____

_____

21. Can you make some recommendations how to engage women more to climate change mitigation and adaption activities?_____

THANK THE WOMEN FOR THEIR TIME!

Observations

iv. Household survey questionnaire (ODK tablet based)

Link to the questionnaire:

https://odk.dockl.com/-/preview/T9rulWvZjxSy9XDlfGwbJYR2PM1LqZ8

b. Annex 2. Field work plan and schedule

Table 16. Field work plan and schedule

DATE	LOCATION	ACTIVITY	COMMENTS
Sun 13.02	**POM-Wabag (via Mt Hagen)**	Arrive in Hagen, travel by road to Wabag. Brief UNDP, Provincial Administration and Environment Officers.	UNDP/Environment Officer Enga to arrange meetings with Enga Districts.
Mon 14.02	**Wabag District**	Consultation with LLG President, Ward Councillors, and identification of two villages. **Protocol Visit to local authorities**	Consider option dropping off Protocol Letters to the 2 villages of study.
Tue 15.02	**Wabag District**	RAs to conduct interviews in survey villages, Wabag District. **Village 1 – Lukitap**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey.
Wed 16.02	**Wabag District**	RAs to conduct interviews in study villages Wabag District. **Village 2 - Birip**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey.
Thu 17.02	**Wabag District**	RAs to conduct interviews in survey villages Wabag District. **Continue conduct interviews/finalize** **Upload HH data to server.**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey.
Fri 18.02	**Wapenamanda District**	Consultation with LLG President, Ward Councillors, and identification of two villages.	Consider option dropping off Protocol Letters to the 2 villages of study
Sat 19.02	**Wapenamanda District**	RAs to conduct interviews in survey villages at Wapenamanda District **Village 1 – Mambisanda**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey

Sun 20.02	**Wapenamanda District**	RAs to conduct interviews in study villages at Wapenamanda District **Village 2 - Yakaedes**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey
Mon 21.02	**Wapenamanda District**	RAs to conduct interviews in survey villages at Wapenamanda District **Continue conduct interview/finalize** **Upload data to server.**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey
Tue 22.02	**Kandep District**	Consultation with LLG President, Ward Councillors, and identification of two villages.	Consider option dropping off Protocol Letters to the 2 villages of study.
Wed 23.02	**Kandep District**	RAs to conduct interviews in survey villages at Kandep District **Village 1 – Pindak**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey
Thu 24.02	**Kandep District**	RAs to conduct interviews in study villages at Kandep District **Village 2 – Luguteges**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey
Fri 25.02	**Kandep District**	RAs to conduct interviews in study villages at Kandep District **Continue conduct interview/finalize** **Upload HH data to server.**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey
Sat 26.02	**Kompiam-Ambum District**	Meet and consult with District Administration, Environment Officer LLG President, and Ward Members to establish and identify two villages of study.	Consider option dropping off Protocol Letters to the 2 villages of study.
Sun 27.02	**Kompiam Ambum District**	RAs to conduct interviews in study villages, Kompiam Ambum District. **Village 1 - Par**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey

Mon 28.02	**Kompiam Ambum District**	RAs to conduct interviews in survey villages, Kompiam Ambum District. **Village 2 – Pandai**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey
Tue 01.03	**Kompiam Ambum District**	RAs to conduct interviews in survey villages, Kompiam Ambum District. **Continue conduct interview/finalize** **Upload HH data to server.**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey.
Wed 02.03	**Lagaip Pogera District**	Meet and consult with District Administration, Environment Officer LLG President, and Ward Members to establish and identify two villages of study.	Consider option dropping off Protocol Letters to the 2 villages of study.
Thu 03.03	**Lagaip Pogera District**	RAs to conduct interviews in study villages, Lagaip Pogera District. **Village 1 - Tukusanda**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey
Fri 04.03	**Lagaip Pogera District**	RAs to conduct interviews in survey villages, Lagaip Pogera District. **Village 2 – Nanglum**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey
Sat 05.03	**Lagaip Pogera District**	RAs to conduct interviews in study villages, Lagaip Pogera District. **Continue conduct interviews/finalize** **Upload HH data to server.**	Identify WFG, Farmers Focus Group, Coffee Farmers Focus Group, Households to conduct survey.
Sun 06.03	**Mt Hagen-POM**	Team returns to POM (via Mt Hagen)	Compile all data and survey material, return all survey tools to POM office

c. Annex 3. Household characteristics

i. Birip

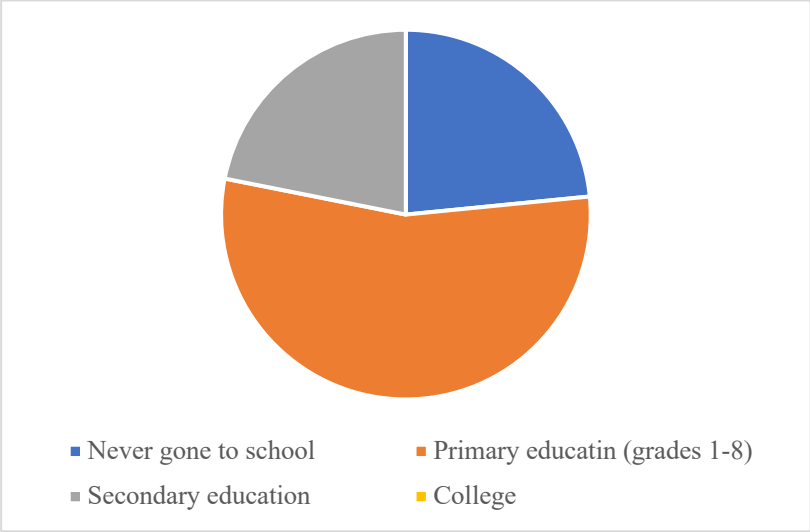
This village had 68 survey respondents.

1. Household characteristics

Gender	Count	%	Age range age	Count	Average
Female	32	46	21 – 35	24	45
Male	36	54	36 – 43	10	
			44 – 51	12	
			52 – 59	8	
			60 or over	14	
Household literacy	**Count**	**%**	**Persons living in household average**		**On**
Local dialect	68	99	Females		2
Pigin	61	88	Males		3
English	27	39	Girls		1
			Boys		2

Main job is subsistence farmer, 28% of respondents have more than one job.

Educational level; 22% has never gone to school, 51% has attained primary level education. 26% has received secondary level or higher education qualification.



2. Household physical features and assets

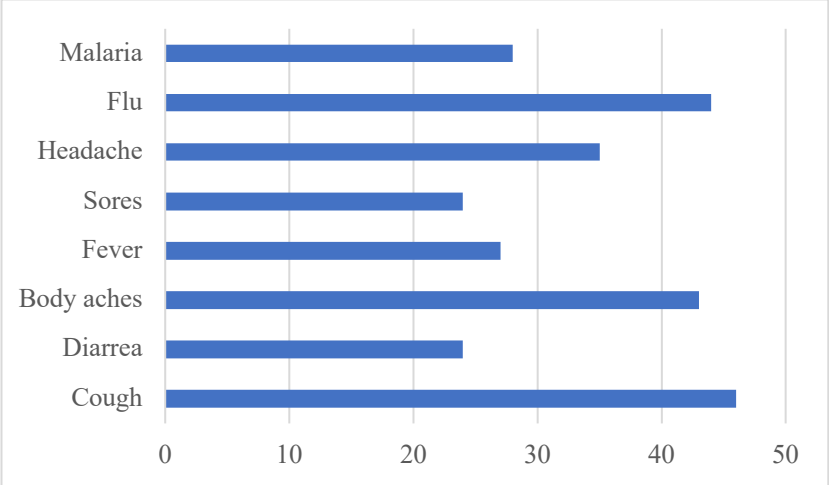
Results reveal that 40% don't have electricity in their household.

Majority of respondents have more than one type of land. Most common types of land are agricultural area, forest, grassland, shrubland and swampland.

38% have only pigs, 10% only poultry and 52% has more than one type of livestock; pigs, poultry, and goats.

3. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. 29% of them had visited health center, 75% in public hospital and 15% had gone to traditional healers. During a year-time on average times of visiting health facility was 4, when answers were ranging between 0 – 15 times. The following figure indicates that most suffered health issues within past 6 months were cough, body aches and flu. 87% reported to have more than one health issue.



4. Household water and sanitation

All respondents except one have a latrine toilet in their household.

58% would describe the toilet quality to be average.

For main source of water are reported spring, pond and piped water. For 91% of respondents, the closest water source is minutes away.

Access to water is described being rather easy or rather difficult. Half describe water to be safe to use and the other half not.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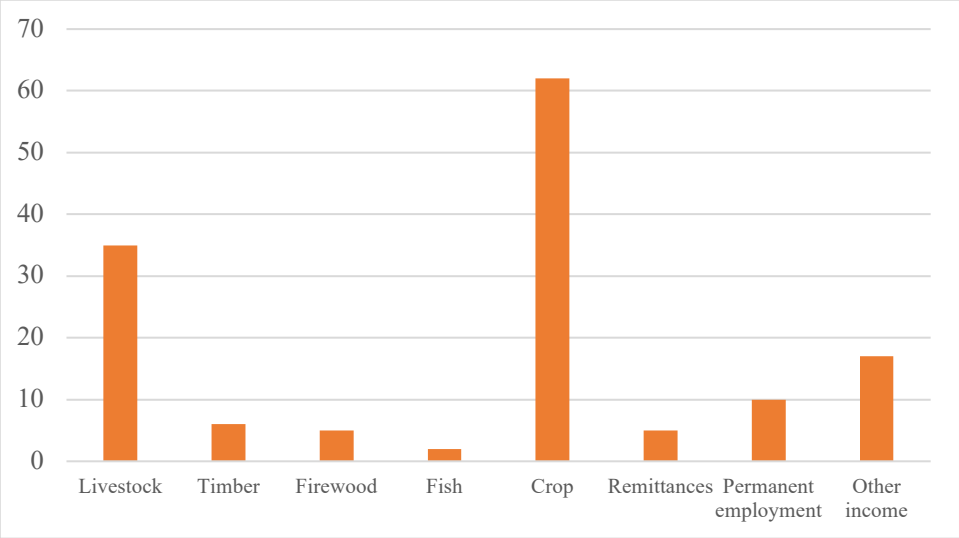
5. Household income and expenditure

The average monthly household income is 385 PGK and monthly expenditure 119 PGK. Most common types of expenditure: food, transportation, clothes, agriculture and compensations.

