Lessons learned on School Agriculture and Nutrition in Papua New Guinea

Marjorie Andrew with Paul Barker

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Date: 18/01/2021

2021 SCHOOL FEES

SECTOR	STATUS	TOTAL FEE (K)	FEES (K)	PROJECT FEE (K)	TRANFER FEE (K)	50% PAYMENT FOR REGISTRATION
UPPER SECONDARY	BOARDING	1120	900	220		K560
	DAY	920	700	220		K460
LOWER SECONDARY	BOARDING	1100	900	200		K550
	DAY	900	700	200		K450
TRANSFER/ REPEAT						
UPPER SCONDARY	DAY	1620	700	220	700	K1160
LOWER SECONDARY	DAY	1500	700	200	600	K1050

ACCOUNT NAME: MARKHAM VALLEY SECONDARY SCHOOL
ACCOUNT NUMBER: 1000048744
BRANCH: LAE TOP TOWN

NOTE:
* All continuing (i.e garde 10 & 12) students must pay all 2020 outstanding fees and 50% or more of 2021 fess before registration
* All new (i.e grade 9 & 11) students must pay 50% or more of 2021 fees before registration
* All repeat and tranfers if selected must pay 50% or more of 2021 fees and the compulsory transfer/repeat fees before registration

Care-Taker 2020-2021

MARKHAM VALLEY SECONDARY SCHOOL
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Abbreviations

ACIAR	Australian Centre for International Agricultural Research
BOM	Board of Management
CEC	Churches Education Council
DAL	Department /Division of Agriculture and Livestock
DFAT	Australian Department of Foreign Affairs and Trade
DHERST	Department of Higher Education Research Science and Technology
DNPM	Department of National Planning and Monitoring
FAO	Food and Agriculture Organisation
GoPNG	Government of Papua New Guinea
GTC	Goroka Teachers College
GTFS	Government Tuition Fee Subsidy
HAC	Highlands Agricultural College
LMIC	Low and Middle Income Countries
MAL	Making a Living
MTDP	Medium Term Development Plan
NDOE	National Department of Education
NDOH	National Department of Health
OBE	Outcome Based Education
P&C	Parents and Citizens
SBE	Standards Based Education
SDA	Seventh Day Adventist
TFF	Tuition Fee Free
UNRE	University of Natural Resources and Environment
UOG	University of Goroka
USD	United States Dollars
WHO	World Health Organisation

ACKNOWLEGEMENTS

The Institute of National Affairs would firstly like to thank the Australian Department of Foreign Affairs and Trade for funding this survey of a sample of primary and secondary schools across six provinces, tertiary educational institutions, the responsible National Departments and Provincial office holders, NGOs involved in education, teachers from other schools and other stakeholders. We'd like to specifically acknowledge the DFAT and ACIAR staff, notably James Marshall, Jessica Raneri and Luke Simmons, for their enthusiasm and commitment to this study and its potential follow up, including with the existing Morobe School Gardens Project, but also the potential for up-scaling of relevant support for schools in PNG.

We'd particularly like to thank the many respondents to this survey, conducted at a difficult time for schools with the ongoing Covid-19 pandemic in 2020/21, which caused major delays in the conduct of the survey, which occurred to minimise any potential health risks to participants. The respondents included staff from the Departments of Education, Health and Agriculture and Livestock, Provincial Education Advisors in the six provinces visited, Principals, agriculture and other teachers and students in the Secondary and Primary schools visited, as well as a few school principals from other schools and past education advisers, lecturers and other staff in universities (notably UoG and UNRE), teaching colleges and technical training institutions, as well NGOs involved in education and agriculture. Respondents are listed by name (except the students and a few teachers whose names we didn't secure) at the end of the report. We were impressed by the high level of commitment of most of the teachers, who were working with severe resource constraints (both time, financial and space) and the need to stretch these resources between multiple functions, at a time when student numbers and class sizes have been rapidly increasing, mostly well in excess of numbers envisaged, but when funding has failed to keep pace.

The Institute would finally like to recognise the work of its research team for this survey, which although commencing in October 2020, was largely conducted during May 2021, namely: Marjorie Andrew, who was also principal author of this report, Tuari Gaudi, Doreen Philip, Gwenda Rabiv, Paul Barker and Rufina Peter. We would finally like to acknowledge the feedback from Prof. Peter Heywood, particularly on nutritional aspects of the report but also on the wider content and findings, as well as from the DFAT and ACIAR team, who'd both drafted the initial questions sought answering from the survey and with the feedback from the successive iterations of this report.

Paul Barker
Executive Director

EXECUTIVE SUMMARY

PNG's National Nutrition Policy (2016-2026) recognises the important role of PNG's education system in helping to address the country's serious child malnutrition problems. The Policy highlights the need to develop and update teaching resources and nutrition as part of the teaching curriculum. In terms of agriculture, the Policy highlights that tools and resources are needed for enhancing the state of food and nutrition in PNG, nationally and locally.

The lessons learned on school agriculture and nutrition in Papua New Guinea study, was designed, managed and funded by the Australian Government through the Department of Foreign Affairs and Trade, and jointly designed by its agriculture development and food security team, and the Institute of National Affairs (INA). The overall goal was to identify lessons learned and present good practices from schools, provinces, training institutions and national departments and agencies. The survey gathered information about the teaching of agriculture and nutrition, and feeding practices at schools in six provinces, Central, Morobe, Eastern Highlands, Western Highlands, East New Britain, and Milne Bay.

The data gathered from primary and secondary schools is not representational. However, a sample of 8 primary schools and 12 secondary schools was conducted, which had a combined student enrolment number of over 14,606 (excluding schools that did not provide enrolment figures). The proportion of female students was roughly 57% for primary schools, and 52% for secondary schools. Four tertiary education institutions were also visited, together with national and provincial education authorities and a few other teachers and education specialists.

School gardens

The primary purpose of school gardens are for conducting practicals in agriculture education. This is the policy that is implicit in the Agriculture syllabus taught from primary through to secondary levels.

However, schools also cultivate gardens to grow fresh produce for use to feed boarding students. This is a practice that has been carried out since the establishment of boarding schools in PNG since the 1950s. These days' schools are heavily reliant on the government grants to feed the boarding students, while supplementing meals with produce from their gardens.

Ways should be found to utilise the school gardens for the purpose of achieving the outcomes specified in the Agriculture Syllabus activities and assessments. Land use by the school has to be planned firstly to accommodate each of the agriculture syllabus units' requirements for each academic term, then secondly, to feed the boarding students.

On average primary schools have 1 to 2 hectares to use to farm. Secondary Schools have larger plots of land for agriculture where the size ranged from 1 hectare (ha) at Malabunga Secondary to 19 ha at Asaroka Lutheran Secondary School, or Benabena with 21.3 ha available, of which 16 ha is potentially arable. The average size of land is 6.4 ha for each secondary school in the study.

Fruits and vegetables are grown by secondary schools. The most common cultivated are aibika greens, corn, pak choi and green beans. Other varieties of greens, including cabbages are grown along with tomatoes, capsicum, peanuts, as well as many schools producing watermelons, pineapples and having mango trees. A few secondary schools grew cash crops. Two of the schools in the Highlands region grew coffee (Asaroka had 1 ha –although the crop is currently being forfeited to theft), one also grows pine trees and Goroka Secondary also cultivates orchids. Two schools located in East New Britain grew cocoa and balsa trees. A few schools kept livestock, especially broiler chickens, fish (in ponds) and goats, although several others said they used to have poultry and pigs, and some in Eastern Highlands have proposals to keep bees.

Schools that had a farm manager position (filled) performed much better than those that did not. They could organise the maintenance of the gardens, plan out gardens, which the teachers did not have the time or generally the skills to do so. Schools which previously had a farm manager reported that they had experienced a noticeable decline in productivity in the school gardens since they'd left. The success of the school farms may be more related to the people available to run the farms – experience, commitment, budgeting and management capability.

The use of science teachers and business studies teachers should be more involved in teaching agriculture, which was found to be useful. For instance, at one school, students were shown how to generate an income from growing 'aibika' greens on a small patch of land and sold the produce at the local market. Most of the schools that produced livestock sold the output for school income, although in some cases the school purchased some for the mess, notably on special occasions.

Student feeding practices

There is currently a policy being draft on school gardens and feeding students. There is no school feeding programmes in primary schools, only in secondary boarding schools. The overall budget and menu is guided by the School Board of Management. The school administration plans the fortnight budget for the school mess. The Teacher In Charge of the mess manages the daily operations including monitoring the procurement and rationing food to students for each meal, and cooking arrangements, where usually students are given responsibilities. Initial calculations show that schools spends K1.00 to K2.45 per student per day to feed them.

In the main, rice and tinned fish sometimes mixed with noodles, were provided to boarders in secondary schools for breakfast, lunch, and dinner, but on some days in some schools tinned meat, was served notebly for certain students who were averse to tinned fish. Some money was used to buy other store items and fresh produce from the market. In many schools the greens were only provided occasionally on special occaision such as meals twice a term, (public holidays or exam time): e.g. with cream bun, cordial, lamb flaps, red sausages, or chicken/ fresh fish, and rice was served. Every payday fortnight, in most boarding schools, students are allowed to go home for the weekend.

Most of the secondary schools visited had access to electricity often (unreliably) supplied by PNG Power Limited. However, the schools often lacked funding to buy or repair their fridges, freezers, ovens, baking and cooking equipment. This means that the school kitchens are rudimentary. Many schools use gas cookers or firewood stoves. Often there is no refrigeration. This works as a barrier to storage of meat, vegetable, frozen goods and dairy products.

The local vendors (sometimes teacher's families) were found to play an important role in providing food and drinks to school children. Some schools have policies to manage vendors; they apply to be registered as a vendor; they obtain approval regarding the food sold, quantity and price, and have a duty teacher assigned to monitor the sale of the food items. Other schools chose to give turns to different groups or communities to cater on set days. Some schools did not really care, and left vendors to sell food and drinks outside the school grounds sometimes in unhygienic conditions. Vendors need to be given guidelines about food safety, and more nutritious food items.

School canteens were useful to have especially at boarding schools. An innovation was for the canteen to be managed with a separate bank account, run as a business within the school such as selling goods to the kitchen as well as to staff and students. Half the number of secondary schools (6 out of 12) had a canteen that was currently operating. Most of the other schools used to have canteens but no longer in operation owing to a number of issues, such as no-one available to run it, or past mismanagement. However, at least three of the schools had plans to have the students operate the canteen, the Students Representative Council or by a student business course students.

Parent knowledge about preparing food for their child to take to school was successful where there was an active participation by parents in school meetings where awareness was given and instructions on the type of food children can bring to school**.** This was applied as part of the Covid-19 measures by the NDOE.

Teacher Training

There appears to have been a lack of standard approach to teaching Agriculture and Nutrition/Home Economics under outcome-based syllabus. The design of the practical agriculture lessons differ between schools depending on the availability of specialized agriculture teachers, and influenced by the university or colleges from which these teachers graduated. (Hitherto most agriculture teachers in primary school had were diploma holders from agricultural colleges, until teacher training became a requirement. This greatly reduced the availability of specialist agriculture teachers, however, with most primary teachers of agriculture, therefore, being generalists).

While there are specialized Agriculture teachers, there are also Science teachers teaching Agriculture, as well as Business Studies teachers. Interventions should be made in the teacher training institutions curriculum on how best to train teachers to teach agriculture and business subjects, along with home science, personal development and health subjects regarding nutrition topics. Ensuring that students study biology prior to, or alongside, studying Agriculture was necessary.

Teachers should be given regular and specific in-service or refresher training to help them to plan, prepare and teach agricultural lessons using appropriate and effective approaches and activities. The National Education Plan 2020 – 2029, has a set of 'Minor Outcomes' that address standards-based curriculum (SBC) development and teacher training during the plan period. The opportunity to review the agriculture and nutrition curricula, along with activities to upgrade existing teachers is overdue, as well as to train new agriculture and nutrition teachers.

School lessons on agriculture are dependent on the leadership provided by the teacher who needs more exciting lessons on the subject, including appropriate practicals, and teachers need to be better trained and supported with adequate resources. School leadership is key, with the administration needing to provide adequate focus and support for teaching the theory and developing practical skills in agriculture, food and nutrition. Schools that had committed principals, teachers and parents, were successful with the running of school gardens and agriculture education.

National policy settings and curriculum offered in schools

Most agriculture teachers are generalists with some training in agriculture. The teachers are left to their own to interpret the *Making a Living* subject for upper primary grades, and the Agriculture Syllabus for secondary grades, and to develop the best way of teaching these subjects. All teachers complained that they did not have manuals, text books, materials such as posters, and most felt they did not have the skills to conduct practical lessons.

There is a new agriculture syllabus for secondary schools, which is "Standards-Based", produced by the Department of Education. The staff in none of the Secondary schools visited had seen or heard anything about the new syllabus and were still using the outcome-based agriculture curriculum. Although the rhetoric was strong on agriculture (from national government and in most cases provincial education advisers, but perhaps less so from the Education Department/Curriculum etc.), very limited resources were provided to enable it to be implemented effectively. Acquiring agriculture interest and knowledge comes through actual agricultural activity and not just through theory in prior research. Students expressed that having more excursions and practical lessons would improve their agriculture education.

Agriculture subject is an elective for Grades 11 and 12, school staff with suitable agricultural background and training are also limited. If school agriculture and nutrition education was made a core subject up to grade 12, this would increase the number of students studying the subject, as well as be an investment in a more sustainable future. A few schools, supported by Provincial Education authorities, recognised the need for practical agricultural and related skills for their students, considering the nature of PNG's job market and resources available to students, and converted or were in the process of being transformed into Agro-technical Secondary schools, providing conventional education through to Grade 12, but also providing practical TVET certification also. (This is somewhat reflective of the model long pursued in the pre-tertiary education system in Solomon Islands, with a focus on formal sector technical skills

requirements, but particularly informal sector skills needs, including through their Rural Training Centres).

Funding for school agriculture, nutrition education and feeding programs

All education institutions are very much dependant on government funding, including the faith-based schools and tertiary institutions. The government pays the salaries of school teachers centrally (unlike with the church health services). The current policy with the funding of schools throughout PNG depends largely on the National Government Tuition Fee Subsidy (GTFS) policy which sets fee limits for each education sector institution, and the amount of subsidy to be provided for student units. Boarding schools (since 2020 and the discontinuation of the Tuition Fee Free system -TFF) are supposed to receive K1,650 for lower secondary per student, and K1,749 per upper secondary student boarders. These amounts represent 62% of the tuition costs, while parents are expected to pay 38% of the fees. In many cases it was found that during 2020 and 2021, to date, these amounts from government were received late or not received in full, while parental contributions were also widely not received in full or in a timely manner.

In terms of expenditure, about 50% to 75% of the tuition fees are spent on buying food for the mess to feed the students in secondary schools (with some implicit cross subsidisation from day student fees of boarding students). The school management generally is envisaged as allocating K4,000 to K5,000 to each subject area for the year, including agriculture. This amount was found inadequate for teachers to purchase text books, equipment and supplies to run a proper agriculture education programme in many cases for hundreds of students (especially with the largest schools now having up to 3,600 students, notably Goroka Secondary, where classes reportedly ranged up to 120 students.

Demand for agriculture and nutrition education

During the school visits, the expressed demand for agriculture education largely came from school teachers, lecturers and from provincial education officials (as well as some provincial education advisers and other sources outside the schools themselves). Many teachers, including many principals, expressed that agriculture should be given high priority as a subject to be taught. They measured this by the number of class periods allocated for agriculture, the number of agriculture teachers employed at the school, and the budget allocation for the subject.

The teachers saw that most of their students would leave at Grade 6 – 10 would return to their homes in the village without any employment opportunities. Many teachers and provincial officials recognise that school leavers should have a set of skills in agriculture and related practical skills to help them become self-reliant and to generate an income from selling fresh produce, livestock, honey and other products. While agriculture may not always be seen as the preferred future by many students, many teachers understood the reality for many of their

students who would not continue on to further their education or limited formal sector employment outside agriculture. Some school principals drove the initiative increase the agricultural focus in their schools, including in the case of one of the sample schools, to rename and refocus it as an agro-tech secondary school. Many parents and students set their ambitions on professional or business careers, notably in urban centres, and showed less enthusiasm on what they seemed undue school focus on agriculture, although the students generally said they valued the food gardens and even garden work, particularly where it provided a direct impact, in improving the composition of the otherwise very dreary and unvaried school meals.

From recent nutrition surveys across PNG, and from the evidence in this survey of school meals and budget, there is clearly a need for better nutrition in schools and the wider community, agricultural education and, improved income earning opportunities. Female students should be encouraged along with boys, to take up these subjects. There is a link between maternal health and education and child nutrition, thus, a continued focus on female enrollment and retention, but also on these practical subjects, as well as the more traditional academic choices, will influence continued reductions in the numbers and shares of children suffering from stunting, wasting, and other indicators of child malnutrition. It may be noted that in the initial years before, but particularly after Independence a major focus was given to improved access to education, but also to agriculture (including cash crops) as the backbone for livelihoods for most of the population, and to improved health and nutrition. Enhanced food and nutrition are, in turn, dependent substantially upon nutritional awareness, access to resources (or entitlements), including land and enhanced and reliable income and livelihoods. In most cases, at least for the immediate future years, such enhanced livelihoods will be sourced from sustainable agriculture for the majority of the population.

Recommendations on way forward

Nutrition

- Government to develop its policy on school feeding programs (in coordination between the key agencies, and drawing upon the best advice available, both within the country and internationally).

- The government will need to increase access of all children to quality education (especially for girls), including specifically on food and good nutrition, so that understanding and awareness about nutrition, infant feeding practices and child feeding can be fundamentally improved.

- The government (including sub-national authorities) to ensure improved access to clean drinking water, good sanitation and hygiene at schools and facilitate such improvements for all communities.

- The national and provincial governments will need to commit sufficient financial and technical resources to support the implementation of the PNG National Nutrition Policy 2016-2026, the School Health Policy, and the National Food Security Policy, supporting schools where necessary.

Up scaling Agriculture Education

- Ministry of Education to make Agriculture and Nutrition Education core subjects and to allocate adequate budget for effective implementation.

- To review the curriculum of Making a Living using the Lower Secondary Agriculture Syllabus and Teacher Guide to be adapted for use in primary, through to upper secondary school levels.

- The government to commit to implementing the Higher Education Strategic Implementation Plan 2017 – 2038. Supporting new scholastic infrastructure, particularly in fields such as agriculture, engineering and teacher training.

- To supply text books and teaching materials to schools. There is a need for high quality learning materials and text books with garden practices, nutrition guides, cooking guides and recipes.

- Schools should have access to advanced methods for gardens, such as small machines, irrigation, high quality planting material (and not simply dependent upon tuition fees for such investment). Money for sheds and fencing were also expressed needs. Schools should be able to buy small scale machinery to teach upper primary and secondary students how to process foods, how to plough the ground using small rotorvators (or tractors, for schools with large land areas), and care and maintenance of these and/or to use low tillage methods. The Highlands Agriculture Training College offers Certificate in rural engineering which covers water, mechanical, small engines, soil management which teachers can be supported to undertake.