Main sources of income are crop, livestock or permanent employment.



6. Household poverty perception

62% thinks their household poverty situation to be average and 23% to be poor compered to others in the village. 75% would describe their village poverty situation as average compared to other villages in the area. Characteristics of poor household are described to be if you don't have land, no gardens, no money and lack of nutritional food.

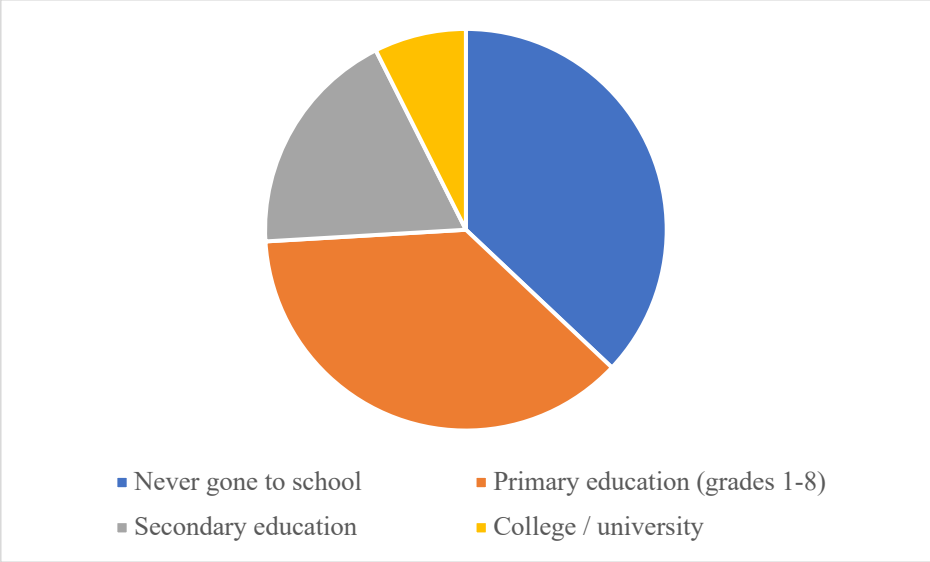
ii. Luguteges

This village had 27 survey respondents.

1. Household characteristics

Gender	Count	%	Age range age	Count	Average
Female	2	8	28 – 35	8	46
Male	25	92	36 – 43	2	
			44 – 51	8	
			52 – 59	4	
			60 or over	3	
Household literacy	**Count**	**%**	**Persons living in household average**		**On**
Local dialect	27	100	Females		3
Pigin	21	78	Males		4
English	8	30	Girls		2
			Boys		3

The main employment type of respondents is subsistence farmer, in proportion to 26 out of 27. 40% of them work in multiple jobs, mainly for government or church in addition to farming. The pie chart indicates the levels of education of the respondents.



2. Household physical features and assets

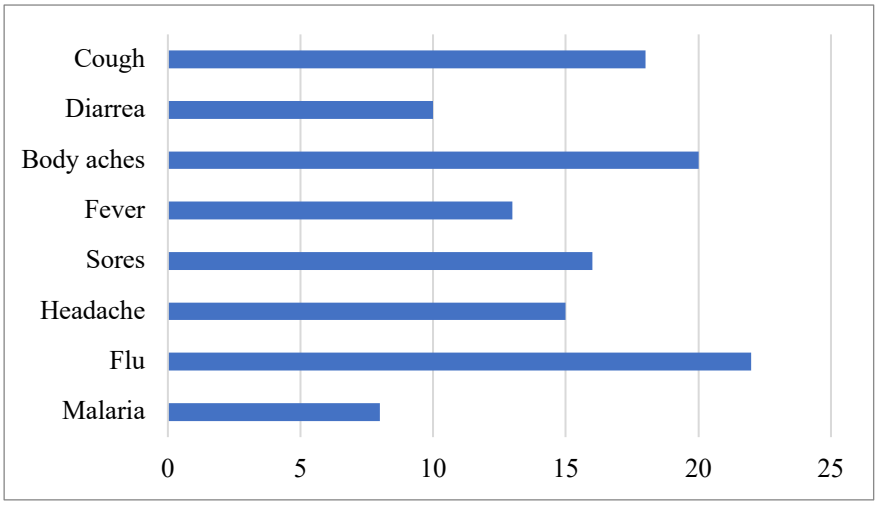
Results reveal that 40% don't have electricity in their household.

Majority of respondents have more than one type of land. Most common types of land are agricultural area, forest, grassland, shrubland and swampland.

63% have only pig, 30% has more than one type of livestock; pigs, poultry, and goats.

3. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. 74% of them had visited health center, 30% in hospital and 22% had gone to traditional healer or aid post. During a year-time on average times of visiting health facility was 4, when answers were ranging between 0 – 15 times. The following figure indicates that most suffered health issues within past 6 months were cough, body aches and flu.



4. Household water and sanitation

All respondents except one have a toilet in a household. Main toilet type is latrine. The quality of latrine is described to be average by over half of the respondents, while 9 respondents would describe it to be dirty.

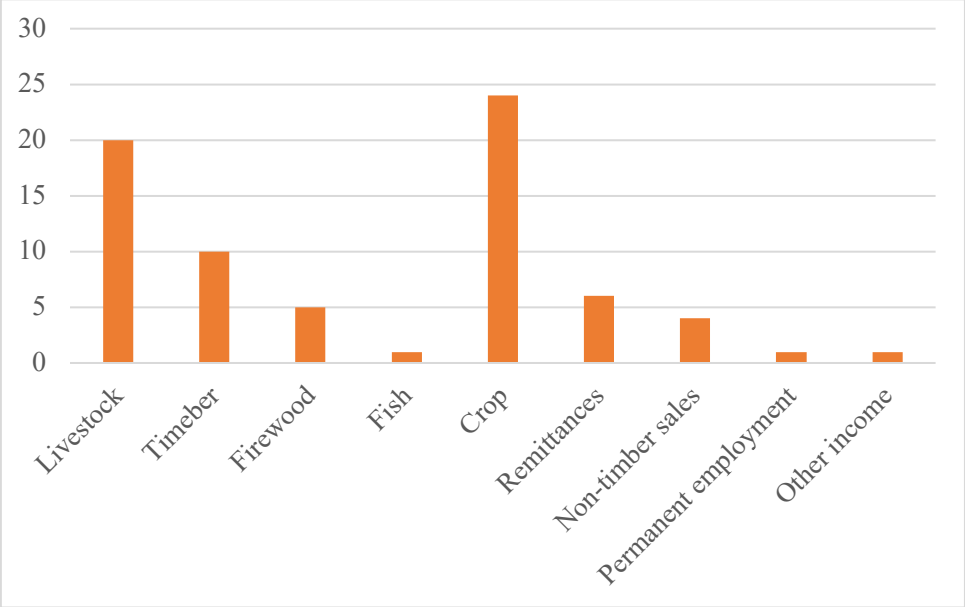
The main source of water for most is spring. The 40% has multiple sources of water, for example spring and pond. 29% of the respondents reported to have hours trip to the closest source of water and only one respondent has water source inside the house. Most of the respondent say that it is difficult or rather difficult to access the water source. When asked about the quality of the water only one says it to be clean, 22% dirty and 72% average. 44% thinks that the water is safe to use.

26 respondents out of 27 have the ownership of the house they are living in. Most of them report no to have electricity. The respondents are asked about the type of the land they own, most of them have multiple types of land, such as agricultural area, forest, grassland, shrubland and swampland.

5. Household income and expenditure

The estimated household monthly income was reported to be 56 PGK on average, ranging from 0 to 200 depending on household. One household with permanent employment reported income to be 800 PGK, which was exceptionally high compared to other respondents and was not calculated

to the average. Main source of income is crop and livestock. 45% reported to have business operations within their household, such as roadside markets. Monthly expenditure of households was on average 39 PGK. Household with 800 PGK incomes reported to have 700 PGK expenditure, which again was not calculated to the average of all other respondents.



The following pie chart indicates the type of expenditures within the households. In most households the decisions on expenditure types are done together. Some households buy all expenditure types together, buy in many cases women mainly buy food and clothes and men take care of compensations and community responsibilities. Most common types of expenditure: food, personal goods, transportation, school, clothes and donations.