- The position of Farm Manager to be created and funded for each school (at least those with accessible land; and efforts made to access land for use by those schools currently without).

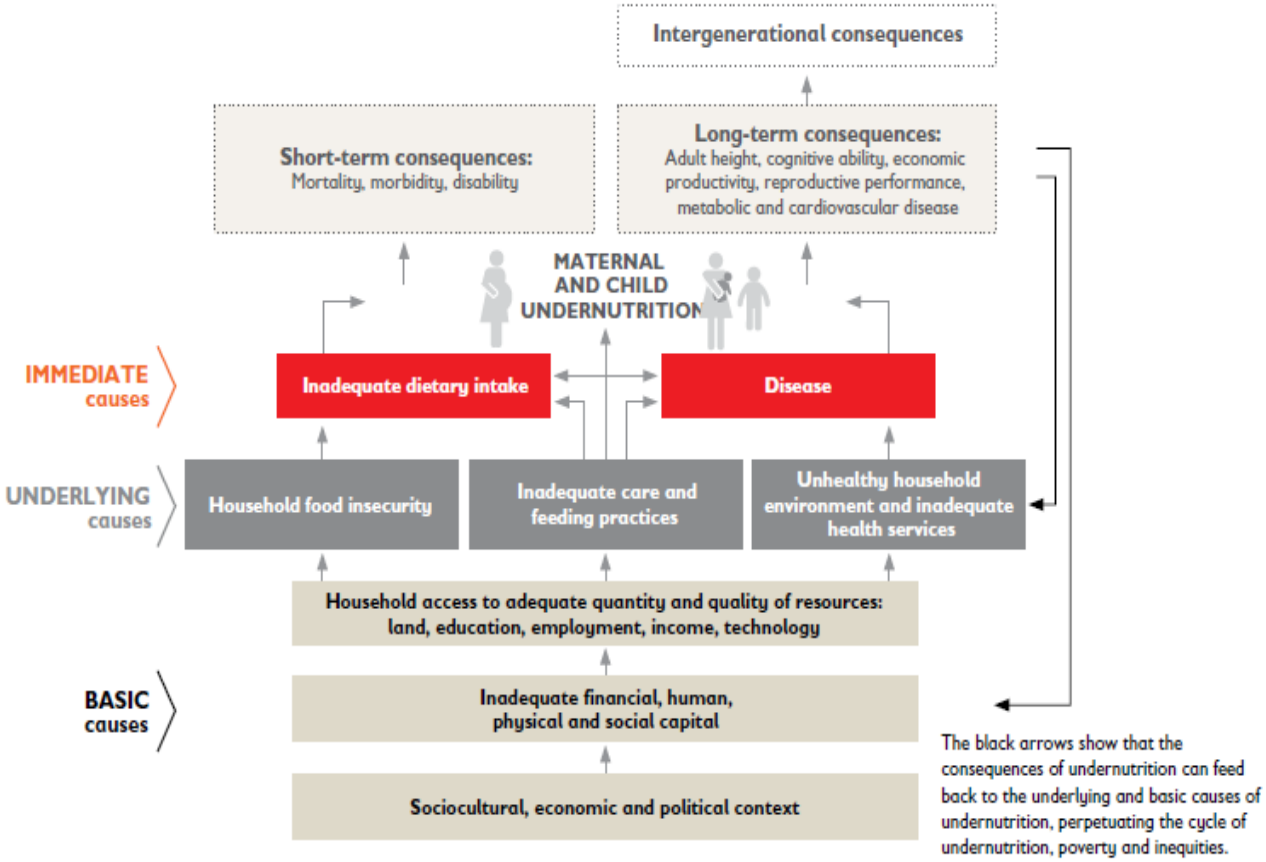
- Teacher training colleges and schools need to be able to visit a nearby model school farm with crops, livestock and fisheries. This could be set up by the agriculture training institutions or at the teachers colleges. Such farms could initially be set up under a pilot project.

- Each year baseline data be collected on each student on the weight and height by age and sex, by grade for each primary and secondary school, by health teams and reports produced. In addition, the female adolescent students be tested to monitor and help address anaemia levels.

1. INTRODUCTION

1.1 BACKGROUND AND RATIONALE

The conceptual framework for under-nutrition developed by UNICEF is presented below (sourced from Save the Children Australia, 2016).



Source: UNICEF: Improving Child Nutrition: the achievable imperative for global progress. United Nations Fund 2013. p4

The conceptual framework presents the basic, underlying and immediate causes of inadequate dietary intake on mothers and children. Household access to adequate quantity and quality of resources, notably: land, education, employment, income, technology, influences the level of supply, care and feeding practices and also food security. Awareness and education is an important factor, but there is also a critical need to ensure access to an adequate food supply and a healthy balanced diet, namely suitable land and food production, employment, income and the capacity for trade, and appropriate technology.

An international workshop on nutrition and school children held in 2017, provided a global overview of the food and nutrition situation of schoolchildren. Highlights from the session:

• Participants highlighted critical information and monitoring gaps on the nutrition situation of schoolchildren in Low and Middle Income Countries (LMICs). The amount and quality of evidence of the nutrition situation of schoolchildren is very scarce in comparison with that for other age groups, such as those in the first 1000 days category.
• The studies available show a complex malnutrition picture that is very context-specific and that has high in-country variations. Chronic and acute under nutrition and micronutrient deficiencies continue to be a critical issue, especially in the African and Asian regions. Overweight and obesity also are of growing concern in most countries.
• There are no global nutrition targets for schoolchildren and adolescents, which hinders high-level commitment and tracking of progress.
• Very few studies measure individual food consumption exclusively in schoolchildren and adolescents; such studies are urgently needed in LMICs to better understand and address food practices and patterns.
• School-based Food and Nutrition Education (SFNE) needs to be better able to respond to current malnutrition and food-system challenges, not only in directly promoting food capacities and healthy food practices in children, but also in empowering and influencing local actors to spark or enact change in school food environments and beyond. (FAO, 2019, p.17)

This study could be an important contribution to addressing malnutrition and school-based food and nutrition education in PNG.

1.2 THE NATIONAL CONTEXT

1.2.1 GEOGRAPHY

PNG includes the eastern half of New Guinea, the islands of New Britain, New Ireland and Bougainville and hundreds of smaller islands. The land area is approximately 463,000 sq. km., of which only 27 per cent is occupied by people. The country is usually divided into the islands, the lowlands (0-1200 m) and the highlands (1200-2800 m).

The extremely diverse range of natural environments is due to large variations in landform, rainfall and altitude. PNG is tectonically and volcanically active, with a large number of active volcanoes. Extensive mountain ranges cover many areas and there a number of peaks over 4000 metres. A number of rivers drain the mainland, including the Sepik River in the north and the Fly River in the south. These rivers have associated swamps and seasonally inundated floodplains that cover large areas.

Average annual rainfall varies from extremely high and continuous with more than 8000 mm in some mountainous areas, to relatively low and seasonal, with 1000-1500 mm in a number of coastal areas. Average temperatures vary mainly with altitude, resulting in tropical temperatures in the lowlands and islands and milder temperatures in the highlands. Frosts occur above 1500 m and cause severe problems for agriculture above 2200 metres. Various types of forest cover over 70 percent of PNG's land area.

Approximately 70 per cent of the total land area has very low to low potential for most food and cash crops, while only seven per cent has high to very high potential.[1] The rugged terrain, combined with widely scattered small villages, makes provision of key services, including transport and communications very difficult (WHO, 2014).

1.2.2 POPULATION

The country's average annual population growth rate has increased from 2.7% (1980-2000) to 3.1% (2000-2011) inter-census periods,[2] with both the growth and fertility rates increasing disproportionally in some provinces. PNG's population is predicted to reach 9 million by 2020. Owing to the slow decline in fertility, some ageing at the base of PNG's age-sex pyramid has occurred but the population remains young with close to 40 percent under the age of 15. As a result, the level of youth dependency (dependent on working-age adults defined as ages 15 to 64) remains high. The continuing broad-based age-sex pyramid implies a significant potential for future growth of the population.[3] This population structure has a huge impact in development issues.

The population is unevenly distributed throughout the country: 40 per cent of people living in the Highlands region, 25 per cent residing in the Momase region, 20 per cent in the Southern region, and 15 per cent located in the New Guinea Islands.

1.2.3 CHILD MALNUTRITION

Child malnutrition is a major problem in Papua New Guinea. The PNG National Nutrition Policy 2016 – 2026, states:

> *Nationwide, 44% of children under 5 years of age are classified as stunted, which limits not only the child's growth outcomes but also their future learning and income earning potential, and perpetuates the inter-generational cycle of malnutrition and poverty.*
> *The problem of wasting, a potentially life-threatening condition caused by lack of adequate dietary intake, infection and a lack of access to clean water and sanitation, is not adequately identified and managed in clinical and community settings, endangering the survival of around 5% of children under 5 years of age in PNG.* (NDoH, NDoE, DAL, NDCDR and DNPM, 2016. p viii).

[1] Excerpts from L.W. Hanson, B.J. Allan, R.M. Bourke, and T.J. McCarthy, Papua New Guinea Rural Development Handbook, ANU, 2001.

[2] National Statistical Office, *Papua New Guinea 2011 National Report – National Population & Housing Census*, NSO, Port Moresby. pp.17-21

[3] DNPM, 2015, National Population Policy 2015-2020. P. 6

Save the Children Australia, published a report in 2017 with Frontier Economics focusing on child stunting. It states that Papua New Guinea (PNG) is facing a nutrition crisis. According to the report, almost one in two children in PNG have stunted growth due to chronic malnutrition; "*PNG has the fourth highest child stunting rate in the world – a rate that is more than double the global average and higher than some of the most impoverished countries in Africa and Asia. Not only does malnutrition pose a threat to the survival and development of over half a million children, it also poses a major threat to sustainable economic growth in PNG. This is because the human and economic costs of malnutrition are inextricably linked*." (2017, p. 1)

The Save the Children report reveals, for the first time, the enormous human and economic costs of child under-nutrition in PNG. Frontier Economics, a consultancy firm, estimates that child under-nutrition cost the PNG economy the equivalent of USD 508 million in the financial year 2015-16 (2.81% of its annual GDP) through three main pathways:
1. Losses in productivity from a reduction in the labour force owing to increased childhood mortality, estimated at USD 46 million (0.26% of GDP);
2. Losses in potential income and productivity from poor physical status and reduced cognitive function, estimated at USD 459 million (2.54% of GDP); and
3. Losses from increased health care expenditure in treating diseases associated with childhood under-nutrition, estimated at USD3 million (0.02% of GDP).

Alarmingly, the reports states that, "The estimate of 2.81% of GDP is regarded as conservative, and the economic impact could be as high as 8.45% of GDP (1.5 billion USD per annum) using alternative assumptions.

John Hoddinott of IFPRI, stresses that "*the biggest economic consequences are those resulting from neurological damage. Studies that have followed undernourished preschool children find that they attain fewer grades of schooling and develop poorer cognitive skills such as those relating to problem solving. By contrast, there is strong evidence that interventions that combat under-nutrition in early life convey lifelong benefits. Everywhere in the world, schooling and cognitive skills are vital for success in the labour market. A useful rule of thumb is that every additional grade of schooling raises wages by eight to 12 percent. So individuals without such skills and with less schooling earn lower wages, which makes it more likely that they will be poor*." (2013. p 4).

The report on child under-nutrition in PNG has shown that there is a compelling social and economic imperative to invest in child nutrition. "Every child in PNG can achieve her or his full growth potential, with significant returns for the PNG economy." (Save The Children, p. 49).

The Ministry of Health published the most recent data showing the national rate to be 21% of children under five years who attended Maternal and Child Health clinics in 2019, were moderately (60 – 80 % Weight for Age) or severely (60% weight for age) underweight. Most of the provinces selected for this survey exhibited rates that were around the national average, but Morobe Province experienced a higher rate of 30% of its children under five years being malnourished (see Table 1). Western Highlands and East New Britain showed better rates of

13% (in 2018) and 16% respectively of children malnourished. Overall, the trend has worsened from 20% in 2018 to 21% the following year.

Table 1: Percent of children moderately or severely underweight in survey provinces, 2019

Percentage of children weighed at clinics, 80% weight for age		
Province	**2018**	**2019**
Central	21%	21%
Milne Bay	23%	22%
Western Highlands	13%	N/A
Eastern Highlands	20%	20%
Morobe	26%	30%
East New Britain	17%	16%
National	**20%**	**21%**

Source: 2019 Sector Performance Annual Review (Ministry of Health)

There is a link between maternal education and child nutrition, thus, a focus on female enrollment rates will influence continued reductions in the numbers and shares of children suffering from stunting, wasting, and other indicators of child malnutrition. In the area of education, Papua New Guinea is making some progress toward achieving near universal enrollment in primary school, but gender inequities remain pervasive at higher levels of schooling.

1.2.4 THE POLICY FRAMEWORK

The national government through the PNG Medium Term Development Plan 2018-2022, has set a goal to (number 3.9) 'Improve Nutrition Standard' with the strategy (number 28) to "Support hygiene, nutrition and dietary education, programs and awareness amongst families, households and schools" (DNPM p. 39). The targets are to reduce prevalence in stunting in children from 48% in 2010 to less that 30% by 2022, and to reduce wasting in children under 5 years from 16% in 2010 to less than 2% in 2022.

The Papua New Guinea *Agricultural Medium Term Development Plan 2020-2022*, recognises that malnutrition rates in PNG are among the highest in the world. It claims that there is a widening gap between the demand for food owing to relatively static domestic production, distribution and marketing. The Agriculture Plan explains that some of the causes of malnutrition are related to low and variable agricultural income resulting from frosts, drought, floods, pest and disease, lack of access to quality food, poor eating habits, increasing population densities, and /or land pressure, stress on land and the lack of nutritional education programs. The PNG National Agriculture Plan lists key strategies to address nutritional issues in the sector, with the school related strategies to: (i) Improve the nutritional well-being of those suffering from nutritional problems, (ii) Establish linkages with the Department of Agriculture and Livestock (DAL), National Department of Health to implement and support food security and nutritional programs; and, (iii) Liaise with Department of Education for awareness on nutritional issues, food production and preservation (2021, p. 26).

PNG's National Nutrition Policy (2016-2026) recognises the important role of PNG's education system in helping to address malnutrition. The Policy highlights the need to develop and update teaching resources and nutrition as part of the teaching curriculum. In terms of agriculture, the Policy highlights that tools and resources are needed for enhancing the state of food and nutrition in PNG, nationally and locally.

Available evidence shows that school garden programs are an effective intervention to improve children's food knowledge, attitudes and preferences in favour of healthier diets. School gardens have been shown to change the attitude of younger children in making good food choices and that this is carried with them as they grow older (Diaz et al 2018; Klein, 2013). Furthermore, "*Agriculture education is important and will benefit the students who want to become agribusiness men or women. Alternatively it will help those who will return to their communities to improve agricultural practices in terms of making them more sustainable.*" (Quartermain and Openg, p.23)

The higher education institutions in PNG are providing some focus on agriculture and nutrition but much more needs to be done particularly to improve capacity and focus in teacher training. It is critical that the GoPNG (supported by its Development Partners) and together with other stakeholders, schools and teaching colleges, provide the necessary investment in the education sector, and specifically placing agriculture and nutrition at the core to arrest a silent disaster facing the country and its young citizens.

2. SCOPE AND OBJECTIVES

2,1 SCOPE

The scope of the exercise was to undertake a review to determine what have been the key drivers in the (apparent) decline of functioning agricultural and nutrition education, and school farms in PNG, and what are the most critical areas and opportunities for intervention. This was conducted in selected institutions in six provinces: Central, East New Britain, Eastern Highlands, Milne Bay, Morobe, and Western Highlands. Initial scoping visits were undertaken in August and November 2019. A small team from Australian DFAT, the World Vegetable Center and Charles Darwin University travelled to Port Moresby, Mul-Baiyer in Western Highlands, Maprik in East Sepik and the Markham Valley in Morobe, to understand the challenges and realities of strengthening nutrition and agriculture in schools in PNG.

Almost no primary schools have any feeding program for the children, except for remote primary boarding schools. Hence the information on food programmes is the situation at secondary boarding schools with supplementary information provided on alternative food providers in primary schools.

2.2 EVALUATION OBJECTIVES/QUESTIONS

The overall goal is to identify the lessons learned and present good practices from schools, provinces, training institutions and national departments and agencies. Specifically, this report will address the following research questions:

1) Where can nutrition interventions best be made working within the Education System, to positively impact positive nutrition outcomes – elementary, primary, secondary and adult education and effective interventions and liaison with health and nutrition extension staff?

2) How has the funding to primary and secondary schools changed since 1980, including consideration for boarding schools? What have been the funding models used previously and currently? What consideration is included, or could realistically/usefully be considered for agriculture, nutrition (including hygiene and sanitation) in the elementary and primary school program for children (and mothers)?

3) How have the national policy settings changed in regard to curriculum and syllabus offered in schools (primary through to TVET) in this time frame?

4) How has the management and funding of faith-based schools changed over this timeframe? Are they more or less dependent on government funding and are they more or less regulated by the PNG Government? Has this influenced the success or otherwise of school farms?

5) How has agriculture and nutrition teacher training changed since 1980 for elementary, primary and secondary teachers?

6) What is the expressed demand for agriculture and nutrition education from students, parents and teachers?

7) What is the trend in recruitment, training and placement for agriculture teachers or teachers with an agriculture and nutrition responsibility since 1980 (including the requirement for teaching qualifications against the prior provision of agricultural college graduates)?

8) Where secondary schools still run successful school farms, what are the critical elements to their survival and success?

An additional set of questions were developed to find out:

What are the children eating at school? Did they bring lunch and snacks and drink? If not, did they have money to buy food and drink? What did the school provide for meals for its students? If the

school did not have any feeding programme, did it allow for a school canteen to operate or allow vendors from outside to sell food and drinks to the children? What items were available and at what cost?

What did the school provide for boarding students to eat? How was this paid for? Was it adequate?

Most boarding schools grow vegetables and/or other foods (like grain and livestock) to provide supplement to the meals cooked to feed students. Some had extensive food garden land and others very little. The survey includes questions about how much land the school had and was making available for food gardening and what was being grown, and how much of this was consumed by students or sold. What were the conditions where school garden worked well?

The education system in PNG is also being looked at to find out how the teaching of agriculture and nutrition subjects are being implemented in selected schools.

The results will serve as a guidance on the conditions conducive for implementation and potential scale-up, as well as the sustainability of operations.

3. APPROACH AND METHODOLOGY

3.1 APPROACH

Knowledge and education combine as one causal factor to improve to address awareness about food, nutrition, hygiene, and farming practices in the school setting. Food and nutrition education has been a strategy to empower people to make the best use of their available resources for improving their food and nutrition practices. School-based food and nutrition education represents an important opportunity to reach children, families and the broader school community in a regular and continuous way to foster lasting healthy food practices and capacities. (FAO, 2019. p.5)

The primary approach proposed is to build on existing programs, working with high schools and primary schools initially over a two to three year timeframe to improve their existing nutrition and agricultural education/skills programs. The aim would be for the users of the survey to build a model which addresses some of the practical reasons why schools are struggling to maintain these programs, including challenges such as teacher availability, capacity and incentives, land availability and cost of inputs and adequate budget, technical capacity, student/parental/school board attitudes/inputs, and maintaining learning outcomes and farm outputs at the same time.

The key stakeholders and/or users of this evaluation include:

- DFAT
- Departments of Education, Health, Agriculture and Livestock and the Provinces and their respective authorities

- Civil society development partners (notably church partners and some NGOs involved with education –including curriculum and outreach, agriculture and nutrition – including women's issues)

3.2 METHODOLOGY

The Institute of National Affairs (INA) was engaged by the Australian Department of Foreign Affairs and Trade (DFAT) to conduct the study during 2020. The policy level categories that the survey questions were framed on agriculture education, including nutrition, school gardens, and on student meals. Four questionnaires were designed and some interviews conducted at the National Department of Education (See Annex 1 School Questionnaire; Annex 2: Training Institutions).

Owing to the Covid-19 disruptions, the field data collection was deferred until 2021 and was undertaken from 4th to 29th May 2021.

The team comprised the following researchers:

- Paul Barker, INA Executive Director, and Lead Investigator
- Marjorie Andrew, INA Senior Research Fellow
- Tuari Gaudi, INA Research Officer
- Doreen Philip, INA Communications and Research Assistant
- Gwenda Rabiv, CIMC Agriculture Sector Coordinator
- Rufina Peter, Consultant (and ex-INA/CIMC staff member)

An overview of the updated work plan phases is presented below, (all revised by Covid-19 conditions)

Phase 1 Completion date 29 April 2021

- *Inception: Planning and Consultation*
- Activities: Background reading. Draft outline of report. Interviews with other key stakeholders. Modify evaluation plan.

Phase 2

- *Data collection and fieldwork*
- Activities: Design instruments for data collection. Completion date 29 April 2021
- Conduct fieldwork at project sites. Completion date 4 June 2021
- Report initial findings.

Phase 3

- *Data analysis and interim report.* Completion date 18 June 2021
- Activities: Analysis of lessons learned. Interim report.

Phase 4

- *Reporting.* Completion date 30 July 2021 (contract revised to end September 2021)
- Activities: Prepare, review and submit final draft report. Complete revision recommended by DFAT. Final report.

3.2.1 SAMPLE

A sample of six provinces were surveyed: Central, Morobe, Western Highlands, Eastern Highlands, East New Britain and Milne Bay. The list of institutions visited are listed in Table 2 below. Overall, key representatives were interviewed in 8 primary schools, 12 secondary schools, 4 teacher training colleges, 4 tertiary educational and training institutions and 5 provincial education officers. Other key informants included National Department of Education officials from Teacher Education Division, Curriculum Development Division, and experts who were former agriculture teachers, a former student of an agriculture secondary school, and a current school principal in the NCD, an academic, two international education advisers, and a manager/adviser with City Mission, an NGO involved in teaching, agriculture and practical skills with older students and supplying schools with related materials, including rice. List of names of persons interviewed by organisation is provided in Annex 4.

Table 2: Number and Name of Institutions Surveyed by Type and Province

Province	**Primary Schools**	**Secondary Schools**	**Teachers College**	**Tertiary Training Institutions**	**Provincial Education Office – # of officials**
Central	2	3			1
Full team Andrew, Gaudi, Rabiv & Philip Peter & Gaudi	Sogeri Primary Kerekadi Primary	Iarowari Agro-Tech Secondary Mt Diamond Adventist Secondary Mainohana Catholic Secondary			Provincial Education Advisor
Morobe	2	1	1		1
Barker, Andrew & Philip	Taraka Primary Ragiampun Primary	Markham Valley Secondary	Balob Lutheran Teachers' College		Education Advisor
Western Highlands		1	1	1	1
Andrew & Gaudi		Kui Wampnga Secondary	Holy Trinity Teachers College	Highlands Agriculture Training College	Education TVET Inspector
Eastern Highlands	1	3		2	1
Barker & Rabiv	Kapakamarigi Primary	Bena Bena Secondary Asaroka Lutheran Secondary Goroka Secondary		University of Goroka Research and Conservation Foundation	Provincial Education Advisor

East New Britain	2	2	2	1	1
Peter & Rabiv	Tudungan Primary Vunairima Primary	Malabanga Secondary George Brown Secondary	Kabaleo Teachers College (DWU) Gaulim Teachers College	University of Natural Resources and Environment	Provincial Education Advisor
Milne Bay	1	2			1
Andrew & Gaudi	Lelehudi Primary	Hagita Catholic Secondary Cameron Secondary School			Provincial Education Superintendent Operations
Total	8	12	4	4	6

The sample size covered 8 primary schools with at least 2,411 students, but with major variation in school sizes from 328 to nearly 800, and well over 1,000 for Taraka Primary; (give or take some apparent inconsistency in records and inability to collect total school numbers for some schools from their central records during the school visit). The number of female students enrolled was especially high for the schools in East New Britain (See Table 3), of those school for which total data was available about 57% of students are female. There are no boarders in the primary schools visited.

Table 3: Number of primary school students currently enrolled, by school and sex, 2021

#	Name of school	Number of students enrolled			Percentage of female students
		Male	**Female**	**Total**	
1	Sogeri Primary	201	217	418	52%
2	Kerekadi Primary			NA	
3	Taraka Primary			NA	
4	Ragiampun Adventist Primary	187	141	328	43%
5	Lelehudi Primary			NA	
6	Kapakamarigi Primary	187	141	328	43%
7	Tudungan Primary	261	538	799	67%
8	Vunairima Primary School	162	304	466	65%
	Total	**998**	**1,341**	**2,339**	**57%**

For secondary schools, the total school population was at least 12,941 students (two secondary schools did not provide enrolment numbers), of which a total of 6,047 students were boarders, which was 46.7% of the schools' population sampled. The statistics made available by only three secondary schools, indicate higher female enrolment numbers than male students. Total male and female secondary school students was 3,531 of which 52.5% were female (See Table 4). The total number of students enrolled in the secondary schools represented at least 7% of the total number of student enrolments (181,740) for 258 secondary schools in the National Education System (2016 Education Statistics of Papua New Guinea, Table 2).

The total primary and secondary school population surveyed was over 15,280 students (excluding schools that did not provide enrolment figures).

Table 4: Number of Secondary School students currently enrolled, by school and sex, 2021

#	Name of school	Number of students		Total enrolment	Number of boarders	Percentage female students
		Male	Female			
1	Goroka Secondary			3,600	0	
2	George Brown Memorial Secondary			NA	0	
3	Malabunga Secondary	446	444	890	300	50%
4	Benabena Secondary	471	755	1226	1226	61%
5	Asaroka Lutheran Secondary			2000	1,000	
6	Kui Wanpnga Secondary			NA		
7	Markham Valley Secondary	767	624	1391	1,200	45%
8	Cameron Secondary			900	300	
9	Hagita Sacred Heart Secondary	486	382	868	525	44%
10	Mainohana Catholic Secondary	272	275	547	547	50%
11	Iarowari Agro-Technical Secondary			870	600	

12	Mount Diamond Adventist Secondary			649	649	
	Total	**2,442**	**2,480**	**12,941**	**6,047**	**52%**

4. FINDINGS

1) Research question: Where can nutrition interventions best be made within the Education System, to positively impact nutrition outcomes in elementary, primary, secondary and adult education and effective interventions and liaison with health and nutrition extension staff?

Teaching Agriculture and Nutrition Subjects

- An important innovation developed by the Department of Education, is the Agriculture Lower Secondary Teachers Guide (2006). As is specified in the introduction, the teacher guide and the syllabus must be used together**.** The syllabus states the learning outcomes for the subject and each unit, and outlines the content and skills that students will learn, and the assessment requirements. The teacher guide provides teaching and learning strategies, ideas for planning and programming and suggested activities to help students achieve the learning outcomes. This is a good resource that could be used for upper primary once agriculture becomes a core subject, it can also be adapted for the lower primary grades.

- A similar teacher's guide could be developed for the nutrition subject.

- Treating agriculture as a core subject. When treated as a core subject, teachers will plan, prepare, and deliver the subject using appropriate approaches and activities that will create deep understanding and experiences. As Quartermain and Openg (2018, p22) of the University of Goroka state, "*Learning agriculture knowledge comes about through actual agricultural activity and not just through theory. However, when teachers teach other subjects as well as agriculture they may not treat it as an important subject*."

- Over half the students surveyed in Lae Secondary Schools, see activities in agricultural education as hard labour and yet have a positive attitude towards the subject as vital for learning (ibid). Many students, as at Iarowari, said they were motivated to work in the gardens where that supplements and gives greater variety to their otherwise routine and basic school meals, which in all secondary schools are centred upon the incessant consumption of the cheapest available white rice for one or two meals almost every day.

- School leadership is key. Schools that had committed principals, teachers, school board members and parents, and good community relations were successful with the running

of school gardens and agriculture education (including avoiding or minimising theft of produce). In the case of the church run secondary schools, those which had church-based policies relating to agriculture and self-sufficiency seemed more successful Working models are: Kabiufa Adventist Secondary School and George Brown United Church Secondary School. Government run schools that were active in maintaining school gardens (albeit on a very tight –indeed inadequate, budget), were Goroka Secondary School, now exclusively a day school and the largest secondary school in PNG, with 3,600 students, although the gardens are used almost solely, at this stage, for agriculture education, as it no longer operates a school mess (as school numbers are too great), and Markham Valley Secondary School for agriculture subjects and to supply the school kitchen. Converting the Iarowari school to an agro-tech secondary school was reported to be the brainchild of the Principal and gained support from the Provincial Education Office. Markham secondary seemed to have a supportive local community, willing to step in and contribute where requested.

- Teachers described how even with very small garden areas in urban schools (such as Gordons Secondary School in NCD, where some agricultural teachers interviewed had worked hitherto) agricultural principles and practice can still be taught effectively. Some schools see themselves as part of the wider community and able to provide leadership and skills development for that community, as described by agriculture teachers at Goroka secondary in developing excellence in apiculture, and agriculture teachers with the local community and providing adult education on managing rice.

- An ex-student of Wesley Secondary School in Milne Bay Province, described that each student was given a 10 metre square plot and had to grow a set of vegetables that they were assessed each year. This is for a remote rural school where land may be abundant.

- The use of business studies teachers in agriculture education was found to be useful. Students were shown how to generate an income from a small patch of land at Cameron Secondary School. Agriculture education needs to build on and show how to add value to crops grown locally.

- Growth of cash crops may instil a more business approach to agriculture education in schools, but need proper farm management records, notably the number of trees, vines, produce, and sales are kept. Cash crops, as with food crops, requires proper fencing and security, and maintenance, or the benefits will be limited (as claimed by Asaroka which said they gained no income from their coffee, but emphasised the need for restored fencing and a full time farm manager).

- There is a need for teachers to maintain continuing student interest. Teachers need to facilitate more group discussions based on reading of text books, combined with practicals. Students surveyed in Lae, 50% expressed that having more excursions and practical lessons would improve their agriculture education (Quartermain and Openg). There can be exciting topics such as small scale processing, cooking and eating the

proceeds, or taking home seeds or new varieties of plants (Questionnaire: Laurie Fooks). The INA survey found that most Primary School students were motivated to grow and sell to make money for the end of the year party.

Teacher Training

- On teaching of agriculture in secondary schools, Quartermain and Openg stress that since agriculture is an important subject for people in PNG it must be treated as a core subject, as reflected by several of the provincial Education Advisers, some Education staff and some principals and most agriculture teachers. Agriculture is a core subject in the Solomon Islands education system (Mary Kalit interview), where it is forms a core component of their secondary school Rural Training Centres.
- It is recommended that teachers be properly trained in the use of the Agriculture Lower Secondary Teachers Guide.
- The Agriculture outcomes, planning and programming from the Agriculture Lower Secondary Teachers Guide be incorporated or adapted for use for Making A Living subject taught in Upper Primary.
- It is recommended that all Agriculture teachers take biology as an essential prerequisite subject to teaching Agriculture.

Management, Finances and Resources

- The Agriculture Lower Secondary Teachers Guide (2006) stresses that each "School must have sufficient land to grow crops and raise animals. Agriculture cannot be taught from the blackboard." (p. 22). For Grades 9 and 10, it is recommended that the school program at least one double period per week for practical applied learning in Agriculture, but highly recommended to program for two double periods per week. Furthermore, the teacher's guide lists the essential resources and equipment for Agricultural units in the following Figure 1.

Figure 1: Essential resources and equipment for Agriculture units

Essential resources/equipment for Agriculture units	
All units that involve soil testing and crop production or forestry (agriculture and horticulture)	Land for gardens or nursery; soil samples; seeds and/or seedlings; agricultural plants; tools and machinery for planting, tilling and harvesting crops; fertilisers; weed and pest control products;
All units that involve livestock production	Land to run the livestock; food and shelter for the livestock; fencing materials; machinery and equipment to feed and care for livestock
Specialist options eg worm farming, aquaculture, farm technology	Worms and soil beds; ponds or tanks; fish or fingerlings; aquatic herbs and/or weeds; equipment and resources to construct simple farm tools

- The national government and provincial education administration should plan and budget to support schools to have the essential resources and equipment for Agriculture education. The salary for a farm manager position be funded for each secondary school who would also be responsible for securing the equipment and coordinating usage.

- There is a need for high quality learning materials with garden practices, nutrition guides, cooking guides and recipes etc.

- Schools should use advanced methods in gardens such as small machines, irrigation, high quality planting material. Money for a shed and fencing were also expressed needs. Schools can buy small scale machinery to teach upper primary of secondary students how to process foods, how to plough the ground using small tractors, and care and maintenance of these. The Highlands Agriculture Training College offers Certificate in rural engineering which covers water, mechanical, small engines, soil management.

- Teacher training colleges, and schools need to be able to visit a nearby model school farm with crops, livestock and fisheries, and where practicals can be experienced. This could be set up by the agriculture training institutions or at the teachers colleges. Improving the delivery by teachers at all levels of schooling of agriculture and nutrition is vital in PNG. A list of resources for agriculture is provided in the Agriculture Lower Secondary Teacher's Guide , (p.63).

- High schools that are successful with their school farms are located in rural centres or outside city centres where they have more land than urban schools, although some urban schools, as with Goroka have good land areas, and even small areas can be utilised effectively for education purposes. However, not all of this land is being fully

used, or used effectively, by the schools, and teachers colleges such as Holy Trinity Teachers College in Mt Hagen.

- Support system – advice, resources, encouragement, - dedicated school farm extension service. Very few schools had support or engagement with outside institutions, such as other provincial divisions of government or NGOs, but where this was provided it was found valuable. For example, Iarowari Agro-tech Secondary School had initial stocking of livestock and fish provided by Central Province Agriculture and Fisheries Divisions. The Taraka Primary School on the outskirts of Lae, explained how they used to have agriculture students from the University of Technology assist them during 1989 to 2017 with their school garden plots to help the teachers with their MAL Grade 7 and 8 classes, growing African yams and raising broiler chickens (these were consumed by the university students).

- Asaroka Lutheran Secondary School has had a valued partnership with Golden Grove Lutheran Church in Adelaide, providing annual support with agricultural and school equipment and supplies (but not since the Covid outbreak). It also had some assistance from China with mushroom production. The Benabena High School acquired a tractor from the Bena DSIP, but need more sustained engagement to make this productive. Water supply projects, e.g. from EU for Asaroka Primary school, have been valued.

- The Malabunga Secondary School is implementing the "farming as a small business" approach in their practical agriculture lessons and generating large amounts of money from the sales of agricultural produce, especially from the perennial crops. The teacher in charge for Agriculture has approached the Principal and discussed the need for the school to open a separate account to deposit the proceeds from the school farms called the "Self-reliance" Account which would be used to fund school agricultural and nutrition activities. The General Account is the main school Account used for the day to day running of the school or educational institute.

Student feeding practices

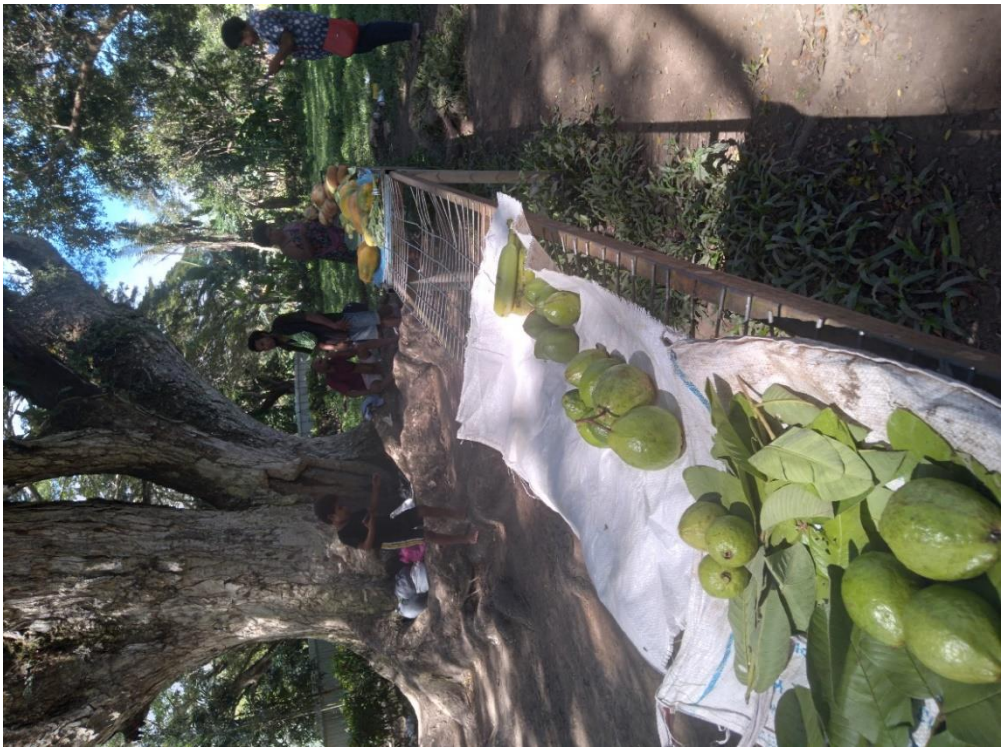
- The schools use their farms to sustain their livelihood to feed both staff and students. They also sell extras to the community and nearby stores. In most cases livestock (and fish) are sold for school income, rather than consumed in the mess, although some schools do provide occasional special meals with home produced meat (notably poultry or fresh fish).

- Schools that had a farm manager position (filled) performed much better than those that did not have such. Teachers usually did not have the time or resources to organise practicals or to tend the gardens between lessons. Maintaining school gardens sometimes was done after hours or on weekends by teachers and their families. They could organise the maintenance of the gardens, plan out gardens, which the teachers did not have the time or skills to do. Schools which previously had a farm manager, reported

that they had experienced a noticeable decline in productivity in the school gardens. The success of the school farms may be more related to the people available to run the farms – experience, commitment, and budgeting, and management capability. A similar finding applies to the presence of a fulltime school cook, who manages and prepares the program of school meals, including use of local produce.