6. Household poverty perception

The respondents were asked to describe their household poverty situation in relation to others in village, for whom 11% responded to be very poor, 51% poor and rest average. Over half (56%) described the poverty situation of the whole village to be poor. In addition, they had chance to explain how they see what the characteristics of a poor household or poor village are. Poor drinking water quality and poor access to water were common answers. No money, no land and no proper toilet facilities was also repeated in many answers. Few indicated lack of decent meals and laziness of people.

iii. Lukitap

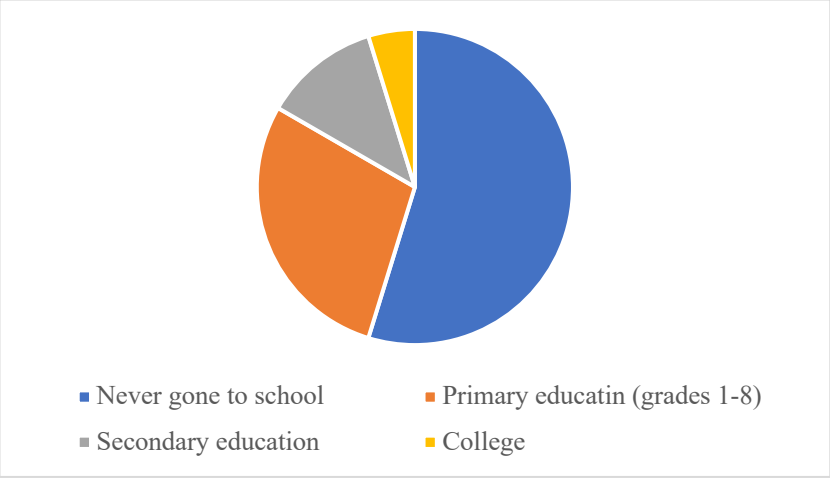
This village had 43 survey respondents.

1. Household characteristics

Gender	Count	%	Age range age	Count	Average
Female	16	37	18 – 35		50
Male	27	63	36 – 43		
			44 – 51		
			52 – 59		
			60 or over		
Household literacy	**Count**	**%**	**Persons living in household average**		**On**
Local dialect	43	100	Females		4
Pigin	32	74	Males		3
English	13	30	Girls		3
			Boys		2

Main job subsistence farmer, 56% of respondents have more than one job.

Educational level; 54% has never gone to school, 28% has attained primary level education. 18% has received secondary level or higher education qualification.

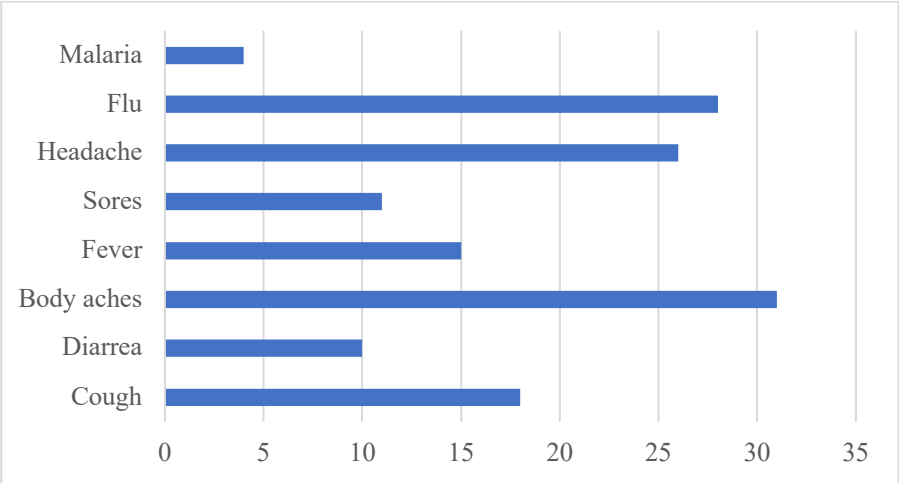


2. Household physical features and assets

All respondents have more than one type of land. Most common types of land are agricultural area, forest and grassland. 45% have only pigs, 4% only poultry and 51% has more than one type of livestock; pigs, poultry, and goats.

3. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. 56% of them had visited health center, 12% in public hospital and 30% had gone to traditional healers. During a year-time on average times of visiting health facility was 2, when answers were ranging between 0 – 8 times. The following figure indicates that most suffered health issues from past 6 months were body aches, headache and flu. 70% reported to have more than one health issue.

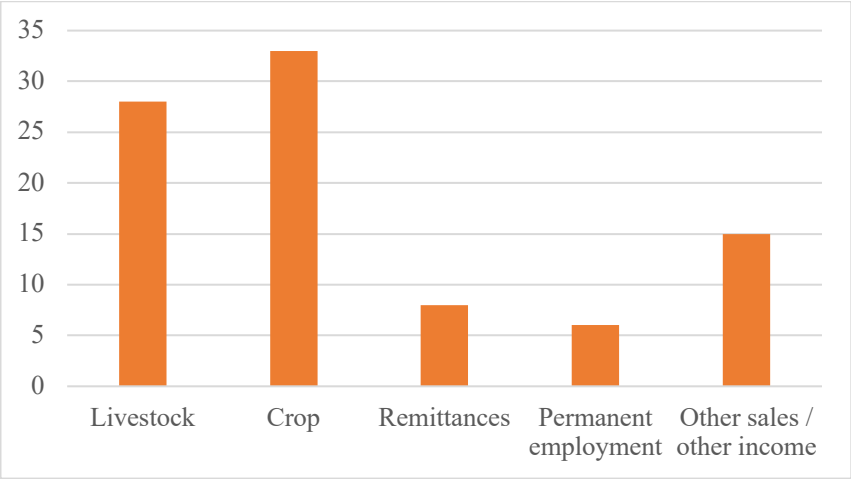


4. Household water and sanitation

All respondents except have a latrine toilet in their household. 40% would describe the toilet quality to be dirty, rest average. For main source of water are reported spring and piped water. For 35% of respondents, the closest water source is hours away. Access to water is described being very difficult or rather difficult by most of the respondents. 55% describe water to be safe to use.

5. Household income and expenditure

The average monthly household income is 317 PGK and monthly expenditure 275 PGK. Most common types of expenditure: food, transportation, clothes, agriculture and compensations, donations and festivities. Main sources of income are crop and livestock. 14% reports to receive remittances as one of the sources of income.



6. Household poverty perception

51% thinks their household poverty situation to be average and 30% to be poor compered to others in the village. 67% would describe their village poverty situation as average compared to other villages in the area. Characteristics of poor household are described to be if you don't have proper housing, no electricity, no proper toilet facilities or no land.

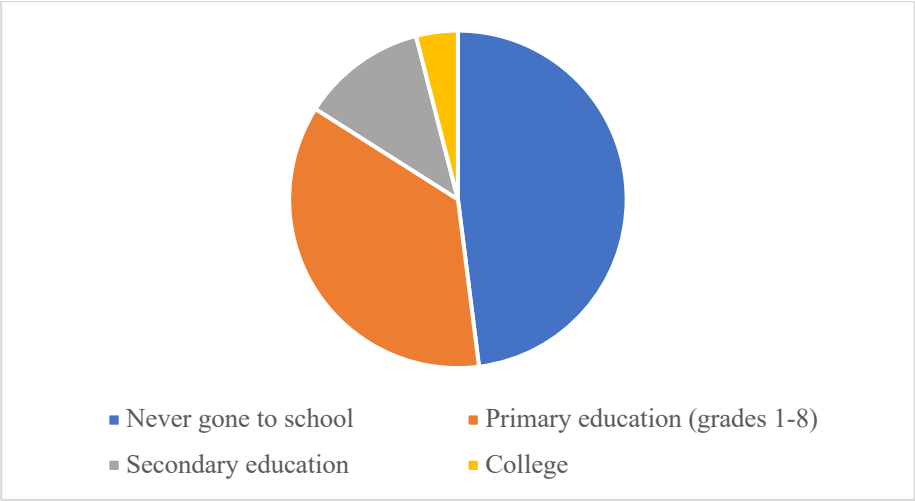
iv. Mambisanda

This village had 50 survey respondents.

1. Household characteristics

Gender	**Count**	**%**	**Age range age**	**Count**	**Average**
Female	19	38	20 – 35	10	52
Male	31	62	36 – 43	5	
			44 – 51	9	
			52 – 59	9	
			60 or over	17	
Household literacy	**Count**	**%**	**Persons living in household average**		**On**
Local dialect	50	100	Females		3
Pigin	29	58	Males		3
English	13	26	Girls		2
			Boys		2

Main job of respondents is subsistence farmer, 36% of respondents have more than one job. Educational level; 48% has never gone to school, 36% has attained primary level education. Only 16% has received secondary level or higher education qualification.

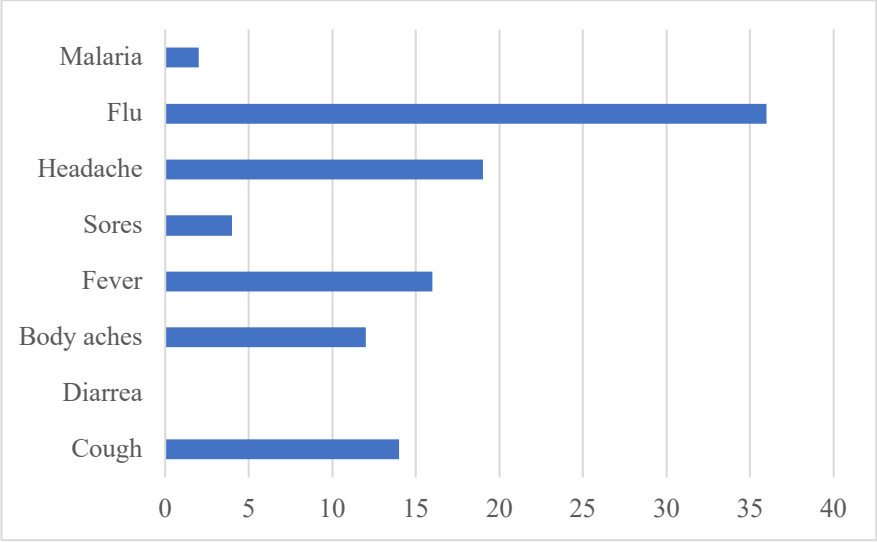


2. Household physical features and assets

92% of respondents have more than one type of land. Most common types of land are agricultural area, forest, grassland, shrubland and swampland. 48% have only pigs, 6% poultry or sheep and 46% has more than one type of livestock; pigs, poultry, sheep and goats.

3. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. 60% of them had visited health center, 16% in public or private hospital and 34% had gone to traditional healers. During a year-time on average times of visiting health facility was 2, when answers were ranging between 0 – 5 times. The following figure indicates that most suffered health issues from past 6 months were flu and headache. 70% reported to have more than one health issue.



Household health issues within past 6 months.

4. Household water and sanitation

48 respondents have latrine toilet and two flush toilet in their household.

48% would describe the toilet quality to be dirty, 8% clean and the rest average.

For main source of water are reported spring. 20% has water tank or piped water. For 44% of respondents, the closest water source is hours away.

Access to water is described being average or rather difficult by most of the respondents. 50% describe water to be safe to use.

5. Household income and expenditure

The average monthly household income is 100 PGK and monthly expenditure 84 PGK. Most common types of expenditure: food, transportation, clothes, agriculture and compensations and festivities.

Main sources of income are crop and livestock. 24% reports to receive remittances as one of the sources of income.

v. Nanglum

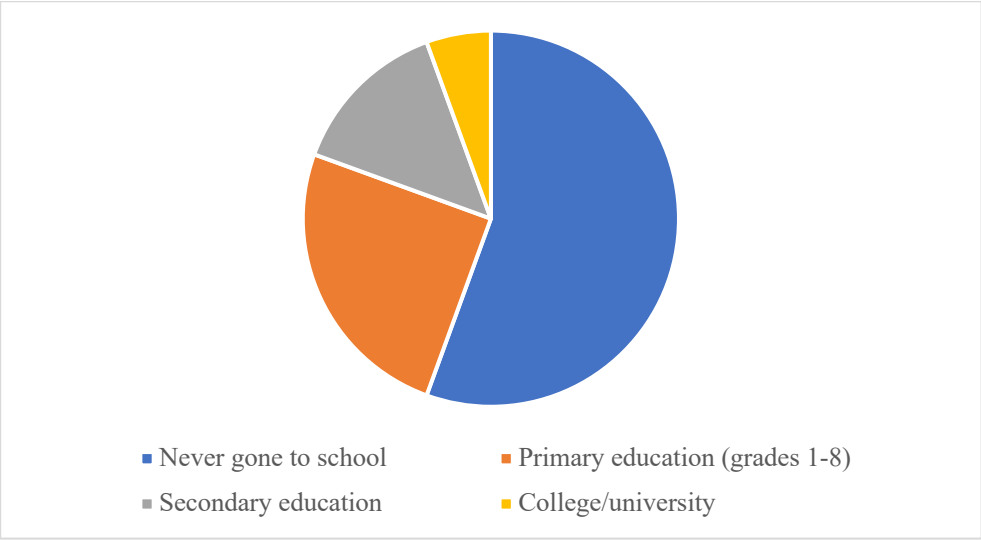
This village had 36 survey respondents.

1. Household characteristics

Gender	Count	%	Age range age	Count	Average
Female	9	25	20 – 35	13	44
Male	27	75	36 – 43	9	
			44 – 51	5	
			52 – 59	1	
			60 or over	8	
Household literacy	**Count**	**%**	**Persons living in household average**		**On**
Local dialect	36	100	Females		3
Pigin	36	100	Males		3
English	3	8	Girls		2
			Boys		2

Main job subsistence farmer, 18% of respondents have more than one job.

Educational level; 56% has never gone to school, 25% has attained primary level education. Only 19% has received secondary level or higher education qualification.



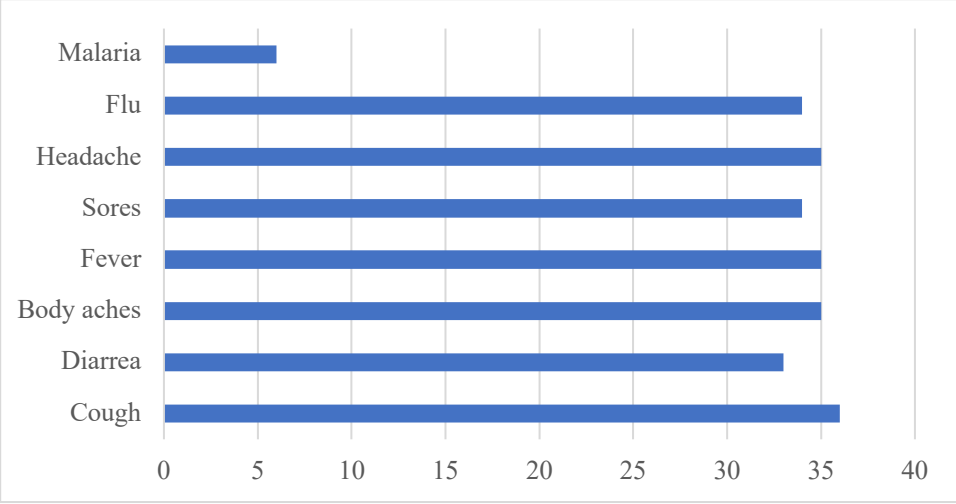
2. Household physical features and assets

All respondents have at least three types of land, most common agricultural area, forest, grassland and shrubland.

19% have only pigs, 33% only poultry, 14% only goats and 34% has more than one type of livestock.

3. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. All of them had visited the health center. During a year-time on average times of visiting health facility was 4, when answers were ranging between 2 – 9 times. The following figure indicates that most suffered health issues from past 6 months were body ache, headache, flu, sores, fever, diarrea and cough. All respondents reported to had more than one health issue.



4. Household water and sanitation

All respondents have latrine toilets.

97% would describe the toilet quality to be average.

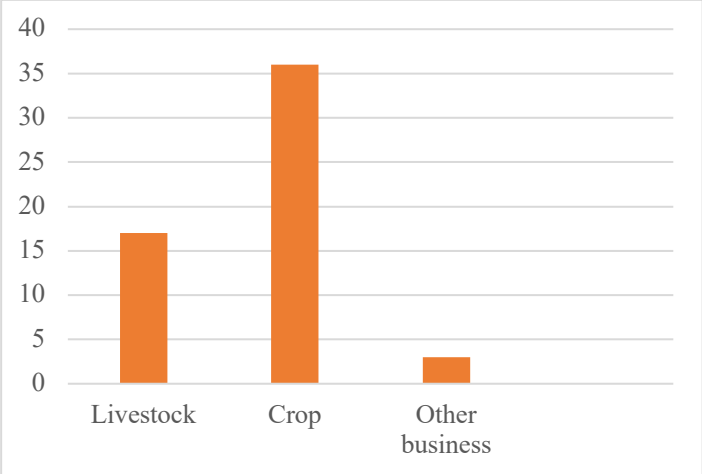
All of respondents use spring as their main source of water. For all respondents, the closest water source is minutes away.

Access to water is described being average or rather difficult. Half describe water to be safe to use and other half not.

5. Household income and expenditure

The average monthly household income is 91 PGK and monthly expenditure 87 PGK. Most common types of expenditure: food, personal goods and agriculture.

Main sources of income are crop and livestock.



6. Household poverty perception

58% thinks their household poverty situation to be poor compered to others in the village. 94% would describe their village poverty situation as poor compared to other villages in the area. Characteristics of poor household are described to be if you don't have gardens, pigs or money.

vi. Pandai

This village had 38 survey respondents.

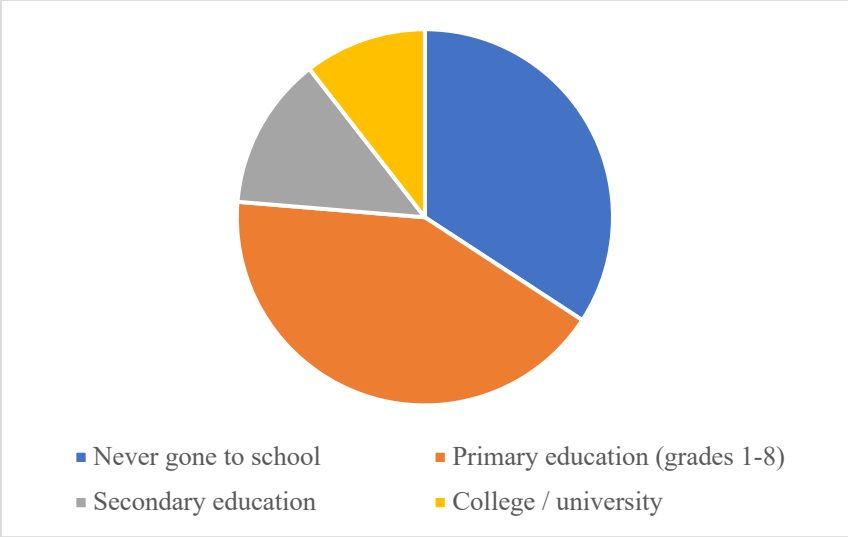
1. Household characteristics

Gender	Count	%	Age range age	Count	Average
Female	12	32	20 – 35	15	42
Male	26	68	36 – 43	10	
			44 – 51	3	
			52 – 59	3	
			60 or over	7	

Household literacy	Count	%	Persons living in household average	On
Local dialect	38	100	Females	3
Pigin	31	82	Males	3
English	9	24	Girls	2
			Boys	3

Main job subsistence farmer, 15 respondents have more than one job.