- Two schools, reported by their provincial education adviser as model agricultural secondary schools in EHP (Benabena and Asaroka Secondary Schools) with extensive land, and Asaroka has extensive coffee planted, both have tractors (one provided from DSIP and the other from project fee, but without implements), but only use them for rice production (in 2020, but not in 2021 for Asaroka in the face of lack of labour during the period of Covid restriction, and late funds); rice is grown exclusively for fear of theft of fresh produce by the local community, as rice cannot be readily utilised without prior hulling. Indeed, the school has been conducting adult education with rice production and buys some rice off parents.

- The local vendors were found to play an important role in providing food and drinks to school children, particularly for the day students, who are largely not fed in the mess, ranging from 50 toea an item to K2 maximum per piece. Urban schools tended to have higher unit costs ranging from 50t to K5 for a meal pack. Some schools have policies to manage vendors on campus; they apply to be registered as a vendor; they are to obtain approval regarding the food sold, quantity and price; and have a duty teacher assigned to monitor the sale of the food items. Vendors can be given guidelines about food safety, and more nutritious food items. Some schools designate a space and provide tables for the food to be placed for sale, like at Mount Diamond Adventist Secondary School, and at Iarowari Agro-Technical Secondary School.



- Parental knowledge about preparing food for their child to take to school was successful where there was an active participation by parents in school meetings, where awareness was given and instructions on the type of food children can bring to school.

- School canteens were useful to have especially at boarding schools. An innovation was for the canteen to be managed with a separate bank account, run as a business.

The school would purchase rice and other items from the canteen for the mess. Teachers and students bought basic supplies and food from the canteen. Canteens are necessary for schools in rural areas. It is valuable for day students and also gives boarding students the option of buying tinned meat or frozen food (tray of chicken pieces), milk to cook in the kitchen for themselves, as well as beverages, like milo (and less healthy items, such as ice cream, where refrigeration is available). Many canteens are run by the commerce students, but with the focus on turnover and profitability, but not nutrition.

School Health Policy

In line with the *National School Health* Policy (Department of Health, 2015), the schools are to organise with the District Health Manager, on improving access of its Elementary and Primary School students to health services, possibly through arranging visits to schools on a quarterly or annual basis, to help reduce cases of diarrhoea, malaria, TB, and pneumonia, along with malnutrition, and food borne diseases. The Department of Health also has the *Integrated Management of Childhood Illnesses Policy* of 2014, where schools can work with the district coordinators to arrange visits to give awareness on the childhood diseases and provide treatment for students attending, or refer them to the nearest health facility.

2) Research question: How has the funding to primary and secondary schools changed since 1980, including consideration for boarding schools? What have been the funding models used previously and currently? What consideration is included, or could realistically/usefully be considered for agriculture, nutrition (including hygiene and sanitation) in elementary and primary school program for children (and mothers)?

All education institutions are very much dependant on government funding including faith-based schools and tertiary institutions. The government pays the salaries of school teachers, plus grants, including the functional grants and what was previously called Tuition Fee Free (TFF) Policy which was introduced in 2012 where the Government provided school fee subsidy. On the basis of a school census data provided to the Education Department, all schools received direct funding support. In 2016, there were three components of the TFF: 40% cash for administration, 30% for teaching and learning materials and another 30% for school infrastructure. The later component's expenditure was supervised by the District Education office. In 2015 Schools were stopped from charging project fees by the Government (at least in theory, although many schools found some ways around this to secure some complementary contributions to keep the school operational). An audit into TFF funds by the Government Auditor General's Office, revealed that K4.27 billion was appropriated from 2012 to 2018 but only K3.365 billion was given to all schools. The balance of K305.6 million was supposed to be for teaching and learning materials but was withheld and never released (The National, July 12, 2021, p.6). This reflects the major increased transfer of public funds to schools, partly displacing parental contributions, while also facilitating enhanced school enrolment and retention, as well as explaining the shortage of funding for teaching materials for subjects such as agriculture.

The current policy with the funding of schools throughout PNG, depends largely on the National Government Tuition Fee Subsidy (GTFS) policy which sets fee limits for each education sector institution, and the amount of subsidy to be provided for student units. Boarding schools (since 2020 and the discontinuation of the TFF) are supposed to receive K1,650 for lower secondary student, and K1,749 per upper secondary student boarders. These amounts represent 63% of the tuition costs, while parents are to pay 37% of the fees. In many cases it was found that during 2020 and 2021, to date, these amounts were received late or not received in full. DDAs have been set an allocation of 20% of their funding for school infrastructure in their districts under DSIP. Tuition fee distribution to schools has been administered centrally, with great concerns over the major delays during the year, although four provincial education authorities are now being given responsibility on a pilot basis, for administering this dissemination, hopefully in a timelier manner.

The GTFS applies to all schools, government and church-run schools. When parents are unable to pay the school fees, they may make payments in kind, but many schools experienced a major shortfall and /or delay in fees paid by many parents (with many only paying the initial K200 contribution, and schools directed by government not to restrict entry, if fees are not paid – providing mixed signals. In some provinces this has been exacerbated, notably EHP over project fees, with the Governor stating that he'd pay this amount for parents; but to date this has not occurred, leaving a major shortfall for the schools). In provinces with seasonal crops, such as coffee in the Highlands, schools are urged by parents to await the main harvest flush before the balance of fees are paid. In some case the value of the produce provided to the school is estimated and deducted from the student fees. In some cases cattle, pigs have been brought, and these are kept to establish livestock projects by the school, such as at Markham Valley.

Widely it was reported that the school management would allocate K4,000 to K5,000 to each subject area, including agriculture. This amount was inadequate for teachers to purchase text books, equipment and supplies to run a proper agriculture education programme for hundreds of students. Some schools did not receive the funds even by the May when the INA survey team visited. Some schools stated that project funds could be applied for, but that, although the provincial education officer was emphasising the new focus on agriculture and life-skills in schools, this hadn't permeated to school principals, who continue to put agriculture at the bottom of the pecking order, with little or no project funding provided

Alternative sources of funding will need to be accessed by the school. One such funding is the School Learning Improvement Programme (SLIP) which is a 3 year plan based at the district level to address the National Education Plan focusing on improving four areas: access, quality curriculum and monitoring, quality teacher education, and management. One such component can be developed to achieve school plans for improving school agriculture and nutrition. Separate funding mechanisms such as an account for the School agriculture, nutrition and sanitation could be designed. A School Garden Committee could be established to coordinate, plan and implement all their activities including outside stakeholders at the school level. While at the District level, the district education manager could organise across all schools and

stakeholders. WASH programme delivery can go hand-in-hand to provide water and sanitation at each school, as well as irrigation for school gardens.

In the years after Independence food and nutrition gained a high priority in government institutions, and also reflected in funding, with each province having a provincial nutritionist and with much larger provincial agriculture extension services, including those working on institutional foods supplies. This was followed by an extended lull, with funding support for health and nutrition badly squeezed and international funding and attention also limited. This has reverted in recent years, with greater attention again for food and nutrition, particularly with the findings from recent surveys showing high malnutrition rates. With this revived focus should come enhanced inter-agency cooperation, including with the Provincial Health Authorities needing to restore their Maternal Child Health (MCH) services to upscale their nutrition awareness and supplement feeding to pregnant women, mothers and children.

3) How have the national policy settings changed in regards to curriculum and syllabus offered in schools (primary through to TVET) in this time frame?

- The national Outcome Based Education (OBE) curriculum, which has provided a guideline to upper primary, lower and upper secondary grades, was launched in 2003, and is still in use today, despite the direction to shift to a Standards-based curriculum since 2012. The syllabus are being reviewed for transition to Standards-Based approach since 2019-2020.

- The national curriculum for SBE that is to be taught in primary and secondary schools

was developed by the National Department of Education, which includes agriculture and nutrition subjects, is yet to be rolled-out to primary and secondary schools.

The OBE approach entails the NDOE issuing the curriculum with Teacher Guides, which provide information about what to teach and describes ways of implementing the syllabuses. The Teachers Guides are supported by the In-service Units. Every Teacher's Guide is said to contain detailed information about the subject content, a broad range of ideas and strategies to help teachers use and understand the subject. Teachers are given the liberty to try out these ideas and can modify them to suit their local circumstances.

Upper Primary

The key features of the Upper Primary 'Making A Living' (MAL) is to "*provide practical learning experiences for students to acquire practical knowledge, skills, attitudes and values. These will assist the students to become self-reliant, innovative and use local resources sustainably to improve their quality of life and contribute meaningfully to their local community and society*." The content of MAL is organised into three Strands and three Substrands. Each substrand is expressed in learning outcomes, and relates to a particular concept, developed across Grades 6, 7 and 8. Within each strand, students will be applying the process of investigating, planning and designing, making or producing, marketing and evaluating. A copy of the Department of Education Making A Living Teachers Guide structure is in Figure 2 below:

Figure 2: Upper Primary School - Key concepts, processes and skills for Making A Living Subject

Strands	Concepts	Making a Living Processes and Skills
Managing resources		The following processes and skills apply to all Strands.
Sub-strand: Land and water	Sustainability	
Sub-strand: Environment	Conservation and protection	
Sub-strand: Crops and animal management	Food security	Investigating
Better living		
Sub-strand: Healthy living	Nutrition and hygiene	Planning and designing
Sub-strand: Care and management	Safety and management	
Sub-strand: Wise consumer	Money management	
Sub-strand: Making things	Creativity and innovation	Making or producing
Community development		Marketing
Sub-strand: Knowing communities	Relationships	
Sub-strand: Communication	Public relations	Evaluating
Sub-strand: Community projects	Social and economic development	

Source: Department of Education, 2003, p.5

Agriculture comes under the Strand 'Natural Resources' and Sub-strand 'Crops and animal management'. Here the Concepts taught are on sustainability, conservation and protection, and

food security. In this strand the students learn about the importance of farming crops and animals for their own consumption and use. Animals includes land and water animals. The Teachers Guide says that the student will:

- Develop understanding about the importance of improving food production,
- Apply appropriate methods for crop and animal production suitable to local conditions,
- Apply appropriate crop and animal management practices.
- Plan, design and implement crop and animal projects to generate income,
- Develop understandings of appropriate food processing and preservation practices.

Under the Better Living Strand, the Sub-strand 'Healthy Living' is organised where the concepts nutrition and hygiene are to be taught. The Teachers Guide says that the student will:

- Be aware of safety practices at home, school, and at the work place,
- Maintain personal cleanliness and safety at home, school or within the community,
- Apply traditional and introduced methods of food preparation, processing and preservation,
- Plan and prepare nutritious meals for personal consumption or for sale.

The MAL Teacher Guide further elaborates on the recommended knowledge, and recommended skills and suggested activities for each Grade 6, 7 and 8. These recommended skills and activities are listed for each Strand, Sub-strand, and links to Subjects, such as Science, Mathematics, and Social Science, under a specified Learning Outcome (MAL Processes and Skills). There is much detail and the teacher is required to make decisions on how to implement the many different activities and learning outcomes.

Most teachers are generalists that have training in agriculture. The teachers are left to their own to interpret the *Making A Living* subject for upper primary grades, and Agriculture Syllabus for secondary grades, and design the best way of teaching these subjects. All teachers complained that they did not have manuals, text books, materials such as posters, did not have the skills to do practical lessons. Interventions must be made in the teacher training institutions curriculum on how best to teach teachers to teach agriculture and business subjects, along with home science, personal development and health subjects regarding nutrition topics. Students need more exciting lessons on the subject, and teachers need to be better trained and supported with adequate resources, either as specialist teachers or those who are generalists.

Lower Secondary

Agriculture is part of the national curriculum learning area Culture and Community and builds on the knowledge and skills students have gained from Making a Living (MAL). The table below presents an overview of the strands:

Table 4: List of Agriculture topics by Level of Schooling

Upper Primary Making a Living - Strands	**Lower Secondary Agriculture Strands**	**Lower Secondary Agriculture Units**	**Upper Secondary (Senior High) - Strands**

• Managing resources • Better living • Community development	• Sustainability • Agricultural technology • Agricultural enterprise	Core • Agriculture in Papua New Guinea 1,2 • Agriculture Production Systems in Papua New Guinea 1,2 Options • Practical projects – growing crops, raising livestock, enterprise projects	• Crops • Animals • Aquaculture • Integrated Natural Resource Management • Agribusiness

Lower Secondary (Grades 9 and 10), is a compulsory subject to the students. Agriculture is an examinable subject at the end of Grade 10. The Agriculture Syllabus is thorough, complex, and is taught with much more theory and practical exercises, to prepare students for productive community living, integrate academic and practical education, and provide ways to paid and unpaid employment.

Senior High

The Agriculture Syllabus for Senior High, Grades 11 and 12, Standards-Based, was published in 2020. This Agriculture Syllabus is offered as an elective subject in Senior High School. The time allocation at this level for Agriculture is 200 minutes per week (three and a half hours). The Standards Based Curriculum agriculture syllabus, has already been set and printed since 2020, but has not yet been rolled out to secondary schools.

The key issues relate to teacher guides, teacher training in the design and implementation of the agriculture strands and units, and having the ability to achieve the benchmarks laid out in the syllabus.

4) Research question: How has the management and funding of faith-based schools changed over this timeframe? Are they more or less dependent on government funding and are they more or less regulated by the PNG Government? Has this influenced the success or otherwise of school farms?

The Churches Education Council (CEC) functions under the umbrella of the PNG Council of Churches. The member churches are the Catholic, Anglican, Lutheran, Evangelical Alliance, Four Square and United Churches. The CEC constitutes a platform to discuss education issues of concern to church-run schools (most of which are financed by the State) and teacher training colleges. It provides an interface with the National Department of Education, but it does not have a secretariat in the NDoE, as the CMC does in the National Department of Health. The

SDA primary schools have remained separate and independent of the government's funding, and are not a member of the CEC. With the exception of the SDA, all church-administered schools have little say in the placement of teachers and funding. The CEC Chairman, Michael Ova, made a pleas for the National Government to give the grants to the church-run schools as they had not received funding for the past 8 years (The National, February 25, 2020). Originally when schools collected school fees from parents, schools were able to operate better. However, since 2012 the 'Tuition Fee Free education' and subsequent subsidised fees have not enabled schools to be run smoothly. The model is not considered to be working.

Each church has its own organisational structure to manage their health and education services. The Catholic Church has its Catholic Education Agency for education headed by an general secretary. The *Catholic Diocesan Joint Ventures Agency Act of 1994*, gives responsibility and power to the Archbishop or the Bishop of a diocese to deal with property and finances to meet the objectives of providing facilities for education, to train school teachers, and to establish schools in PNG.

The *United Church in Papua New Guinea Incorporation Act 2020* covers schools, colleges and universities as instrumentalities of the church, and to be an education agency in accordance with the Education Act 1998. The United Church has the Assembly Education Secretary, and has an Education Committee that overseas and makes decisions on its education services.

The Anglican Church has the Anglican Education Division, The SDA Church operates in the education field through the Adventist Development Relief Agency (ADRA PNG). The Lutheran Education Department manage the schools for the Evangelical Lutheran Church (ELC) in PNG. The churches each have a decentralised system to manage their education facilities and schools throughout the country. For instance, the ELC-PNG operates as a decentralised model of service delivery via district based education secretaries, who are supported by the Lutheran Education Department (LED) consisting of management and training staff based at the headquarters of the ELC in Lae.

Consultation with the church agencies on strengthening agriculture and nutrition needs to be conducted, along with the government education authorities.

All church education agencies have to work with Provincial Education Boards regarding funding, personnel, and in-service training provided by the church agency to teachers and staff at their schools. The churches used to run their schools generally efficiently and provided quality education services, but now this is handicapped by funding delays and restrictions and education services have deteriorated.

One key informant recalled that the school he was based at in the nineteen seventies was already faith-based and did rely on government funding at the time. This reliance has increased. A small but significant study carried out in East New Britain and in Gulf provinces, sheds light on what is happening and how church-run schools have been affected:

"The TFF policy bans schools from charging parents fees; however, many schools are not following this directive. Nine out of the ten schools we visited were not adhering to the government's ban, and charges had increased (i.e., going to school became more expensive) between 2015 and 2016. This was partly a result of late and erratic delivery of government subsidies; it was also a reflection of the absence of other funding sources. We found that church-run schools in particular were threatened by these factors. …Since the introduction of the TFF policy, church schools have become far more reliant on national government funding (church schools we visited were even more reliant on government funding than government-run schools), and church administrators now play diminished role in school management and oversight. Enforced reliance on government funding has resulted in a national dispute over legal right of church schools to charge fees." (Walton, Davda, Kanaparo, 2017, pp. 2-3).

The government is providing teacher salary payment support to the Catholic, Anglican, Lutheran, Baptist and United Church, run schools. Teacher placements are determined by the national and provincial education authorities.

There are a number of church-run schools that have major agricultural programmes. This is consistent with their faith, but also for practical purposes to be self-reliant and be able to feed the student population and generate some income. The secondary schools and tertiary institutions which have large school farms (Over 5 hectares) are:

Mainohana Catholic School, Central Province 6 ha (Note that recent flooding had destroyed much of their rice crop).

George Brown Secondary School (United Church) 80 ha, East New Britain (ENB) which grew cash crops cocoa and balsa, and vegetables.

Asaroka Lutheran Secondary School, Eastern Highlands Province. 19 ha Coffee, Pine forest trees, upland rice and vegetables are grown, along with livestock (formerly).

The SDA Pacific Adventist University (PAU) in the NCD, and the Sonoma Adventist College in East New Britain (a campus of PAU), both have large agriculture programmes that feed their students. The PAU near Port Moresby, produces fresh food which is sold in Port Moresby. Apart from most of the teacher training colleges which are church run, the churches also run various technical and vocational schools and centres across the country, some with a major agricultural focus.

Dr Michael Bourke, who has worked with schools and other educational institutions in PNG over a long period, both obtaining information from staff there and helping them with their agricultural enterprises, reported on his visit in September 2019 to Kabiufa Adventist Secondary School near Goroka. "*The school used to grow temperate climate vegetables to raise money, but this has ceased, apparently because of a build-up of chemicals in the soil there. They currently have two programs: One is a teaching one for students in Grades 9 and 10. The other is the school farm which is run by a paid manager and produces food to feed 1300 students. This produces sufficient food to provide one meal a day to the 1300 students. The other meal consists of imported food (from memory rice and other foods). Kabiufa Adventist Secondary School has produced vegetables for over 50 years*." Hence, this is a

significant contribution towards student feeding programmes, which on average take up about 75% of the secondary school fees for boarders (with day students to some degree subsidising boarders) and TFF or tuition subsidy use.

When the government does not pay the grant on time (TFF or GTFS), church-run schools may appeal through the school board to the local diocese or circuit, for assistance. A Catholic-run school informed us that a loan would be provided to the school to be repaid later. In the case of one SDA secondary school, the school's budget is managed by the board, who would work with its local churches to raise funds to help the school.

5) Research question: How has agriculture and nutrition teacher training changed since 1980 for elementary, primary and secondary teachers?