Educational level; 34% has never gone to school, 42% has attained primary level education. 24% has received secondary level or higher education qualification.



2. Household physical features and assets

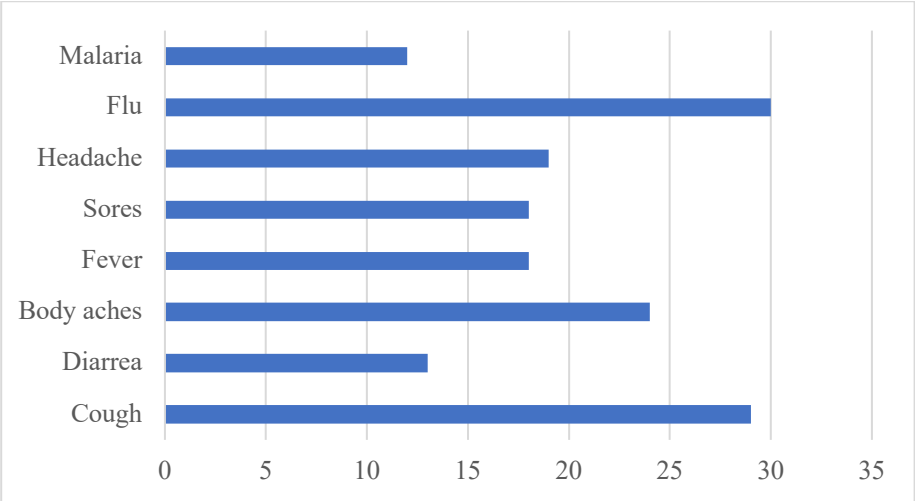
Results reveal that 71% don't have electricity in their household.

36 respondents have at least three types of land, most common agricultural area, forest and grassland.

60% has only pigs, 8% only poultry and 32% has more than one type of livestock.

3. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. 45% of them had visited health center, 28% in public hospital, 21% had gone to traditional healers and 63% to aid post. During a year-time on average times of visiting health facility was 4, when answers were ranging between 0 – 10 times. The following figure indicates that most suffered health issues from past 6 months were flu, headache, body aches and cough.



4. Household water and sanitation

Majority of respondents have latrine toilets, some also normal toilets in addition. 8% do not have toilets in their household.

79% would describe the toilet quality to be average.

All respondents use spring as their main source of water.

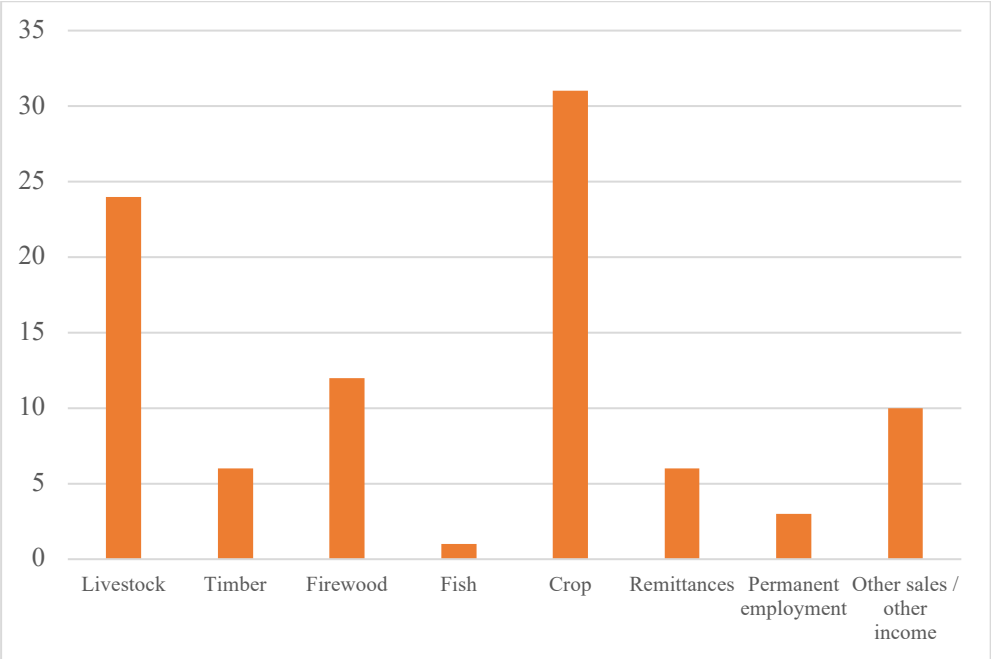
For 16% the closest water source is hours away.

Access to water is described being rather easy or average. Majority describe water to be safe to use.

5. Household income and expenditure

68 % of respondents have roadside or trade market operations additionally to their main source of income. The average monthly household income is 320 PGK and monthly expenditure 340 PGK. Most common types of expenditure: food, personal goods, transportation, school, clothes and donations.

74% of respondents have more than one main source of income, most common crop and livestock. 16% report remittances as one of the main sources of income.



6. Household poverty perception

71% thinks their household poverty situation to be average compered to others in the same village. 58% would describe their village poverty situation as average compered to other villages in the area. Characteristics of poor household are described to be if you don't have job, land or money. Also lack of nutrition and poor quality of housing are brought up.

vii. Par

This village had 64 survey respondents.

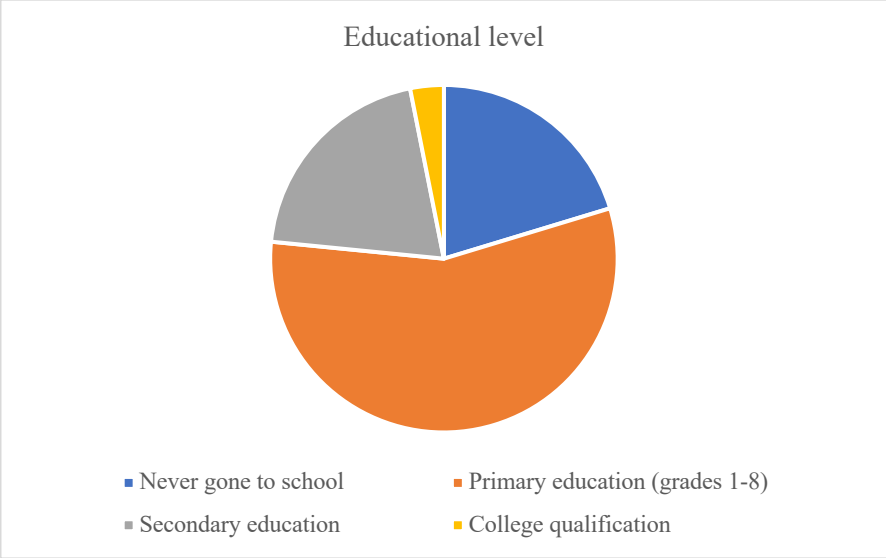
1. Household characteristics

Gender	Count	%	Age range age	Count	Average
Female	32	50	21 – 35	12	49
Male	32	50	36 – 43	13	
			44 – 51	11	
			52 – 59	11	
			60 or over	17	
Household literacy	**Count**	**%**	**Persons living in household average**		**On**

Local dialect	63	98	Females	3
Pigin	57	89	Males	3
English	26	40	Girls	2
			Boys	2

Main job subsistence farmer, 24 respondents have more than one job.

Educational level; 20% has never gone to school, 56% has attained primary level education. 24% has received secondary level or higher education qualification.



2. Household physical features and assets

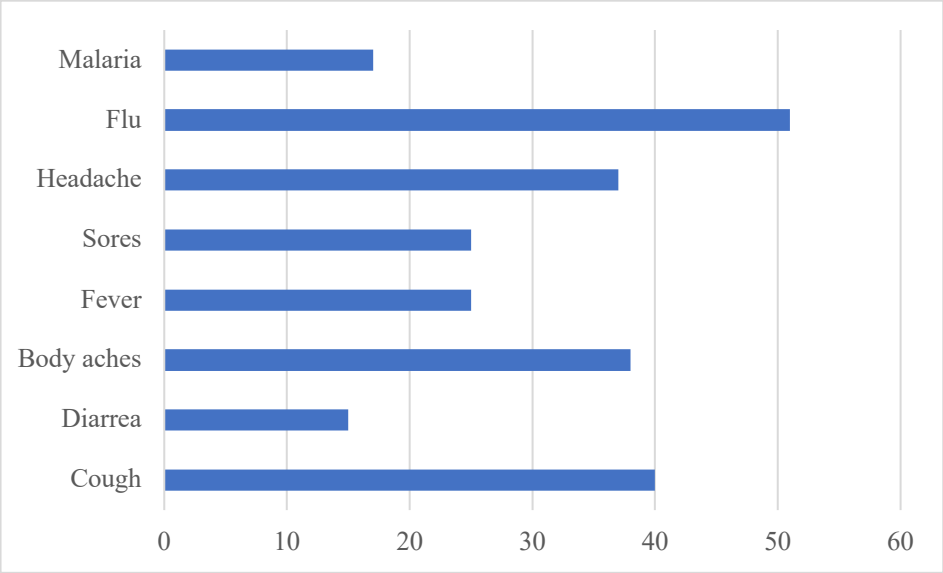
Results reveal that 55% don't have electricity in their household.

55 respondents have at least three types of land, most common agricultural area, forest and grassland.

58% has only pigs, 6% only poultry and 36% has more than one type of livestock.

3. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. 65% had visited the health center, 40% in public or private hospital and 19% went to see traditional healer. During a year-time on average times of visiting health facility was 4, when answers were ranging between 1 – 95 times. The following figure indicates that most suffered health issues from past 6 months were flu, headache, body aches and cough.



Household health issues within past 6 months.