In PNG two institutions used to prepare secondary science teachers. One was the former Goroka Teachers College (GTC, now UOG) which offered prospective teachers a Diploma in Secondary Teaching after a two year course from Grade 12. The great majority of secondary teachers took this course. Secondary agriculture teacher training in the 1980's was a one year addition at Goroka Teachers College to a 2 year certificate in agriculture. The certificate in agriculture was very practical (Interview notes from Rufina Peter). The University of Goroka was established in 1997, taking on the GTC and the Bachelor of Education course, and has continued to produce the majority of secondary teachers for the nation.

The University of PNG Faculty Of Education offered a small minority a Bachelor of Education course until the University of Goroka was established.

W Palmer argues that the content of GTC science courses in the 1980s was "*based on the topics that teacher trainees will have to teach rather than on what staff consider educated scientists should know. In fact, Guthrie (1983) gave the general opinion of GTC teachers as 'good teachers professionally but lacking in detailed subject knowledge'. ...GTC courses thus seek to train more than they seek to educate, regrettable though this may be*." (Palmer, 1987. p159). This could shed light on the training of agriculture teachers, where the curriculum may concentrate on what is to be taught in schools, rather than educating the teacher to develop a quantitative and scientific approach to agriculture and how best to teach it to students in different grades and cultural contexts.

There are currently twelve Teachers' Colleges that provide a Diploma in Primary Teacher Education and two colleges that provide a Bachelor of Education (one for Primary and another for Secondary Teaching) (See Table 6 and Table 7).

The University of Goroka offers a range of academic programs that could be considered for School Agriculture and Nutrition Education as follows:

Diploma in Agricultural Extension
Diploma in Health Education
Diploma in Health Teaching

Bachelor of Agriculture Extension
Bachelor of Agriculture (In-service)
Postgraduate Diploma in Science - Agriculture

The structure of the courses at University of Natural Resources and Environment (UNRE) focuses on improving the practical ability/competency of graduates by including entrepreneurship/management and extension in the case of Agriculture graduates. The KAIRAK farmer training extension centre at the UNRE, is a well-suited avenue for the agriculture students to be involved in donor funded training and extension programs such as Public Private Agriculture Partnership (PPAP) and its successor program. The KAIRAK farmer training & extension set up not only gives students the real life practical experience but it also exposes and enables students to learn emerging approaches and models of development not taught in the University such as the Farm Family Team Approach to extension which promotes a family vision, financial literacy, gender roles in the context of a Farm Family Team and the importance of nutrition.

The Highlands Agriculture College (HAC) offers a Certificate in rural engineering which covers water, mechanical, small engines and soil management. According to the Higher and Technical Education Strategic Implementation Plan (2017-2038), the Highlands Agriculture College would become a specialist agriculture college.

Reforms are being implemented with respect to teacher training education, tertiary training in colleges and universities in PNG. The PNG National Executive Council Decision 25/2017 and subsequent directives, the registration and accreditation function for all universities, TVET and business colleges, teachers' colleges, nursing colleges and speciality colleges, which were regulated previously by the Department of Education, the Commission for Higher Education, and by the National Training Council, are now under the responsibility of Department of Higher Education Research Science and Technology (DHERST), and the National Higher Education and Technical Education Board. There are twelve Teachers' Colleges that provide a Diploma in Primary Teacher Education and two colleges that provide a Bachelor of Education (one for Primary at Sonoma Adventist College (which also offers a Diploma in Tropical Agriculture) , and another for Secondary Teaching at St. Peter Chanel Catholic College), both located in East New Britain.

The UNRE offers Diplomas, Advanced Diplomas, and Degrees in Sustainable Tropical Agriculture, Sustainable in Fisheries Marine Resource Management, in Sustainable Tropical Forestry, and Sustainable Livestock Production.

The HAC College was established in 1973 by the Department of Agriculture and Livestock (DAL) but transferred to the Ministry of Higher Education, Research, Science and Technology (DHERST) in February 2021. A new governing council is to be set up under DHERST. The Department of Agriculture and Livestock (DAL) previously ran several regional agricultural colleges around PNG, two of which subsequently became UNRE in Vudal, ENBP and the UNRE campus in Popondetta, Oro Province. The HAC offers: Diploma in Post Certificate Diploma (Tropical Agriculture); 1 year. Certificate in Agriculture Farming Stage 1. Certificate

in Agriculture Farming Stage 3 (2 years). Certificate in Operational Skills in Agri-business (1 year). The HAC courses were designed by Lincoln University in New Zealand during the 1990s, and an academic approval process was operated by the DAL. These courses remain, together with subsequent revisions. An observation was made by a former employee (from 1978-1984) suggesting an increasing reluctance of new (PNG and expat) staff to get involved in practical agriculture.

Graduates from UNRE, UNITECH and UOG can go on to complete a Diploma in Secondary Teaching at UOG to be qualified to teach in secondary schools. The PNG University of Technology in Lae, offers a Bachelor of Science in Agriculture, along with the Department of Applied Sciences which offers a Degree in Food Technology covering subjects on nutrition and food safety.

- The National Education Plan 2020 – 2029, has a set of 'Minor Outcomes' that address standards-based curriculum (SBC) development and teacher training during the plan period. The table below provides the layout for the three minor outcomes and activities:

4.1 That all new teachers have undergone an effective pre-service education.
4.2 That a teacher upgrading program has been implemented.
4.3 That all teachers regularly participate in a program of In-Service teacher professional development.

The NDOE Teacher Education Division is to work with DHERST, PNGEI, and the UOG, to achieve these outcomes. It is recommended that the review of the agriculture and nutrition curricula are inserted into these plans, along with activities to train agriculture and nutrition teachers.

Figure 3: Plan for Teacher Training 2020 - 2029

Minor outcomes and activities

Activity	Output	Outcome	Resp.	20	21	22	23	24	25	26	27	28	29
Minor outcome 4.1: That all new teachers have undergone an effective pre-service teacher education program													
4.1.1. To complete the relocation of the Primary Teachers Colleges to DHERST	Colleges under auspices of DHERST	Well prepared teachers in all schools	TED DHERST										
4.1.2 To realign the pre-service programs with the new SBC	Updated primary teachers college curricula		TED DHERST										
4.1.3 To work with DHERST to develop a plan for the development of teacher education programs	Five year rolling plan for primary teacher education		TED DHERST										
Minor outcome 4.2: That a teacher upgrading program has been implemented													
4.2.1 To develop and deliver a conversion program for elementary teachers	Elementary teachers capable of teaching lower primary grades/ Prep	Teachers prepared for the 1-6-6 restructuring program	PNGEI										
4.2.2 To develop and deliver a conversion program for primary school teachers	Primary qualified teachers capable of teaching the junior secondary grades		PNGEI										
4.2.3 To provide opportunities for non-education university graduate teachers to gain a PGDE	Fully qualified first degree holders capable of teaching senior secondary grades		UoG										
Minor outcome 4.3: That all teachers regularly participate in a program of In-Service teacher professional development													
4.3.1 To support the facilitation of In-service Training activities.	Annual NIST / PIST week for all teachers	Professionally trainned and In-service teachers	Provinces										
4.3.2 To prepare teachers for using a Standards Based curriculum and the CCVE	Teachers equipped with knowledge of SBC and CCVE		TED ID CDD										
4.3.3 To develop and deliver short courses for teachers and leaders in all sectors.	Set of courses prepared for teachers		TED ID CDD										

Source: Department of Education. National Education Plan 2020 – 2029, p. 49

Responses towards to reforms

According to the University of Natural Resources and Environment (UNRE) staff interviewed, the recent changes and direction from the Department of Higher Education Research Science and Technology (DHERST) to the universities is providing uncertainty and affecting the quality of education and is therefore of great concern to the UNRE. Specifically, DHERST has directed the Universities to reduce the number of subjects from 6 to 4 resulting in the lack of depth in the foundational/fundamental agriculture courses owing to amalgamation of subjects to meet the new targets. Some colleges, such as the National Fisheries College, are concerned at being removed from the relatively well resourced National Fisheries Authority to come more directly under Higher Education, which is generally less well resourced, with concern, as expressed by some staff in the agriculture colleges over the years, that the colleges will be less attuned to the needs of the sector and future employers.

In addition, under the current curriculum the students get a general agriculture degree. DHERST wants UNRE to shift to produce more specialized agriculture students (Crops & Livestock). The concern for Animal Science/Livestock is that the Livestock industry in PNG is not developed and as such there is no demand for specialized Animal Scientists. The Curriculum

should be market driven, they argue, rather than conceptual and driven by education curricula and models that may have been successful in other countries but are not relevant to the PNG context. Furthermore, they argue, the number of teaching weeks has increased from 10 to 14 per semester tiring the lecturers, and undermining potential for academic research, and implicitly affecting the quality of content and delivery of courses and university education.

Secondary Schools

Under the original standard based education for grades 7 to 10, Agriculture as a subject was allocated three 40 minute periods per week; one period for theory in class and a double period of practical sessions. Home Economics comprised a double period per week which taught nutritional value of food and how to prepare and cook nutritious meals using organically grown fresh produce from the agriculture plots. Specialized agriculture teachers usually taught agriculture in High Schools (Grades 7-10). Commerce was also allocated two single periods per week.

There appears to have been a lack of standard approach to teaching Agriculture and Nutrition/Home Economics under OBE. The design of the practical agriculture lessons differ between schools depending on the availability of specialized agriculture teachers, and influenced by the university from which these teachers graduated.

A Principal expressed that "*under the current curriculum, agriculture, nutrition and hygiene is provided as an optional subject to all students and hence resource allocation to these subjects are low. Food is important for human survival. When it is a core subject, resource allocation for agriculture, nutrition, health and sanitation will be accorded high priority. The government should also put priority in agriculture teacher training at tertiary institutions. This should accompany a change in policy from Outcome-based Curriculum to Standard based Curriculum as before because it worked well",* (notes from Rufina Peter).

There is a new agriculture syllabus for secondary schools, which is "Standards-Based", produced by the Department of Education. None of the Secondary schools visited had yet seen or heard anything about the new syllabus and were still using the outcome based agriculture curriculum. Although the rhetoric was strong on agriculture (from national government and in most cases provincial education advisers, but not yet so much from the Education Department/Curriculum Division, etc.), little or no resources have been provided to make sure it has been effectively implemented yet.

School lessons on agriculture are dependent on the leadership provided by the teacher, along with the level of support from the principal. The Malabunga Secondary School agriculture teacher, who is a graduate of UNRE, designed the agriculture lessons and practical classes with farming as a business focus. Specifically, Grade 12 agriculture students run the agriculture plots/farms as a small business. Students are assigned specific positions/roles in the farm business, which included Manager, Treasurer and the rest as fresh produce farmers, who will grow the crops. The ITC Agriculture also designed the perennial crop "Cocoa Block Management Practices" including selling of the cocoa beans as the major project. The concept

of farming as a business being implemented in the school is as a result of being a graduate of UNRE, which implements the Applied the Natural Resource Management (ANRM) approach.

While there are specialized Agriculture Teachers, there are also general science teachers teaching Agriculture, as well as Business Studies teachers.

Primary Schools

Under the outcome based education curriculum, agriculture is taught as a topic within the subject "Making a Living (MAL)" which includes Home Economics and Business Studies. In the Upper Primary Grades (6-8), MAL comprises of Agriculture, Healthy Living, Personal Development (PD covers nutrition). In the Lower Primary grades of 3-5, MAL comprises of Health & Social Science with the latter covering nutrition.

There are no specialist agriculture teachers in the Lower and Upper Primary schools resulting in generally only theory classes being taught, without practical agriculture classes. MAL seems ineffective in teaching agriculture and nutrition relative to SBE.

6) Research question: What is the expressed demand for agriculture and nutrition education from students, parents and teachers?

During the school visits, the expressed demand for agriculture education largely came from school teachers (including many principals as well as agriculture teachers), lecturers, provincial education officials and from Education Department officials, including in the Curriculum Division. The teachers see that most of their students would leave school, largely between Grade 6 – 10 and return to their homes in the village without any formal sector employment opportunities. Teachers and provincial officials believe that school leavers should have a set of skills in agriculture to become self-reliant and to generate an income from selling agricultural products. A survey of student perception on agriculture (n=60), reported that urban secondary school students in Lae stated that they would likely be engaged in agricultural activities in the future and would benefit from their schools' studies in agriculture (Quartermain, Alan, D. Openg, 2018). The study concludes that although students think that agriculture is a subject involving hard physical labour, this mentality can be changed if the teacher can prepare well and make learning interesting and present the subject so as to generate "deep learning experiences", including practical lessons and excursions (ibid. p. 23). Certainly, as stated by the agriculture teacher at Asaroka, and students at Iarowari, there's appreciation for gardening and other agriculture activities if students see the output (and can boost their food intake and variety), but not otherwise.

Parents approached a deputy principal in Kui Wampnga Secondary School wanting to know why agriculture was not being taught practically. He was asked to raise the matter at the P&C meetings. On the other hand, parents at another school in Kokopo expressed that they did not want their children to study agriculture (as reported from some other schools around the country, e.g. in rural Madang), and that they were there to learn other important academic subjects. While agriculture may not always be seen as a good future, teachers understood the reality for many of their students who would not continue on to further their education. Secondary school students, as at Asaroka, asked what their ambition was tended to emphasise

the formal sector careers in medicine, as a pilot, or geologist, and many parents also see school as a potential ticket into the formal sector and away from the village and subsistence production; however, the realities of the prevailing PNG job market are recognised by many teachers, provincial education advisors and in the education Department, namely that the majority of school students in PNG will not currently secure formal sector employment or gain tertiary education opportunities and that practical skills are required to support, rather than undermine, continued life in villages, and rural livelihoods.

The Provincial Education Advisor in Morobe Province said that the administration would like to roll out the Morobe School Gardens Project to all schools in the province. The Project will have a focus on increasing local food production and creating opportunities for local community members to work on school farms. The Education Advisor, Mt Tangui said, "If we don't grow our own crops we will just eat rice", and that it was important for students to know how to apply fertilizer, and know about different types of pigs, for instance. The pilot project would be rolled out into MAL and other subjects. The Education Advisor in the Eastern Highlands emphasised greater self-reliance and moving to agricultural secondary schools, including greater school agricultural production both to enhance food and nutrition and reduce dependence on tuition fees.

The Future We Want: Voices from the People of Papua New Guinea (DNPM and UNDP, 2013) provides the result of country consultations with 343 participants from vulnerable groups (women, youth, girls and boys, people living with disabilities, PLWHA, Sex workers, LGBT, Urban Poor, Rural Poor, health groups, refugees) throughout PNG, who gave the following responses:

"*Ultimately, all vulnerable groups in urban and rural areas expressed the need to have access to clean water, proper sanitation, nutritious food to eat, and receive skills training to become employable, productive and self-reliant, and learn how to be more responsible parents and empowered citizens.*" (p.27)

When women's groups were asked what they needed to live well, the finding was: "*To live well for women, also means to have access to affordable basic services, namely health, electricity, and transport, as being important. The women's group also mentioned the need to eat good food, and have land available for the family. Women stressed the need to maintain a safe environment for everyone. Women want to be part of the community decision making process, having community meetings to identify ways to solve problems, have community laws. They also wanted effective law enforcement, laws to protect children and stop polygamy, to control gambling and the consumption of alcohol. To have skills training, and access to income earning opportunities and employment, particularly in agriculture, and markets to sell their produce.*" (p. 30)

Clearly the community demands agriculture education and better nutrition, along with income earning opportunities, even if some parents are concerned at loss of emphasis on subjects that might provide other careers for their children. Female students should be encouraged along with boys, to take up these subjects. It may be noted that in most schools the girls participated

equally in the agricultural activities with the boys, with only a few schools mentioning some division of tasks

7) **Research question: What is the trend in recruitment, training and placement for agriculture teachers or teachers with a agriculture and nutrition responsibility since 1980 (including the requirement for teaching qualifications against the prior provision of agricultural college graduates)?**

Information gathered from the training institutions revealed that the current number of students enrolled for training in at least 13 primary teacher colleges around the country in 2021, totalled at least 5,729 students. Statistics were unavailable for 5 of these colleges). At least six of the 13 colleges confirmed through the survey or by their public information, that they provide agriculture training.

Table 6: Primary Teacher Collage enrolments for 2020-2021, and Agriculture

Name	Agency	Location	Year established	Enrolments
Balob teachers' College	Lutheran	Lae, Morobe		1,058
Dauli Teachers' College	Evangelical Church Of PNG	Tari, Hela		700
Enga Teachers' College	Government	Wabag, Enga		700
Gaulim Teachers College	United Church	Rabaul, East New Britain	1966	
Holy Trinity Teachers' College	Catholic	Mt Hagen, Western Highlands	1957	701
Madang Teachers' College	Government	Madang		
Melanesia Nazarene Teachers' College	Nazarene Church	Tumang, Jiwaka		
Kabaleo (DWU) Teachers' College	Catholic	Kokopo, East New Britain	1966	440
Sacred Heart Teachers College	Government/Catholic	Bomana, NCD		700
St Benedicts Teachers College (DWU)	Catholic	Wewak, ESP		
Simbu Teachers' College	Government	Simbu	2013	1,030
Sonoma Adventist Coll+A16:I22ege	Seventh Day Adventist	Rabaul, East New Britain		
Christian Leaders Training College (TBC)	Christian organisation	Waghi Valley, Jiwaka		
St Peter Chanel College	Catholic	Rabaul, East New Britain	2014	400
TOTAL				**5,729**

Table 7: Training Institution Enrolments, Secondary Level 2021

Name of Institution	Department of Agriculture student number	Total Enrolment
University of Natural Resources and Environment	350	750
Highlands Agriculture	152	152
University of Goroka	N/A	3,500

Information on the number of enrolments or graduates for each of these programs was not available.

An observation by one principal was that not many agriculture trained teachers are coming out of training colleges and universities. As the subject is an elective, staff with agriculture background in schools are also limited. "*I have noted that new graduates have only one subject major unlike before where intending teachers were required to train in two subject areas. Most new graduates come out specializing in one of the core subject areas of either English, maths, social science or science leaving out the elective subjects.*"

The Department of Agriculture, Stock and Fisheries (subsequently, Department of Primary Industry and Department of Agriculture and Livestock, since 1987) established 3 agricultural training institutes, first with Vudal in 1965 (now UNRE), which used to offer three year diploma courses and then the Popondetta and Highlands Agriculture Training Institutes in the 1970s, which offered two years certificate courses. They were subsequently renamed agriculture

colleges, together with the Sepik Agricultural College in Maprik, but Vudal was then incorporated into the University of Technology in 1992, the same year as the Sepik college closed down. The Vudal campus was then established as an independent Vudal university, incorporating the Popondetta campus, in 1996, and renamed UNRE in 2005. Popondetta's status was uncertain during the 2010s, reverting to an agricultural training institute for six years, before a direction from DHERST to be reabsorbed into UNRE during 2021. Efforts were made to restore the Sepik college, first as a campus of UNRE in 2012, and recently in 2021 as a campus of UOG, to offer three year Diploma courses in agriculture. Until the requirement for teacher training qualifications, most primary school agriculture teachers had been the products of the four agriculture colleges.

The Highlands Agriculture College (HAC), established in 1973, remained under DAL administration until 2018, before its transfer to the auspices of DHERST. It has produced well over 3,000 graduates, and over 2,000 trainees in Certificate in Farming, including short specialized training courses and in-service courses. It had received limited funding support for many years, but gained some upgrade in facilities in 2019. HAC also since 2007, continues to conduct three programmes concurrently: (1) the Post Certificate Diploma (PCD) programme, the Certificate in Farmer Training (CAF) and short ad-hoc courses, including Operational Skill, Rice farming and HIV/AIDS. The HAC reported that 150 students graduate each year with certificates, and diplomas.

The Principal of the Highlands Agriculture College explained the following points:

- That many students did not make agriculture their first choice when applying for tertiary places and scholarships. It was a third choice or not at all. In some cases they were "forced" to attend the college, and would later accept the study program.
- The interest in agriculture has dropped because other optional subjects like information and computer technology are on high demand. Some schools in urban centres do not offer the course due to limited land for practical farming.
- At a meeting he attended with the University of Goroka to plan for HAC graduates to continue on to do a diploma in education at UOG, a remark was made by a UOG official that only two out of four of the recruits from HAC were suitable as agriculture teachers.

The Department of Higher Education, Research, Science and Technology has given a Service Contract to the University of Goroka to redevelop the former Sepik Agriculture College at Bainyik, Maprik District to offer its Agriculture and Rural Development programs. A three-year Diploma in Agriculture program will be offered at the Bainyik Campus beginning 2021. On successful completion of this program in 2023, the top 20% of the cohort will be selected to do another year of study to obtain a Bachelor of Agriculture degree.

Teacher Training

The training of teachers is a key aspect to implementing agriculture education. The national policy settings continue to change. Following NEC Decision NG25/2017 and section 5 of the Higher Education and Technical Education Reform Act 2020, and the Gazette Notice of 28

May 2021, all public teaching colleges transferred to the authority of DHERST (and the Higher Education Board) from 30 May 2021, with Technical Colleges (including fisheries, maritime and other such specialist facilities) following on 30th June 2021, joining the other tertiary education institutions already under DEHERST's responsibility. The teachers' colleges were managed by the Department of Education and the National Education Board up until this point. A Teacher Colleges' Technical Working Group was set up to facilitate the transfer from one Ministry to another. This group comprises officers from both the NDOE and DHERST, representatives from the Church Agencies, the Teaching Services Commission, the PNG Teachers Association and UPNG.

It is not clear at this stage how the DHERST Implementation Plan and the Working Group will reform the teachers colleges. However, it is useful to highlight the *Education Sector Strategic Plan 2011 – 2030* lays out a set of strategies for teacher education which should be applied to agriculture education. These are as follows:

T1.1 Redesign teachers college curriculum to reflect needs in schools and the reform curriculum.

T1.2 Update teachers college curriculum on a regular basis to reflect changing needs.

T1.3 Develop alternate pathways for teacher education.

T1,4 Establish a National Professional Standards Framework.

T1.5 Conduct an ongoing program of professional development.

Some of the Specific 2030 Targets listed, could include agriculture teachers.

T2.4 That all upper secondary school teachers have a subject degree qualification.

T2.5 That all teachers take part in professional development activities on an annual basis.

The *Higher Education Strategic Implementation Plan 2017-2038*, highlights the recommendations of the Review of Outcome Based Education as: Strengthening national and regional centres of excellence of higher education in the following selected priority areas: agriculture and livestock, health sciences and health delivery support services, engineering, ICT, business enterprise, training of teachers and educational managers (page 10). Task 2. Build modern Science and Technology infrastructures in agriculture and livestock, engineering, health services, ICT, TVET and teacher colleges (page 18).

It is not clear at this stage how the DHERST Implementation Plan and the Working Group will reform the teachers colleges. However, it is useful to highlight the *Education Sector Strategic Plan 2011 – 2030*, which lays out a set of strategies for teacher education which should be applied to agriculture education. These are as follows:

T1.1 Redesign teachers college curriculum to reflect needs in schools and the reform curriculum.

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Some of the Specific 2030 Targets listed, could include agriculture teachers.

T2.4 That all upper secondary school teachers have a subject degree qualification.

T2.5 That all teachers take part in professional development activities on an annual basis.

A set of recommendations, quoted from Quartermaine and Openg, are as follows.
"Teachers of Agriculture need to be helped if necessary to understand the importance and benefits of agricultural education. Teachers must be given regular and specific in-service or refresher training to help them:

- Plan, prepare and teach agricultural lessons using appropriate and effective approaches and activities;
- Effectively utilize double period for practicals; and,
- Create and implement interesting agricultural learning activities which will help the students develop agricultural knowledge, skill and values.

Schools must develop facilities and plan activities that can be carried out in adverse weather conditions, and teachers given training to ensure adequate agricultural activities can be organised during rainy periods instead of just cancelling classes." (2018, pp 23-24)

In the case of the Highlands Agriculture Training College, all salaries and land (198 ha) is owned by the Department of Agriculture and Livestock (DAL). 35% is currently in use, of this 55% is used for cattle. 7 ha for coffee and 4 ha for sweet potato. DHERST scholarships and government subsidies, and tuition fees from parents, goes towards the operations and mess, dormitories, and teaching resources for the college. It is uncertain as to how DHERST will support HATC, but a development plan has been submitted.

There is no monitoring of graduates by the teacher colleges or universities. The placement of teachers is done by the NDOE in consultation with the Provincial Education Boards, and the schools, and, perhaps surprisingly, even the UOG Agriculture Department has no system of tracking of past graduates, leaving them little knowledge of whether they end up teaching or in the agricultural field or elsewhere.

5. SCHOOL AGRICULTURE AND NUTRITION QUESTIONNAIRE RESULTS

The main results from questionnaires administered during the survey
The school questionnaire was primarily a qualitative survey but there were some statistics that were gathered.

Most boarding schools were established before Independence in 1975, although they have grown in scale very considerably; a few, such as Goroka secondary school have reverted to becoming a day school only, partly as a result of the size to which it has grown and the impractiality of administering a boarding compponent; (it's size is partly a reflection of its own academic success and therefore appeal over the years, as well as its central location in growing town and province).

Question 1: Name of school, number of students and boarders?

Table 8 below shows the total size of the number of students currently studying agriculture, as a compulsory subject in Lower and Upper Primary classes. On average, 41% % of students enrolled, are undertaking agriculture related subject across Grades 6 to 8.

Table 8: Number of Primary School students currently enrolled, taking agriculture subject, by school and sex, 2021

	School name	**Total enrolled**	**Grade 6 Males**	**Grade 6 Females**	**Grade 7 Males**	**Grade 7 Females**	**Grade 8 Males**	**Grade 8 Females**	**Total**	**% of enrolment**	**% females**
1	Sogeri Primary	418	20	29	34	25	40	43	191	45%	50%
2	Kerekadi Primary	NA	28	17	34	23			102		
3	Taraka Primary	NA	327	313	320	314			1,274		
4	Ragiampun Adventist Primary	328									
5	Lelehudi Primary	NA	37	29	29	40			135		
6	Kapakamarigi Primary	400	36	14	34	25	40	43	192	48%	42%
7	Tudungan Primary	799	57	32	50	34	36	44	253	32%	43%
8	Vunairima Primary School	466									
	Total	**2,411**	**505**	**434**	**501**	**461**	**116**	**130**	**2,147**	**41.6%**	**45%***

*Average

For secondary schools, on average 35% of the total number enrolled from Grades 9 through to Grade 12 for selected schools, were taking an agriculture subject (See Table 9). On average 51% taking agriculture subject were female.

Nationally, the number of students drops by 72% after Grade 10, into Grade 11. The number of students taking up agriculture in Grades 11 and 12 dramatically reduces six fold. For Senior High School, agriculture is taken as an elective subject. The range of class sizes for agriculture ranges from 10 students in Grades 11 and 12, as in the case of Mainohana Secondary School, and a maximum of 93 students as in the case of Goroka Secondary School.

Table 9: Number of Secondary School students currently enrolled, taking agriculture subject, by school and sex

Name of school	**Total enrolment**	**Number agriculture students (Grade 9)**		**Number agriculture students (Grade 10)**		**Number agriculture students (Grades 11&12)**		**Total agric students**	**% of Agric students**	**% female Agric students**
		M	**F**	**M**	**F**	**M**	**F**			
Goroka Secondary	3,600	240	240	240	240	56	37	1,053	29%	49%
Markham Valley Secondary	1,391	227	204	229	200	-	-	860	61.8%	46.9%
Cameron Secondary	900	38	57	23	34	36	54	242	27%	58%
Mainohana Catholic Secondary	547	33	31	25	32	5	5	131	24%	52%
Total	**6,438**	**538**	**532**	**517**	**506**	**97**	**96**	**2,286**	**35%***	**51%***

*Average

Question 2: Distance from the nearest service centre/ main store (hours/minutes) for secondary school students

On average, it takes 35 minutes to travel one way to the twelve secondary schools. The secondary school in the survey that was the furthest away from the main service centre is Markham Valley Secondary School, which is over two hours away from Lae City (see Table 10).

Table 10: Distance and cost of travel to school by students

Name Of The School	**Distance To Nearest Shops and Main Business Centre**	**Write Cost Per Student And Travel Mode**
Goroka Secondary School	The school is in the town area. Students can travel up to 45 minutes (from Daulo and Henganofi) from out of town (notably from Daulo and Henganofi).	K1.00 to K4.00 for a return trip depending on the distance.

George Brown Memorial School	40 - 45 minutes to Kokopo town	Tomu Area (most students reside) with Rabaul Area - K3.00. Kerevat Area - K4.00 & Napapar Area - K2.00 K10.00 for a return trip for students that come all the way from Kokopo town
Benabena Secondary School	45 minutes to 1 hour drive to Goroka town	All students are boarding students
Asaroka Lutheran Secondary School	45 minutes to 1 hour drive to Goroka Town	K4 for a return trip per day for a student coming from Daulo or Goroka Town
Kui Wanpnga Secondary School	10 - 15 minutes' drive to Hagen Town	K2 from Hagen Town to school. From villages the cost is different. K4 from Hagen Town to school & return
Markhan Secondary School	90 - 120 minutes (2-3 hours) to Lae City. 10 minutes to Mutzing Station.	90% of the student population are boarders. Few day students pay up to K2 to get to school from within the District. It costs K20 to and from Lae City
Cameron Secondary School	3-10 minutes	K2 to travel to school from town and return.
Hagita Sacred Heart Secondary School	45 minutes to Alotau town	K4 two ways
Mainohana Catholic Secondary School	10 - 15 minutes' walk to Bereina station 1-2 hours' drive to Port Moresby	K20 one way to Port Moresby city
Iarowari Agro-Technical Secondary School	5 minutes walk to shops at Sogeri. 45 minutes to Port Moresby	K5.00 one way for students that live in POM and travel to school. Other students living in nearby communities walk to school
Mount Diamond Adventist Secondary School	20 - 30 minutes to Port Moresby	School truck and hire private PMV bus to transport students to and from school. (20km) K10.00 for 5 students. It is K3.00 from Bautama to school (1 hour walk). For those few day students that travel to school by PMV bus the fee is K10.00 return trip
Average	35 minutes	Main form of transport to school is by PMV.

		Average return fare to and from school is K4.80

Question 3: What is the most commonly used mode to travel to the nearest Service Centre by teachers from the school? How do students normally travel to the institution/school? What is the average cost of travel to and from schools for students?

Table 5.3 indicates that the most common mode of transport to and from school, whether by teachers, day students or those going home for the weekend each fortnight, is by Public Motor Vehicle (PMV), costing on average K4.80 return fare. Day students can pay up to K10 return trip to and from school, or up to K40 return trip to the city. Some schools provide accommodation for most teachers, others for a smaller portion, with a few teachers commuting from nearby towns, as with Iarowari Secondary school commuting daily from Port Moresby

Question 4: Does this institution/school have land for agriculture? If yes, how many hectares or square meters? What are the crops being grown by the school currently?

Table 11 shows that on average primary schools in the survey have 1 to 2 hectares to farm on. Primary schools largely ask students to bring their own tools from home. The same table shows that primary Schools are growing a range of crops in school gardens. Primary Schools on average have 1.7 hectares of land to farm. The MAL teacher at Sogeri Primary School (where the villagers have provided about 1.2 ha for a school garden) explained that she decided to grow cassava with corn so that the whole cycle could be covered in a few months (planting, maintenance, harvest, storage, food preparation). Other crops took much longer to grow. In most cases the class sold the produce to teachers or local market, to raise money for their end of primary school year party. Only two schools raised chickens (in the past), and another school kept a pond with 12 fish. A few primary schools are growing cash crops, such as vanilla beans, coffee, and cocoa. These schools reported the number of vines and trees that were being grown. However, for the vegetable crops they did not count or weigh the produce, nor did they keep records.

Table 11: Primary School Land Available and Crops and Livestock Farmed

Name of Primary school	Land available for gardens	Crops and livestock grown past and current
Sogeri	0.1	Cassava with corn (but stopped with Covid-19).
Kerekadi	1.5	Tapioca, Sweet potato, Pumpkins, Watermelons, Beans, Cucumbers
Taraka	0.3	African yams. Chickens

Ragiampun Adventist	2.5	Vanilla, Cocoa, Banana, Pakchoy. Fish pond.
Lelehudi	0.1	Peanuts, Cabbages
Kapakamrigi	2	Sweet potato, Corn, Banana, Pakchoy & a coffee block
Tudungan	3.5	None
Vunairima	3.5	Pakchoy, Corn, Aibika, Bean, Watermelon. Land preparation for rice.
Total	13.5	
Average	1.7	

Secondary Schools in the sample generally have larger plots of land for agriculture where the size ranged from 1 hectare (ha) at Malabunga Secondary to 19 ha at Asaroka Lutheran Secondary School and 21.3 ha (school farm) at Benabena Secondary School, with 16 ha of it arable. Markahm Secondary has 7 ha of arable land for agriculture. Table 5.5 below indicates the average size of land is 6.4 ha for each school. The schools with large blocks invested in tractors (and sometimes ploughs and other instruments, although in many cases these have not yet been acquired). The schools supply spades, digging forks, irrigation system, and wheel barrows. Students are required to bring their own grass knives. Table 12 below, reveals that the main starchy carbohydrate crops grown by secondary schools is cassava and sweet potato. Mt Diamond produced some six hundred kilograms of cassava and Iarowari some 250 kilograms were harvested in the first six months of the year. Yam and cooking bananas are not as common. However, rice is being grown by two schools: Mainohana produced 2-3 tonnes this year), and Benabena Secondary schools. Mainohana had planned to grow sweet potato but the heavy rain and flooding in the early part of the year, forced the school to plant rice only.

Table 12: Starchy carbohydrates grown by selected Secondary Schools

Name of school	**Cassava**	**Sweet potato**	**Rice**	**Yam**	**Banana**	**Total**
Goroka Secondary		1			1	2
George Brown Secondary	1	1				2
Malabunga Secondary						0
Benabena Secondary			1			1
Asaroka Lutheran Secondary			1 (but not in 2020/21)			0

Kui Wanpnga Secondary						0
Markham Valley Secondary		1		1	1	3
Cameron Secondary	1	1				2
Hagita Sacred Heart Secondary	1	1		1		3
Mainohana Catholic Secondary			1			1
Iarowari Agro-Technical Secondary	1	1				2
Mount Diamond Adventist Secondary	1					1
Total	**5**	**6**	**2**	**2**	**2**	17

Food gardens at Iarowari Agro-Technical Secondary

Table 13: Fruits and vegetables grown by selected secondary schools

Name of school	Aibika green	Corn	Pakchoi	Beans	English cabbage	Peanuts	Capsicum	Eggplant	Broccolli	Pumkin	Tomato	Sugarcane	Chinese cabbage	Papaya	Aupagreens	Watercress	Watermelon	Coconut	Oranage	Carrots	Shallots	Ginger & chillie	Total
Goroka Secondary	1	1	1	1				1	1										1				8
George Brown Secondary	1	1		1	1		1	1			1												7
Malabunga Secondary	1		1	1	1																		4
Benabena Secondary																							0
Asaroka Luthe																							0

ran Secondary																						
Kui Wanpnga Secondary																						0
Markham Valley Secondary	1						1			1		1		1				1		1		6
Cameron Secondary	1	1		1		1									1							5
Hagita Sacred Heart Secondary	1	1	1							1												2
Mainohana Catholic Secondary	1		1																			2

Iarowari Agro-Technical Secondary		1	1		1	1										1						1	5

Mount Diamond Adventist Secondary	1	1	1	1							1		1				1						7
Total	**8**	**6**	**6**	**5**	**3**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**		**1**	46

The fruits and vegetables grown by secondary schools are shown in Table 13 above. The most common cultivated vegetables are aibika greens, corn, pakchoy, green beans. Other types of greens and cabbages are grown along with tomatoes, capsicum, peanuts, and little fruit.

Table 14: Cash crops grown by selected secondary schools

Name of school	Cocoa	Coffee	Balsa	Orchids	Pine trees	Land available (Ha)
Goroka Secondary		1		1		2
George Brown Secondary	1		1			8*
Malabunga Secondary	1		1			1
Benabena Secondary						16
Asaroka Lutheran Secondary		1			1	19
Kui Wanpnga Secondary						2
Markham Valley Secondary						7
Cameron Secondary						5
Hagita Sacred Heart Secondary						10
Mainohana Catholic Secondary						6
Iarowari Agro-Technical Secondary						5
Mount Diamond Adventist Secondary						NA
Total ha	**2**	**2**	**2**	**1**	**1**	**71**
Average ha						**6.4**

*Adjusted outlier

Table 14 above shows that few secondary schools grew cash crops. The two schools in the Highlands region grew coffee (Asaroka had 1 ha – although complaining that in recent years the crop was largely being stolen), one also grew pine trees (3 ha), and Goroka Secondary which also cultivated orchids. Two schools located in East New Britain grew cocoa and balsa wood. George Brown Memorial school had produced 8 bags of cocoa valued at K3,200 in the past 6 months. Amounts and value of the other cash crop produce were not made available.

Table 14 also provides information on the size of land available to the school for agriculture purposes. The size ranges from 1 hectare at Malabunga in East New Britain, to 19 hectares at Asaroka Lutheran Secondary School.in Eastern Highlands. The average size of available land was 6.4 hectares (N = 11).

Table 15: Livestock farmed by selected secondary schools

Name of school	Chickens	Fish	Goats	Pigs	Ducks	Cattle	Number of types of livestock
Goroka Secondary	1	1		1			3
George Brown Memorial School							
Malabunga Secondary							
Benabena Secondary							
Asaroka Lutheran Secondary	before						
Kui Wanpnga Secondary							
Markhan Valley Secondary	1			1		1	3
Cameron Secondary							
Hagita Sacred Heart Secondary							
Mainohana Catholic Secondary			1				1
Iarowari Agro-Technical Secondary	1	1	1		1		**4**
Mount Diamond Adventist Secondary							
Total	**2**	**2**	**2**	**1**	**1**	**1**	

Most Secondary Schools did not keep livestock, as is shown in Table 15 above. Iarowari TVET Secondary had 300 Broiler chickens, 31 ducklings, 5 goats and Tilapia fish provided by Central Province Fisheries and DAL extension. Mainohana had 5 goats given to the school by the Central Province DAL. Markham Valley Secondary School kept 8 piglets and 2 cattle which were given as partial school fee payment. Asaroka said they used to have a poultry shed and other livestock, and wanted them again, but none at the moment. Asaroka and Goroka

Secondary both have plans for beekeeping and the head of agriculture at Goroka is a noted apiculturist in her own time.