4. Household water and sanitation

All respondents have latrine toilets, some also normal toilets in addition.

61% would describe the toilet quality to be average.

97% of respondents use spring as their main source of water.

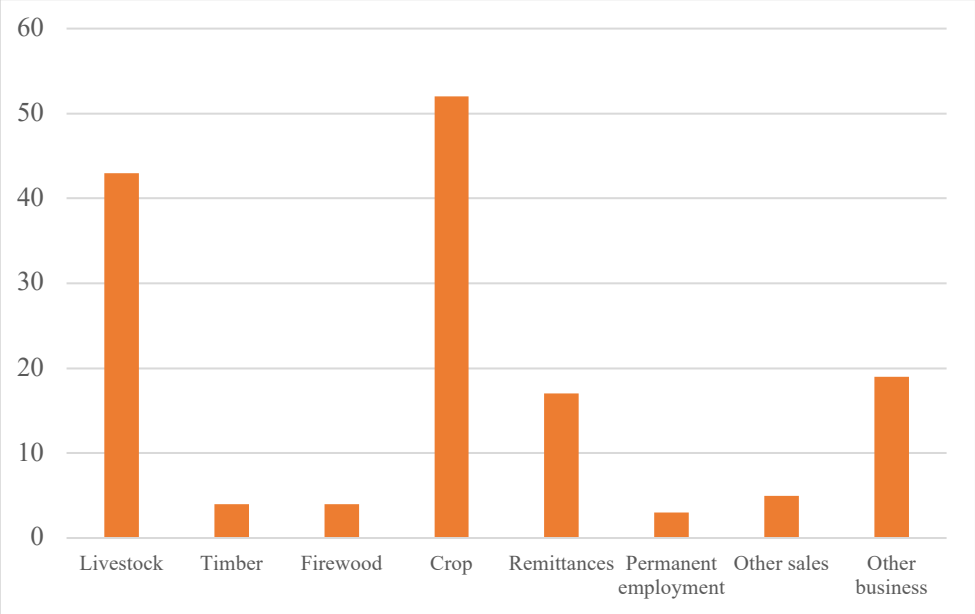
For 32% the closest water source is hours away.

Access to water is described being rather difficult or very difficult by over half of the respondents. 47% describe water to be safe to use.

5. Household income and expenditure

63% of respondents have roadside or trade market operations additionally to their main source of income. The average monthly household income is 455 PGK and monthly expenditure 173 PGK. Most common types of expenditure: food, personal goods, transportation, school, clothes and donations.

77% of respondents have more than one main source of income, most common crop and livestock. 27% report remittances as one of the main sources of income.



6. Household poverty perception

72% thinks their household poverty situation to be average compered to others in village. Majority (88%) would describe their village poverty situation as average compared to other villages in the area. Characteristics of poor household are described to be if you don't have job, land or money. Also lack of nutrition and poor quality of housing are brought up.

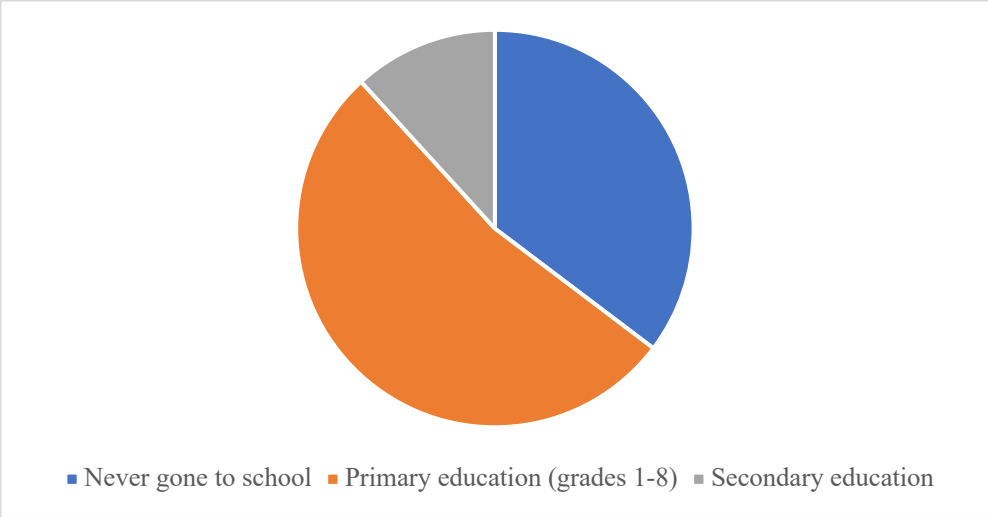
viii. Pindak

This village had 34 survey respondents.

Gender	Count	%	Age range age	Count	Average
Female	6	18	18 – 35	10	47
Male	38	82	36 – 43	7	
			44 – 51	3	
			52 – 59	6	
			60 or over	8	
Household literacy	**Count**	**%**	**Persons living in household average**		**On**
Local dialect	34	100	Females		4
Pigin	28	82	Males		3
English	9	26	Girls		2
			Boys		2

Main job subsistence farmer, 18% of respondents have more than one job.

Educational level 35% has never gone to school and 53% has attained primary level education. Only 12% has received secondary education qualification.



1. Household physical features and assets

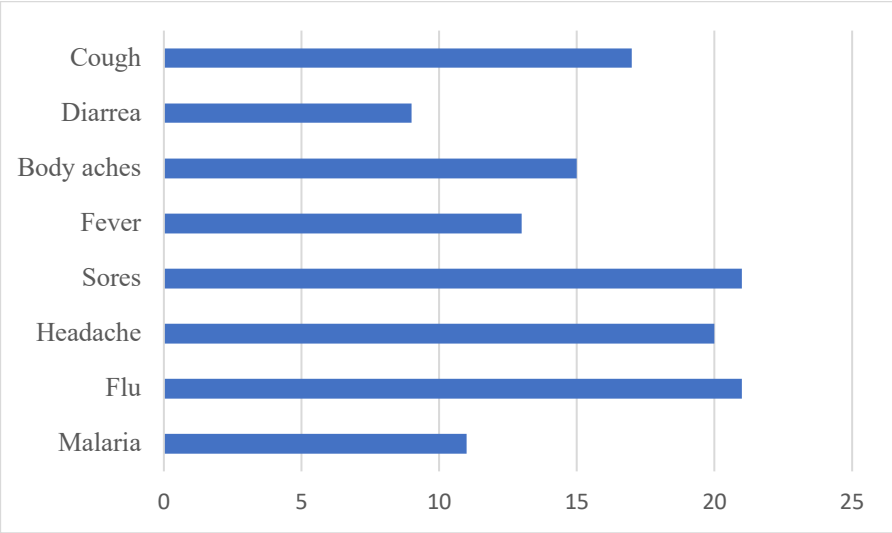
Results reveal that the majority, 85% don't have electricity in their household.

25 respondents have at least three types of land, most common agricultural area, forest, grassland and shrubland.

38% have only pigs, 12% only poultry, 6% only goats and 44% has more than one type of livestock.

2. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. 71% had visited the health center, 26% in public or private hospital and 12% had visited mobile health volunteers. During a year-time on average times of visiting health facility was 4, when answers were ranging between 0 – 10 times. The following figure indicates that most suffered health issues from past 6 months were headache, body aches and flu.



Household health issues within past 6 months.

3. Household water and sanitation

All respondents have latrine toilets, some also normal toilets in addition.

82% would describe the toilet quality to be average.

94% of respondents use spring as their main source of water.

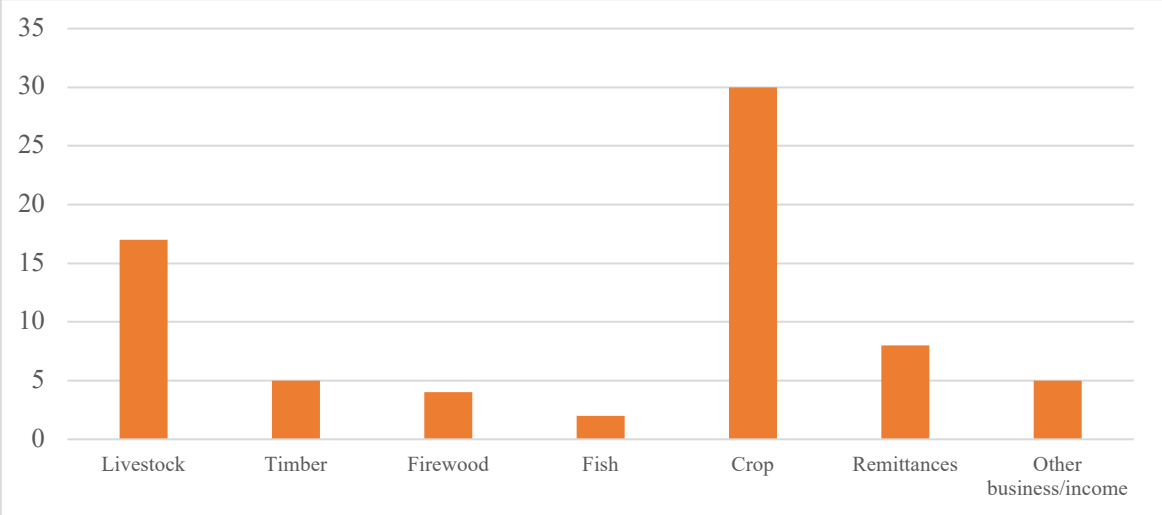
For 24% the closest water source is hours away.

Access to water is described being average by over half of the respondents. 59% describe water to be safe to use.