Question 5: What kind of financial and resource support (seeds, tools, materials etc.) is the school getting for its School Agriculture and Nutrition program?

There are two categories. First those schools that rely only upon what they receive from the national Government Tuition Free Subsidy (GTSF).

The highest amount given to support the agriculture and nutrition subject is at Malabanga Secondary School which allocated K11,500 - Agriculture (Grade 7 to 10), K10,000 - Agriculture & Natural Resource Management (Grade 11 to 12), K13,000 - Home Economics (Grade 9 & 10), and K8000 - Food Technology. Assistance is only from the school administration and tools are brought by students if there is a shortfall in school.

Two Secondary Schools (Cameron and Hagita) reported that they got K4,000 to K5,000 for each subject area including agriculture and home science for the academic year. Some private companies provide maintenance of equipment (eg. Water pump) buildings, duck farms, poultry (2 years ago). Students use school tools This was used to buy materials and equipment to teach the subject.

Hagita Catholic Secondary School reported that they had not received their K5,000 per subject to date for 2021. The school buys buckets, watering cans, wire and shade materials. But in the last three years it has asked students and surrounding communities to donate seeds and cuttings. Students also bring bush knifes and grass knife to school for their self-reliance and agriculture programs.

Asaroka Lutheran Secondary School relies on the school administration to manage the grants and fees; although in past years, before the pandemic they gained a lot of support, including equipment and supplies from Golden Grange Lutheran Church in Adelaide. Indeed, in 2020 they'd bought a tractor for K160,000 and produced a first harvest of rice, with large ambitions of in due course saving the K252,000 cost of imported rice, and even selling a surplus to other institutions in EHP, but inadequate funding and Covid lockdowns, plus some minor theft of parts from the tractor into 2021, have disrupted these ambitious plans to utilise the schools extensive land. Seeds for choko and tapioca are brought from home by students. The school has a poultry house, but it's currently not in operation. Students are not allowed to bring tools to school as they may use them as weapons during fights.

For the day schools, the school provides tools and students are also asked to bring tools as well as seedlings. For Home Economics where nutrition is taught students are asked to bring food to cook. At Kui Wanpnga Secondary School, some text books were provided by the school, with no gardening activity.

At Goroka secondary they can apply for school grants for projects, normally up to K5,000, but the agriculture staff feel that the subject gains a low priority against other subject requests.

The second category are those schools that also receive grants and equipment from external sources. Examples are where the Central Province DAL provided a rice milling machine to Mainohana Secondary School, which they are using to hull the rice, and carried out maintenance on the storage building for the rice. This year, the Central Province Governor, Robert Agarobe secured K450,000 for Iarowari Agro-Technical Secondary School Central Province to elevate the school to a Level 10 school to teach agriculture, livestock, technology and tourism. The Member for Kairuku Hiri, Peter Isoaimo also pledged a tractor to the school (The National, April 29, 2021. p 19)). The provincial DAL supplied poultry (chicks) and feed. Provincial Fisheries supplied fingerlings and feed for the school fisheries program. Central Provincial Administration also supplied a school tractor with accessories. The Kokoda Initiative provided and built fencing for the school fish ponds. The school also provides utilities for the community school.

Benabena Secondary School was provided a tractor from Bena DSIP, facilitated by the Member and former Agriculture Minister, Benny Allen , although so far it does not have implements, but was able to borrow a plough for 2020. The Provincial Governor reportedly said that he'd provide the fuel, but so far that's only been funded by the school itself; the school is seeking a rotorvator/harrow and a fence to safeguard agricultural production and therefore be able to grow other crops than just rice. K5,000 is provided to each department, including agriculture, in the school budgetThe school water supply comes from the same small creek used by the village, and it provides it also for the primary school. The school is seeking a bore to be able to irrigate the arable land.

The Mainohana Secondary School received from the Central Provincial DAL a survey of the school land, hired a tractor to plough 1 hectare of land for planting rice, donated 1 x 20kg rice seeds bag, 5 goats (1 male, 4 female), fencing materials (wires and nails) for goat fencing sickles, tools, corn and pakchoy seeds. The school provided land for rice cultivation and goat grazing and some building materials for the goats' shed.

At Kabiufa SDA Secondary School, the farm is irrigated from a permanent stream. Farm equipment includes a tractor, tools and storage shed, presumably provided initially by SDA international network; (Dr Michael Bourke).

These external sources are more available for some schools than others, and may include one-off large injections of funds or equipment to the school, which may pay some (non-teaching) staff salaries, farm structure and equipment, to build up the school as a TVET training school, but would need sustained funding in future years.

Question 6: School Meals feeding plan (Breakfast, lunch and/or dinner)

(a) Does the school have a school feeding program?

Few primary schools have any feeding programs, although some did in the, with some, like Kapakamarigi primary school intiaiting a Friday cooking program, but it gained no support from the school management, reportedly.

All boarding schools have a feeding program. There are nine boarding schools covered in the survey, where the majority of students are boarding.

There are six secondary schools that provide three meals a day for boarders. Two of these schools provided lunch for days students (Markham Valley and Mainohana).

There are two secondary schools that did not provide breakfast to the boarding students, only lunch and dinner (Asaroka Lutheran and Benabena Secondary). Benebena provides a mid-morning breakfast/lunch to the Boarders (in two sittings, as the mess is small). They used to provide all students lunch, but now provide a basic lunch (buns brought from a Goroka bakery) for day students only.

Markham Valley Secondary School up until 2017 did not provide breakfast for the boarders. Prior to 2012, all the SDA secondary schools did not provide breakfast, but served a brunch meal at 10am, and dinner in the evening. Mt Diamond Adventist Seondary School, reported that the school board decided to include breakfast.

Three secondary day schools did not provide any feeding program, nor did they have a school canteen. The students only relied on vendors or 'school market'as some call it). Two of these schools (Goroka, and George Brown).used to have a feeding program but no longer do so as they have stopped accommodating boarders and with 3,600 students, Goroka was too large for a single sitting of students and the lunch period would take too long. Kui Wanpnga is a new Day school, said that the Students Representative Council was responsible for setting up a canteen.

All schools are suffering difficulties in funding their school meals on the limited or delays school grants, especially where many parents only pay partial or long delayed contribution of fees, although where substantial school gardens are available and utilised they add to both quantity and diversifty of food provided, even if some of that production is used to generate school revenue.

b) How are the school meals planned? i.e. who decides which foods/meals to cook and serve, do people follow nutritional guidelines, if so which ones?

There is no NDOE standard policy on feeding students, except to find ways to implement the principle of "self-reliance" that the NDOE promotes. The overall budget and menu is guided by the School Board of Management. The school administration plans the fortnight budget for the school mess. The Teacher In Charge of the mess manages the daily operations including monitoring the procurement and rationing food to students for each meal and cooking arrangements. The meals are planned based on a set menu, plus what is available, including the money to purchase items other than rice and tin fish and meat. With budgets in all cases so tight, invariably the schools are focused on obtaining supplies as cheaply as possible, and with cash flow problems (related to delays in receipt of government or parental tuition fees) schools in many cases need to secure food on credit, with only some suppliers ready to do that. For example, at three schools:

Iarowai Agro technical Secondary School: Food ration per meal for 600 students: 6 x 10kgs of Rice; 20 cans of tin fish (Ocean Blue Tuna - in Oil –being the cheapest and cheaper than the locally produced tinned fish) large size (425g); and 200 packets of noodles. Vegetables of local greens and other, but staple produce from the school garden is very limited and only provided in season and once a month or on special occasions.

Hagita Catholic Secondary School, the following was arranged to feed 525 students:
Breakfast: 12 cartons of Cabin biscuits; 2 packets of 100 of tea bags; milk.
Lunch: White rice (5x10 kilogram bags); tin fish (Ocean Blue Tuna in Oil 425g)
Dinner: White rice; 3 large cooking pots corned beef (Ox & Palm) stew; 4 large cooking pots of tin fish and vegetable stew.

Special meal: White rice 5x10kg bags; 7 large cooking pots of chicken stew. (Once a term)

Cameron Secondary School: Ration for 150 students. Per meal: 20kgs (Roots Rice), 6 x Ocean Blue Tuna in Oil Tinned Fish Large (425g) size; 6 x 80g Packets of Noodles.

These amounts reveal that on average, each student at the three boarding schools were given less than half a cup of uncooked rice at each meal (100grams of uncooked rice); and 15 - 18 grams of tin fish per meal mixed with vegetable stew. Some schools provided 3 meals a days, but many only provided two meals, such as a brunch and dinner.

c) How are the foods sourced (i.e. from where are the foods bought)?

The store bought items are bought from rice wholesale companies, usually Trukai (although some schools said that Trukai doesn't supply on credit) and Homestate. Fish and tinned meat and other items such as cordial, tea, milo, salt, sugar, are bought from other wholesale stores in the provincial centre. Vegetable suppliments other than those grown by the school, are sourced from community markets, or vendors (often parents, and sometimes teachers' family) that bring produce to sell to the school. Table 5.9 shows that in most cases, the (non-livestock) produce from school farms is eaten by the students. The produce is either given to the kitchen, or sold to the kitchen (by the school canteen), to be cooked for the student meals.

Table 16: Proportion of garden produce eaten by students and sold

NAME OF THE SCHOOL	**How much garden produce is consumed by students? (Includes sale to mess)**	**How much garden produce is consumed by teachers?**	**What proportion is sold?**
Goroka Secondary School (Day)	10% is normally taken home by the students and consumed as it is a day school		90% is supposed to be sold, however much of it is stolen
George Brown Memorial School (Day)	Students self-reliance plots (produce) 90% to school mess		10% from students practical plots sold to the teachers

Malabanga Secondary School	They purchase and consume, 100% is sold to the school mess and the teachers		
Benabena Secondary School	The students consume 100% of the rice that they grow and mill (the school has extensive extra land and says they'd like other crops and livestock, including cattle, but secure funds for fencing – for security and livestock, and maybe bore water)		
Asaroka Lutheran Secondary School	100% Whatever is produced at the school farm (largely rice – but not in 2021 as not planted when student home during Covid) by the students is all consumed by the students. Livestock & pigs are consumed during special occasions or graduation (although lost the livestock and need to restore fencing, irrigation, poultry etc. sheds, and to have a farm manager)		
Kui Wanpnga Secondary School (Day)	None		
Markham Secondary School	Coconuts - 99% and Greens (Aibika) 95%.		Greens (Aibika) - less than 5% sold to teachers. coconut - 1%. Greens (Aibika) - less than 5% sold to teachers
Cameron Secondary School	Sweet potato - 25%, Peanuts - 50% Corn - 100%		Aupa - 55%
Hagita Sacred Heart Secondary School	Sweet Potatoes - 100% Cassava - 95%		Cassava - 5%

Mainohana Catholic Secondary School	60% rice consumed by students	5% consumed by teachers	Rice -35%
Iarowari Agro-Technical Secondary School	Sweet Potatoes - 100%, Cabbage & Pak choi 60%. 1 wheel barrow to mess per week Poultry - 50%		Cassava and English Cabbage & Pak choi - 40%, Peanuts - 100% Poultry - 50%
Mount Diamond Adventist Secondary School	Cassava - 50%, Aibika - 100%, watermelons - 100% & Chinese cabbages - 100%	Cassava - 40%	Cassava - 10%

d) What is the budget that is used to determine meals (e.g. Kina/meal per student)?

About 50% to 75% of the tuition fees is spent on buying food for the mess to feed the students in secondary schools (clearly markedly more in boarding schools, and it may be noted that day students effectively cross-subsidise boarding students, despite the latters' higher fees). Initial calculations show that schools pay K1.00 to K2.45 per student per day to feed them. The method used to calculate this, was to obtain from the school the fortnight or monthly budget allocated to purchase the food, multiplied to obtain an annual amount, divided by 280 school days, and then divided by the number of boarding students.

The most popular brands were Ocean Blue Tuna tinned fish and Trukai Roots white rice (often bought on credit). Homestate Company provides credit for the purchase of rice, most other wholesale suppliers do not. All boarding schools try to provide additional supplements of cabbage, aibika, beans, tomatoes, carrots and other items. (We were told that Lufa High School provides a cabbage soup for lunch, which doesn't seem nutritious; but we didn't visit this school). In some cases instead of rice, then a biscuit or bun was provided, notably for breakfast or lunch. Buns were largely purchased, although in some cases the schools had the capacity to produce them (or aspired to do so). Tea or Milo with milk was rare, and most drank water with their meals. The SDA schools provided Tang cordial with the student meals. (Students in some schools were buying milk based drinks, such as milk or chocolate milk, from school canteens)

Both SDA and Catholic run secondary school management recently made decisions to introduce new items into the meals which would have a budget impact. The Mount Diamond Adventist Secondary School board decided to feed brown rice to the student's diet this year, which increased the cost from K8,000 to K12,000 per fortnight. 95% of their foods were store bought goods, while 5% was from the 4 ha size garden. Mount Diamond Secondary School was spending some K1.32 per day to feed their students. Hagita Catholic Secondary School spent some K2.45 per day to feed one student. The budget for food provided by a government run Markham Valley Secondary School which was calculated to spend some K1.65 per day per on student meals,

which includes feeding an extra 150 day-students at lunch time. An average of K1.80 per day to cover three meals per student.

e) What other considerations are included (other than cost) when determining what school meals will consist of?

Other considerations are what produce is available (and in season) from the school gardens, and what vegetables or fish and livestock can be bought from local sellers. Also, there are some students who are averse to tin fish and rice every day. These students may be given tinned meat instead, with vegetables. It was reported that one school (Lufa Secondary) which ran out of money to purchase store goods, gave only cabbage soup to the boarders. Sometimes groups or parents make donations to the school mess, such as cartons of noodles, tinned meat, or vegetables. The Mt Diamond Secondary school board decided ealy this year, to improve the nutrition of students by introducing brown rice, to be mixed with the white rice.

f) Who is involved with the cooking and serving of school meals?

On average there are 2.3 cooks employed for each of the boarding schools. The range was from 1 cook at Mainohana Secondary, to 4 cooks plus a supervisor at Mt Diamond Secondary and 5 cooks at Asaroka. Quite a large responsibility is given to students to assist with meal preparation, cooking, serving the food, and with cleaning. Students are normally rostered and supervised by a Teacher In Charge (TIC) (See Table 17).

Table 17: Food preparation, cooking, serving and cleaning at secondary boarding schools

Name Of The School	Number of cooks employed	Student responsibilities
Goroka Secondary School	Day School (previously had a mess, when the school had boarders, and before it gained too many students, and the mess was too small to cater for all)	None
George Brown Memorial School	1 mess supervisor & 2 cooks.	Students assist the cooks with serving of the food
Malabanga Secondary School	3 cooks	
Benabena Secondary School	Two ancillary staff prepare lunch & Dinner.	Breakfast is prepared by students
Asaroka Lutheran Secondary School	TIC Mess, and 5 cooks	Duty students help cook (students cook for themselves over the weekend)
Kui Wanpnga Secondary School	Day school	None
Markham Secondary School	3 cooks & 1 assistant	Students, serve the meals. Clean the mess, wash dishes,
Cameron Secondary School	2 cooks for preparing lunch.	Students prepare & serve breakfast & dinner
Hagita Sacred Heart Secondary School	2 cooks	Students cook (prepare) & serve the meals at breakfast and dinner
Mainohana Catholic Secondary School	1 cook. The school bakery provides lunch	Breakfast & dinner: Students cook (prepare) & serve the meals.
Iarowari Agro-Technical Secondary School	School ancillary staff / cooks (no number recorded)	Duties are rotated each week; one from each grade (Grade 9-12). Boys chop firewood, wash pots, Girls sweep the mess, wash dishes. Students help with cooking and serving.
Mount Diamond Adventist Secondary School	Employ 4 cooks plus supervisor	Students only assist in serving the meals

g) What are the main barriers to providing more nutritious foods to students (e.g. money, skill/time to prepare foods, facility to prepare food, facility to store food (i.e. buy in bulk to save costs))?

The principle barrier to providing more nutrious foods to students is the low (and inadequate) amount of funding available to the schools and its often untimely (long delayed) receipt. The schools rely on reciept of the GTFS fundinds from the national government, and when there is a delay in issuing the fee subsidies, this greatly affects the ability of the administration to purchase food for the mess. Secondly, when parents are unable to pay the school fees on a timely basis or in full, this also affects the availability of funding to purchase store goods.

A newspaper article explained that Cameron Secondary School had to send over 250 boarding students home or to relatives recently, retaining only 30 boarders who were from remote islands, due to the delay in the government's subsidies reaching the school account. The principal reported that the people and business houses in Alotau were also helping out, and that when the funds were received in the account, the schol would recall the students. (The National, 13August 2021, p8). Despite the ambitions of being self sufficient, saving major costs and producing a surplus of rice for other insitutions in EHP, the tractor was in disrepair, resulting in insufficient food to feed students, leading to reported fights between students over food in June 2021.

There is usually a limited range of fresh produce sold at the local markets as neibouring villages are not growing other nutritious vegetables, notably staples, greens and fruit, but also other foods items, such as red capsicum, avocado, garlic, ginger, nuts, spices such as chillie and black pepper, to name a few. More of the limited crops grown could be bought by the school, such as fruits and cucumber, spring onions, pawpaws, mangos, coconuts, sweet potato, yams, and bananas, if they had sufficient cash to spend.

Most of the secondary schools visited had access to electricity supplied by PNG Power Limited. However, the schools often lacked funding to buy or repair their fridges, freezers, ovens, baking and cooking equipment. This means that the school kitchens are ruddimentary. Many schools use gas cookers and firewwod stoves. Often there is no refrigeration. This works as a barrier to storage of meat, vegetable, frozen goods and dairy products. Tinned fish, meat, margarine and dried goods, such as salt, sugar, milo, tea, powdered milk, eggs, can be stored in the kitchen cupbords.

Food eaten past week

In the main, rice and tinned fish were provided to boarders in secondary schools for breakfast, lunch, and dinner, but on some days in some schools tinned meat, was served routinel for certain students who were adverse to tinned fish. Some schools offered dry biscuits or a bun at breakfast. Lunch and dinner was mainly (imported) white rice, with the main protein supplement being (imported tinned) fish and vegetable stew made with local greens (mainly aibika), although in many schools the greens were only provided occasionally, and other vegetables that were available from the school garden or bought at the community market, sometimes mixed with noodles, as an alternative to rice. Only four schools provided sweet potato at lunch and/or dinner each day. (Refer to Annex 3: Food served at secondary boarding schools). Annex 3 provides the menu for 8 of the 9 boarding secondary schools. The comments section beneath each table explains when a "special meal" was served which consisted of chicken or occasionally fresh fish (locally purchased, or in a few cases from the school pond). For most schools the special meal was usually only twice in a term (depending partly on seasons), although some schools were able to provide a special meal each week. Only a few schools provided a light meal/snack for day students, comprising largely buns.