4. Household income and expenditure

65% of respondents have roadside or trade market operations additionally to their main source of income. The average monthly household income is 82 PGK and monthly expenditure 52 PGK. Most common types of expenditure: food, personal goods, transportation, school, clothes and compensations. 29% reports food to be the only type of expenditure.

59% of respondents have more than one main source of income, most common crop and livestock. 24% report remittances as one of the main sources of income.



5. Household poverty perception

79% thinks their household poverty situation to be average compered to others in village. 67% would describe their village poverty situation as average compared to other villages in the area. Characteristics of poor household are described to be if you don't have food, land or gardens, no pigs, no money or no permanent employment.

ix. Tukusanda

This village had 43 survey respondents.

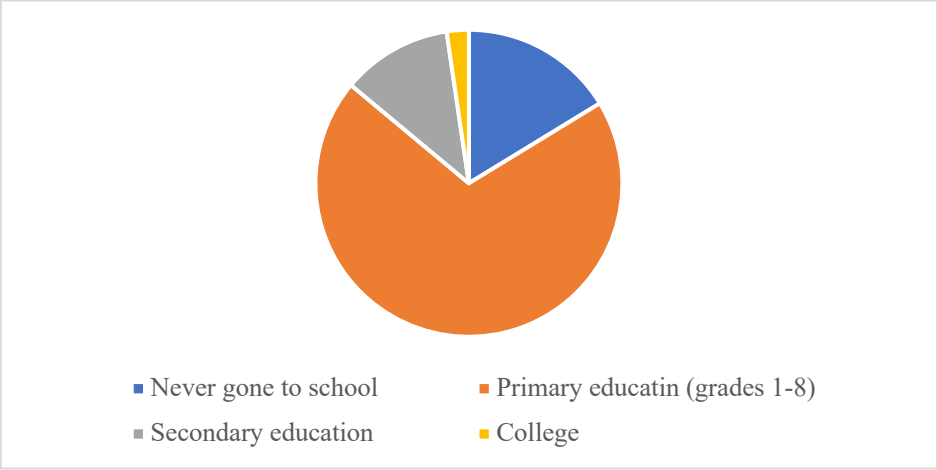
1. Household characteristics

Gender	Count	%	Age range age	Count	Average
Female	4	10	18 – 35	20	41
Male	39	90	36 – 43	5	
			44 – 51	6	
			52 – 59	3	
			60 or over	9	

Household literacy	Count	%	Persons living in household average	On
Local dialect	43	100	Females	3
Pigin	42	98	Males	3
English	29	60	Girls	2
			Boys	2

Main job of respondents is subsistence farmer, 40 % of respondents have more than one job.

Educational level; 16% has never gone to school, 70% has attained primary level education. Only 14% has received secondary level or higher education qualification.



2. Household physical features and assets

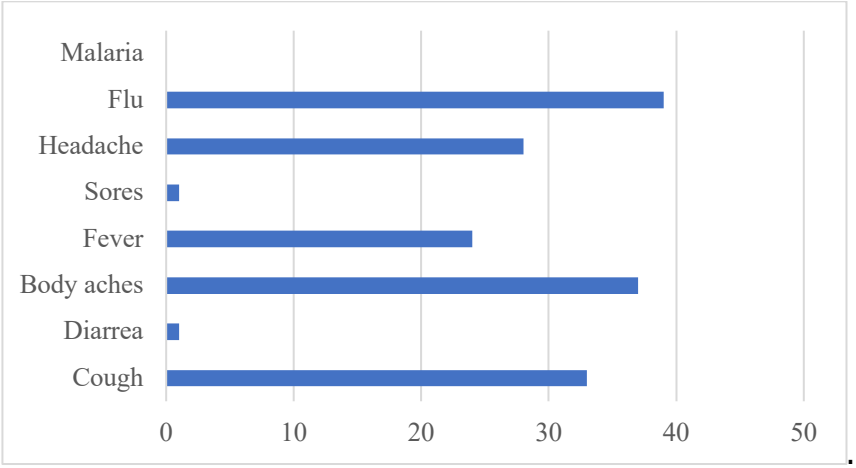
Results reveal that the majority, 85% electricity in their household. Either solar or private generator.

93% respondents have at least three types of land, most common agricultural area, forest, grassland and shrubland. 84 % has more than one type of livestock; pigs, poultry and goats.

3. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. 37% had visited in public or private hospital and 63% had visited the aid post. During

a year-time on average times of visiting health facility was 3, when answers were ranging between 1 – 6 times. The following figure indicates that most suffered health issues from past 6 months were body ache, headache, flu, fever and cough. All respondents reported to had more than one health issue.



Household health issues within past 6 months.

4. Household water and sanitation

All respondents except one have latrine toilets in their households.

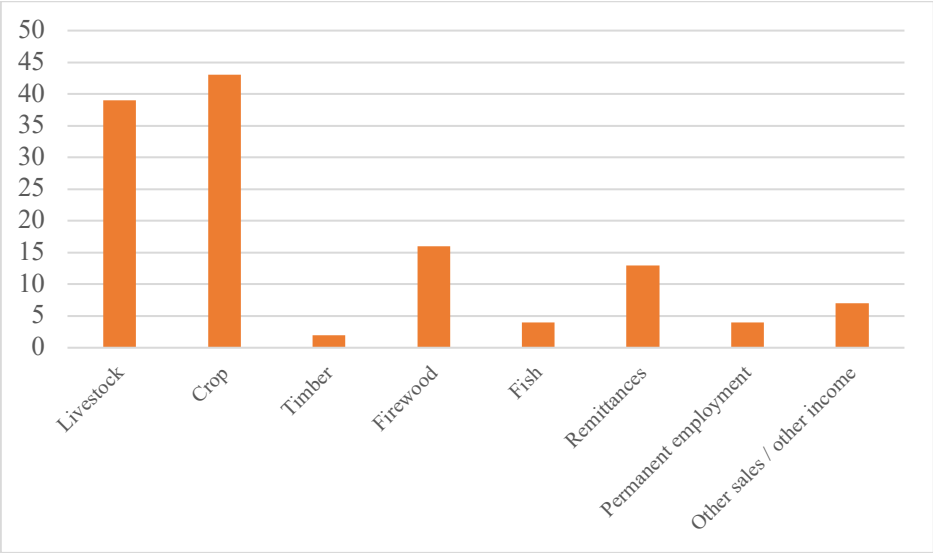
Only 32% would describe the toilet quality to be clean. Rest would describe it as average.

Most common main source of water is piper water into dwelling. For all respondents, the closest water source is minutes away.

Access to water is described being easy or rather easy. All describe water to be safe to use.

5. Household income and expenditure

The average monthly household income is 192 PGK and monthly expenditure 102 PGK. Most common types of expenditure: food, personal goods, school, transportation, clothes and agriculture. Main sources of income are crop, livestock, firewood and remittances.



6. Household poverty perception

84% thinks their household poverty situation to be poor compered to others in the village. 93% would describe their village poverty situation as average compared to other villages in the area. Characteristics of poor household are described to be if you don't have gardens, no food or the laziness of people.

x. Yakaedes

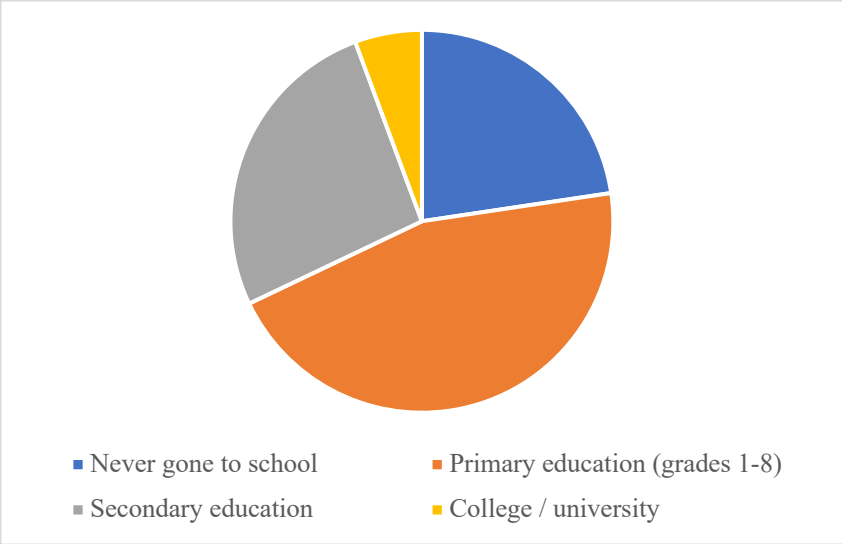
This village had 53 survey respondents.

1. Household characteristics

Gender	Count	%	Age range age	Count	Average
Female	11	21%	22 – 35	16	45
Male	42	79%	36 – 43	11	
			44 – 51	11	
			52 – 59	5	
			60 or over	10	
Household literacy	**Count**	**%**	**Persons living in household average**		**On**
Local dialect	53	100	Females		3
Pigin	52	99	Males		3
English	22	42	Girls		2
			Boys		2

Main job of respondents is subsistence farmer, 28% of respondents have more than one job.

Educational level; 23% has never gone to school, 45% has attained primary level education. 32% has received secondary level or higher education qualification.



2. Household physical features and assets

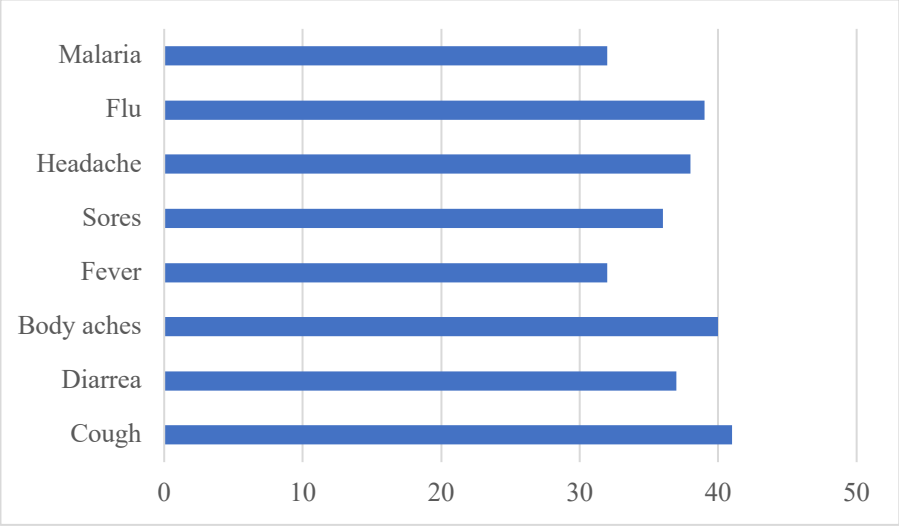
Results reveal that 76% has electricity in their household, either solar, private generator or grid.

Half of respondents have more than one type of land. Most common types of land are agricultural area, forest and shrubland.

34% have only pigs, 9% poultry and 57% has more than one type of livestock; pigs, poultry, and goats.

3. Household health status

When asking about the health issues within past six months, all respondents had visited at least one health facility. 77% had visited health center and 57% had visited the public hospital. During a year-time on average times of visiting health facility was 5, when answers were ranging between 0 – 12 times. The following figure indicates that most suffered health issues from past 6 months were body aches, cough, flu, headache, diarrea and sores. 92% reported to have more than one health issue.



Household health issues within past 6 months.

4. Household water and sanitation

All respondents except one have latrine toilet in their household.

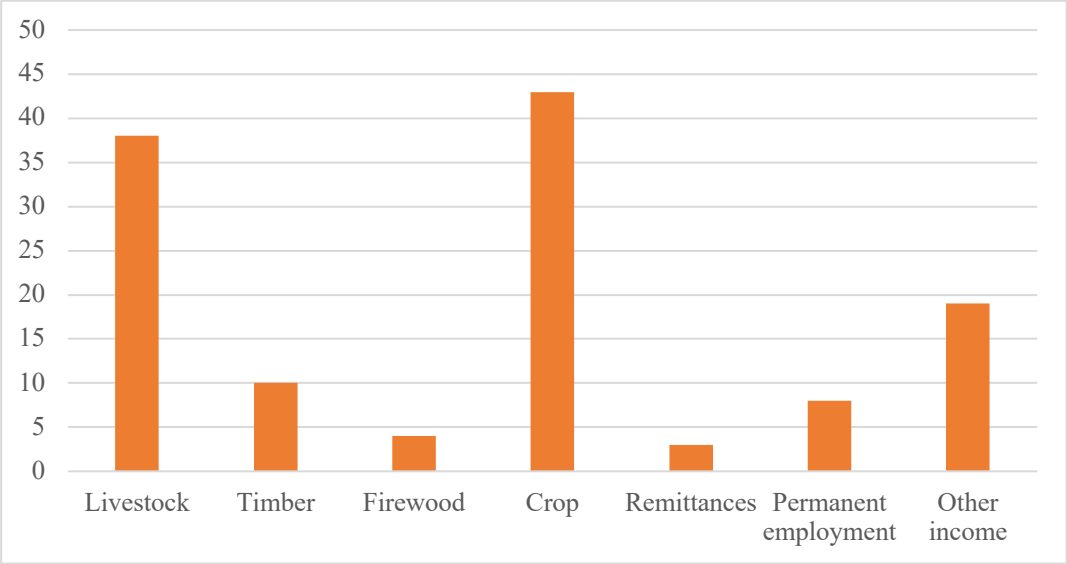
68% would describe the toilet quality to be average, 25% clean.

For main source of water are reported spring. 23% has water tank or piped water. For 44% of respondents, the closest water source is hours away.

Access to water is described being between very easy to rather difficult. 55% describe water to be safe to use.

5. Household income and expenditure

The average monthly household income is 540 PGK and monthly expenditure 148 PGK. Most common types of expenditure: food, personal goods, transportation, clothes and compensations. Main sources of income are crop and livestock.



6. Household poverty perception

70% thinks their household poverty situation to be average compared to others in the village. 68% would describe their village poverty situation as average compared to other villages in the area. Characteristics of poor household are described to be if you don't have land, no garden, no money and if children are not going to school.

d. Annex 4. List of people met during data collection

Table 17. List of people met during data collection

Names of Community Members	Designation	Contact	Location
1. Sam Moko	Project Manager, UNDP	71026308 sam.moko@undp.org	UNDP Office, Ipatas Bldg, Level 3, Wabag Town
2. Timothy Lawton	Environment/Climate Change Officer Natural Resource Branch	73009150 timilawton@gmail.com	Natural Resource Branch, Ipatas Bldg, Level 2, Wabag Town
3. Raphael Tamean	Deputy Provincial Administrator Corporate Services	raphael.tamean@epg.gov.pg	Enga Provincial Administration, Ipatas Bldg, Wabag Town
4. Ben Sarett	Director, Planning Enga Provincial Government	bensarett@gmail.com	Enga Provincial Administration, Ipatas Bldg, Wabag Town
5. Dorothy Kukum	A/Director Community Development Branch,	73062165/75236510 dkukum@gmail.com	Community Development Branch Enga Provincial Administration, Ipatas Bldg, Level 1, Wabag
6. Abraham Nane	A/Director – DPI/Agriculture and Livestock	71126574 abrahanpakau@gmail.com	Department of Agriculture and Livestock, Provincial Agriculture Office, Ipatas Bldg, Level 2, Wabag
7. Keith Yaem	Resource Horticulture Enga Administration	73693068	Enga Provincial Administration, Ipatas Bldg, Wabag
8. Sakarias Pakembo	SME, Youth and Women Commerce, Tourism and Culture	71652112 spakembosakarao@gmail.com	Commerce, Tourism and Culture, Enga Provincial Administration, Ipatas Bldg, Level 2, Wabag
9. Samson Fezamo	Rural District Officer (Crops) DAL, Wabag District	73481367	DAL, Wabag District officer, Wabag
10. Sam Mek	Provincial Coffee Coordinator CIC	71718765	Coffee Industry Corporation Ltd or CIC Ltd, Wabag

11. Kim Arut	President Country Women's Association Wapenamanda	71562190	Country Women's Association, Wapenamanda
12. Janet Kepuli	President Voice of ENDA Inc. Association	79043263	Wapenamanda
13. Jerry Wampao	Former Teacher Community Leader	71633754	Lukitap Village, Rural Wabag District
14. Jackson Komai	Community Leader Farmer	71814526	Lukitap Village, Rural Wabag District
15. Kandes Niya	Coffee Corporative Society President	79172138	Birip Village, Rural Wabag District
16. Rex Nyia	Ward Councilor, Birip village	70888975	Birip Village, Rural Wabag District
17. Kent Komba	District Civil Engineer, Wapenamanda	79453031	District Office, Wapenamanda District
18. Kunia Kadato	Village Court Magistrate	79014269	Mambisanda Village, Wapenamanda District
19. Dia Fongo	Ward Councilor	72196118	Mambisanda Village, Wapenamanda District
20. Aquila Kunzie	Community Leader	70431919	Mambisanda Village, Wapenamanda District
21. Simon Sae	Ward Councilor	73204052	Yakaedes Village, Wapenamanda District
22. Joseph Roo	Ward Recorder, Headmaster	70818634	Yakaedes Village, Wapenamanda District
23. Robert Lyuio	Community Leader	73900881	Par Village, Kompiam-Ambum District
24. Bepi Luio	Teacher Community Leader	70941762	Par Village, Kompiam-Ambum District
25. Oscar Kurapae	Teacher / Community Leader	73640565	Pandai Village, Kompiam-Ambum District
26. Mathew Kakale	Community Leader	71500917	Pandai Village, Kompiam-Ambum District
27. Samuel Ambai	Ward Councilor ,Pindak village	79498868	Pindak Village, Kandep District
28. Keplina Was	Kandep District Council of Women President and	72938235	Kandep District Council and Lutheran Church (Good News)

	Chairlady Lutheran Church (Good News)		
29. Tania Mar	Education Officer, Kandep District	70477957	Kandep District Education Officer
30. Yakob Kero	Ward Councilor	73655618	Luguteges Village, Kandep District
31. John Timothy	Bishop Good News Lutheran Church	71240869	Luguteges Village, Kandep District
32. Anton Andamale	Community Leader	72631463	Luguteges Village, Kandep District
33. John Kalan	Former Public Servant – Village Leader	71370817	Tukusanda Village, Laiagam
34. Lonny Pindas	Ward Councilor, Ward 22	72066023	Tukusanda Village, Laiagam
35. Manas Boro	President Corporative Society	73326578	Tukusanda Village, Laiagam
36. Jerry Nyetta	Community Leader	79221124	Naglum Village, Laiagam
37. Daniel Mark	Community Leader Headmaster, Tukusanda Primary School	73155959	Nanglum Village, Laiagam
38. Gibson Piari	Ward Councilor Naglum Village	-	Nanglum Village, Laiagam
39. Nickson Pakea	Chairman Porgera Chamber of Commerce and Trade. Chairman Coffee Cooperative	71913123	Porgera, Chairman Coffee Cooperative
40. Serah Erasi	Chairlady, Porgera Women's Development Association	79484251 serasi@ipiliwanda.com	Porgera Women's Development Association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