In primary schools students brought their own food, or in some cases only ate prior to going to school or upon returning home. Although some primary schools have school gardens, they do not have school feeding programs for students.

Does your school have a canteen where students buy food and drinks?

Only one of the eight primary schools surveyed had a canteen currently in operation, Vunairima Primary School, which sold Em Nau Snax biscuits and drinks. Taraka Primary School in Lae had a canteen operating hitherto, but the teacher who used to run it moved away and the function was shifted to the Board of Management, and it has since remained closed. Students there are meant to bring lunch from home, but most don't and depend on buying from local sellers, with kids carrying money (as parents mostly working), but this local selling ceased with the start of Covid-restrictions, and some students are having to be sent home early as hungry.

Half the number of secondary schools (6 out of 12) had a canteen that was currently operating (See Table:18). Most of the other schools used to have canteens but no longer in operation owing to a number of issues, such as no-one available to run it, or past mismanagement. However, at least three of the schools had plans to have the students operate the canteen, the Students Representative Council or by a student business course students.

Malabanga Secondary school canteen currently is not in operation awaiting BOM approval to let the Business Students run the canteen and use it for their practicals. The BOM is yet to approve that idea and commit and approve money for the purpose.

Markham Secondary stated that their school already used the canteen for commerce student studies and that the canteen provides a reliable and significant revenue source for the school.
Asaroka said their canteen wasn't making money as expected, and the fridge was broken down. It had been run by a church group, but there were plans for the business students to take over and run it, partly as a training exercise: pending.

The Benabena secondary school canteen is also used by the adjoining Kapakamarigi primary school students.

Table 18: Status of secondary school canteen and vendors sale

Name of School	School has a canteen in operation	Outside vendors or informal sellers to sell outside the fence or on the school grounds
Goroka Secondary School	No	Yes, on school grounds
George Brown Memorial School	No	Yes
Malabanga Secondary School	No	Yes, on school grounds
Benabena Secondary School	Yes	Yes
Asaroka Lutheran Secondary School	No	Yes, outside school fence
Kui Wanpnga Secondary School	No	Yes, outside of school grounds

Markham Valley Secondary School	Yes	No
Cameron Secondary School	Yes	No
Hagita Sacred Heart Secondary School	No	Yes, on school grounds
Mainohana Catholic Secondary School	Yes	Yes, outside of the school fence
Iarowari Agro-Technical Secondary School	Yes	Yes. On the school grounds
Mount Diamond Adventist Secondary School	Yes	Yes. On The School Grounds

What items are sold at the school canteen?

The secondary school canteens sold a range of food, drinks, and toiletries. They serve the students who buy snacks, as well as food that can be cooked by themselves. Common items being sold are given in the following lists.

Iarowari Secondary School canteen

Item	**Price**
Snax biscuits packet	K1.00
Popmi noodles cup	K2.50
Ice cream /cones	K2
Coffee sachet 3 in 1	K1
Can soft drink	K2 -K3
Packet of chocolate milk	K2-3
Pora juice (cordial) cup	K1
Rokrok chocolate biscuit packet	K4.50
White rice 500g packet	K2.50
Chicken pieces (4-5) tray	K15:00

Cameron Secondary School canteen

Item	**Price**
Doughnuts	50t
Rice balls	K1.00
Kebab (with meat)	K1.00
Scallops with banana and sausage	K1.00
Scone/ Bun	K50t – K1.00
Cup cake	K1.50
Ice block cup	50t
Coffee sachet 3 in 1	K1
Can soft drink	K2 -K3
Tea - packet	
Sugar	

White rice 500g packet	K2.50
Tinned meat	
Tinned fish (Ocean Blue 425g)	K7.00

Markham Valley Secondary School canteen

Item	Price
Snax biscuits packet	K1.00
Popmi noodles cup	K2.50
Ice cream cone	K2
Coffee sachet 3 in 1	K1
Canned soft drink	K2 -K3
Pora juice (cordial) cup	K1
White rice 500g packet	K2.50
Chicken pieces (4-5) tray	K15:00
Tinned fish Besta Mackeral 425g Diana Tuna 425 g Dolly Tuna 180g Ocean blue Tuna 180g Besta Tuna 155g Diana 180 g	 K7.20 K4 K2.80 K2.80 K1.55 K2.30
Flex cards	K3,K5,K10,K20
Stationery: Sharpener Biros Eraser Correction fluid Marker Ruler Pencil	 K1.00 0.50 K1.00 K2 K1.00 K1.00 O.50

Does the school allow for outside vendors or informal sellers to sell outside the fence or on the school grounds?

Almost all schools allow vendors to sell food to the school population. Table 19 reveals how schools treat vendors and how the practice of sales by vendors has been affected by the NDOE COVID-19 directive. Some schools have ceased to allow them to come into the school grounds to sell. Other schools have allowed them to sell outside the school fence, and do not have control over who sells and items being sold (sellers, as at Goroka and Asaroka Secondary schools, state that the school has no authority over how or what they sell outside the fence anyway, although most schools experience some positive cooperation, especially as some of the

sellers are parents or family members anyway). Other schools continue to allow the vendors to sell on the school grounds and control who sells, what items, and the price of items. For instance, at Tudungan and Sogeri Primary School, nothing is sold above K2.00, and at Ragiamun Primary, no cooked food (i.e. meat and vegetables) can be sold to the children. In Goroka and Asaroka, where there have been ongoing outbreaks of typhoid, cautionary advice is given; kaukau, cooked corn, peanuts etc sold at Asaroka, and currently no cooked food sold on campus at Goroka.

Table 19: Status of vendor markets at primary schools

Name of the School	School allows or not. Comments on the policy towards vendors
Sogeri Primary	Yes. Teacher In Charge of the school market and one to assist. To ensure the items sold are healthy and prices kept below K2.00,
Kerekadi Primary	Yes. Teachers monitor the price of goods and quality. 3 years ago collected 50t each from vendors for use of school. Last year stopped vendors selling due to COVID 19.
Taraka Primary	No. Not selling at the moment. After 4 weeks lockdown due to CoVID 19 restrictions. When resumes, the mothers register with the school and few men from around the community. Mothers from the Police Barracks sell through the fence. School has rules on types of food sold. Mondays, Wednesdays & Fridays -Cooked foods. Tuesdays & Thursdays - Fruits. No sweets. Children are no longer bringing lunch from home. While outside the fence, there is no control over what is sold.
Ragiampun Adventist Primary	Yes. No cooked food sold because it is out in the open and unhealthy. Some items sold include: Cucumbers, Coconut Juice (Kulau), Biscuits and Donuts
Lelehudi Primary	Yes. Parents & Citizens Meetings - Teachers talk to the parents to raise concerns and awareness on selling healthy, nutritious and good food No selling during lockdown (4 weeks) this year. Before more came to sell. Now only 2 or 3 mothers come to sell each day. When there is a Parents & Teachers meeting then more mothers come and sell food on that day.
Kapakamarigi Primary	No. The same market/sales outside the school fence is used by the Secondary school so the Secondary School is in charge
Tudungan Primary	Yes. There is a TIC that makes sure the food sold is safe for consumption as well as the price is K2 and below
Vunairima Primary School	Yes. The TIC monitors nutrition of food sold. Pre-COVID, students would share their lunch together with class members. But this has been stopped due to NDOE COVID directives.

The Malabanga Secondary school has a market house with tables where the mothers from the respective villages come and sell their items. 2 days Taulim, 1 day Rapitok & 1 day Teachers' families. They have a roster that gives chances to the nearby villages to come and sell including the staffs' families too.

There is an ENB Savings and Loans Agent too, next to the market. K1.00 fees are collected and deposited into the account and is used to maintain the market. Mothers are also encouraged to open accounts and bank their takings if they which to save.

Goroka Secondary School, Stopped because of typhoid and COVID-19, which has caused the school to open and close; they were into one week of operation before the survey was undertaken. Cameron Secondary School stopped vendors from selling to the school. Gave teachers opportunity to sell food and drinks to the students.

What items are sold by vendors?

Five primary schools listing of items sold, by price and unit, by vendors at the time of the visit are presented below. The prices range from 10 toea for one ripe banana, to K2.00 for a food pack.

Food items sold by vendors at selected primary schools

Sogeri Primary School

Item	price	unit
Greens with tapioca or sweet potato	50t	1 wrap
Doughnuts	50t	1
Scone	50t	1
Boiled egg	K1	1 egg
Chicken feet	50t	1 claw
Fried Tilapia fish - small	50t	1
Fried Tilapia fish - medium	K2	1
Ripe banana	50t	1 fruit
Guava	50t	1
Peanuts - bunch	K1	1

Vunairima Primary School

Item	price	unit
Food parcels of vegetables and piece of fish or chicken	K2.00	1 wrap
Rice with green beans, tin fish, saveloy sausage, eggplant	K1.00	1 pack

Tudungan Primary School

Item	price	unit
Food parcels of cooked banana and greens with piece of fish or chicken	K2.00	1 wrap
Cooked banana and local greens	K1.00	1 wrap

Mumu cassava with ripe banana	50t	1 pack
Coconut (kulau) juice	50t	1 nut
Peanuts (small bunch)	50t	1
Galip nuts wrap	50t	1 wrap
Ripe banana	10t – 20t	1 fruit
Ice block	50t	1 cup
Doughnut	50t	1

Kapakamarigi Primary School

Item	price	unit
Ripe banana	10 t	1 piece
Cooked sweet potato	20t – 40t	1 piece
Peanuts	20t	1 small heap
Orange fruit	50t – K1.80	1 fruit
Mandarin	20t – 40t	1 fruit

Lelehudi Primary School

Item	price	unit
Coconut juice (Kulau)	50t	1 nut
Cooked fish (Fried or boiled)	K5:00	1 whole
Cooked prawns (threaded)	60t	1 stick
Scone	30t	1
Doughnut	20t – 50t	1
Damper with icing	K1:00	1 slice
Local greens in coconut (aibika, tulip, pumpkin tips)	20t	1 small wrap
Tulip with chestnuts (1-2)	20t	1 wrap
Ripe banana	20t	1 fruit
Pineapple	30t	1 slice
Watermelon	30t	1 slice
Mango	20t	1 fruit

Food (and some non-food items) items sold by vendors at selected Secondary Schools

Iarowari Secondary School – vendor market on school grounds

Item	price	unit
Sausage (Saveloy)	K1	1
Sweet potato – fried scallop (with flour)	50t	1
Scone	K1.00	1
Doughnut	50t	1

Hagita Secondary School – vendor market on school grounds

Item	price	unit
Coconut juice (Kulau)	K1.00	1 nut
Battered Sausage (Saveloy) fried	K1.00	1
Patty mixed with tinned meat, fried	K1.00	1
Scone	20t	1
Doughnut	50t	1
Chestnut	K1.00	4 nuts

Malabunga Secondary School – vendor market on school grounds

Item	price	unit
Coconut juice (Kulau)	K1.00	1 nut
Local greens with cooked banana	K1.00	Wrap
Local greens with banana with piece of chicken or fish	K2.00	Pack
Doughnut	50t	1
Ice-block (cordial)	50t	1 cup
Ripe banana	20 – 50t	1 fruit
Mandarin	30-50t	1 fruit

Mainohana Secondary School – vendor market outside of school grounds

Item	price	unit
Soft drinks	K3.00	1 can
Em Nau Snax biscuits (4 pieces)	K1.00	1 packet
Sausage (Saveloy) fried	K1.00	1
Local greens uncooked	K1.00	1 bunch
Betelnut	50t-K1.00	1 nut
Cigarettes	K1.20	1 stick

Kui Wampnga Secondary – vendor market outside of school grounds

Item	price	unit
Soft drinks	K3.00	1 can
Em Nau Snax biscuits (4 pieces)	K1.00	1 packet
Banana	K1.00	1 hand
Fried or boiled sweet potato	50t	1 whole
Cucumber	10t-50t	1 whole
Guava	50t	1 fruit
Smoked corn	K1.00	1 cob
Peanuts	K1.00	1 bunch

Do the teachers (or others) monitor the sale of food items to the children?

Monitoring of vendors is carried out by the teacher in charge or teacher on duty in most primary and secondary schools. They are to make sure that the food sold is safe for consumptions, and that the prices are kept low, as agreed with the vendors. It was observed that some schools do not monitor the vendors, such as Kui Wanpnga Secondary School, and Mainohana Secondary School where vendors sold outside the school grounds. The school also played a role in coordinating providers form selected villages, as well as among teachers' households that made or sold items under their houses or at a designated area. Sometimes it was a role given to security guards to vet sellers, their items and prices. A couple of secondary schools were planning to give the responsibility to the student representative council to monitor and coordinate the vendors as well as the running of the school canteen.

If the school want the vendors to improve the sale of food to the child, who can they speak to address this issue? (for example related to food safety, quality, choice)?

It was found that in most cases the school principal and senior staff would deal with the vendors directly or deal with the parents and teachers association or meetings to state what they wanted done. The schools have had to deal with changes to the numbers of vendors and locations for the sale of food and drinks, due to Covid-19, food safety and pricing. There was little mention of the school board or local level government council role in dealing with vendors around the schools.

Are there students with disabilities who participate in the School Agriculture and Nutrition learning and practical activities?

Three primary schools focus groups said they had students with hearing problems (Kapakamarigi, Tudungan, Vunairima). One student who was disabled stopped going to school as it was too far to walk (Ragiampun). All other primary schools indicated that they did not have student disability issues. They indicated that these students were still able to participate in agriculture and nutrition learning activities.

There were very few cases of students with disabilities reported by the secondary schools. The persons with some physical impairment would be assisted or accommodated in agriculture practical activities. One female student could not be exposed to too much sunlight and heat (Mt Diamond), while two males one case of one eye, the other tip toe walking (Mainohana), and someone had a hearing problem (Markham Valley). One student at Asaroka told us that she had a condition that restrained her from participating in field agricultural activities, but as a teacher's daughter living on campus she had some compensating opportunities. The teachers advised that there were no current persons with disabilities at the school, but the students highlighted a few cases.

Is the school agriculture and nutrition program design gender sensitive?

Gender equity and social inclusion are presented as part of 'Overarching Curriculum Principles' at the beginning of the Agriculture Syllabus. To be inclusive, it is the responsibility of the teacher to ensure that all boys and girls have the opportunity to participate fully in all learning activities. The Agriculture Syllabus for Grades 11 and 12, Standards-Based, has 5 strands and a set of Evidence Outcomes for each of the strands, with Content Standard for each of the units, along with Benchmarks, for each grade. None of these list gender in any of the syllabus structures and benchmarks. For example, Strand 5: Agribusiness, does not provide any way for students to understand the differences in gender roles and relations which men and women can face or perform in agribusiness, the different access to resources such as land, technology, finances, and

marketing roles to sell their goods and services. Gender does not appear in the glossary of the Syllabus.

The Syllabus for Lower Secondary Agriculture (2006) on the other hand, provides specific guidelines to Grades 9 and 10 teachers. It states that:
"To implement the policy, teachers have the responsibility to use and promote gender equity practices in their classrooms and with the wider community. This means that teachers:

- Use teaching and learning strategies that meet the needs and rights of all female and male students
- Use gender inclusive language, content, methodology and assessment
- Respect positive cultural values and challenge unfair cultural practices
- Respect the contributions of men and women to society
- Promote positive attitudes and behaviours of social responsibility, empathy and sensitivity." (Department of Education, 2006, p. 7)

Inspector reports are to assess if these curriculum principles are being met.

Which activities do females not participate in and why?
Teachers were aware of the gender equity and social inclusion policies of the education system. In general, schools reported that male and female students participated in all activities together. One school explained that while they all did the same tasks, the boys would do the irrigation system and digging work. There was some division of labour in the kitchen in a number of schools.

What priority is given by the school to teaching Agriculture and Nutrition Syllabus? Please explain.
Teachers generally expressed that agriculture should be given high priority as a subject to be taught. Many agriculture teachers expressed concern that it gained inadequate status and focus from management. Most education advisers were giving it emphasis and the Education Department staff (notably curriculum div) stated that, while important, it hasn't been given the level of focus that it should have gained. Teachers measured this by the number of class periods allocated for agriculture, the number of agriculture teachers employed at the school, and the budget allocation for the subject. The following are the responses given by the small focus groups or key officials from each secondary school. Personal Development included topics on health and nutrition, along with home science. These subjects received similar amounts of money as Agriculture.

Asaroka Lutheran Secondary: Agriculture as a subject is taught effectively when there is more practical work. However, though the school admin treats it fairly in the budget sometimes time and financial resources are not sufficient. When shortage arises, agriculture is overlooked. If more money is spent on Agriculture (and notably practicals, which would also generate food and school income) the administration felt that they would be accused of misusing funds earmarked for the standard curriculum.

Benabena: In terms of priority, Agriculture is given the same priority as other subjects with the same budget of K5000 per year. However, since agriculture is effectively taught with more practical lessons, the money is not sufficient. Also the amount of time needed to teach the subject is not enough. Agriculture Teachers in the school (1x UNRE & UoG graduate, 1 primary school teacher upgrading at Peter Chanel Teachers College). 90 minutes per period.

Cameron: Upper Secondary - 5 periods. (2 Theory & 3 practical)

Lower Secondary - 5 periods. (2 Theory & 3 Practical) in a week.

Hagita: Lower secondary - 5 teaching periods. Upper Secondary - 6 teaching periods in a week.

Iarowari: It is a high priority because it is now an agriculture technical school. They believe that realistically students will not gain further education or gain a formal sector job, so they need practical skills in agriculture; (they leave school with both school certificate and a TVET skills qualification). High Priority - most want to be here in the field of agriculture. The new school initiative has been mostly driven by Principal (who is a biologist), but supported by the provincial authorities and the Provincial Government.

George Brown Memorial: Agriculture is not given the assistance required. The school has 4 teachers teaching Agriculture: 1 Agriculture Teacher and 3 Science Teachers.

Goroka: High Priority is formally accorded, although the agriculture teachers felt that agriculture remained down the pecking order for funds and support, as against the traditional subjects; , they indicated that there are insufficient tools, no seedlings and facilities for livestock, coffee and piggery are run down, with not enough practical activities due to lack of funding. As in many schools, they indicated various practical ideas and initiatives they would like to conduct and had planned.

Kui Wanpnga: Last year contact periods for agriculture subject were 3 per week. This year the school increased them to 5 per week, as for English and Math subjects. Other people from outside have been engaged to talk to students about nutrition.

Malabanga: Equally treated as other subjects, which shows in the school budget, however the cost of teaching Agriculture and Nutrition in practice is very expensive as there are a lot of practicals involve and the time needed is more. Therefore, time and money is a constraint.

Mainohana: 3 periods for agriculture per week. For the lower secondary, agriculture is offered to students as an elective or optional subject. Two agriculture classes and 2 business studies classes. They stated that they would like agriculture to be offered as a compulsory subject to all lower secondary students.

Markham Valley) Grade 10 Assessment: 60% Practical, 40% Theory. Serious importance. Grade 11 & 12 less than 30 students (out of 280 students) via the science stream.

Mt. Diamond) Agriculture combinations with: 1 Home Economics - includes nutrition and 2. Business. 1 Home Economics Teacher (Gr 9 & 10) & 2 Agriculture Teachers.

The placement of teachers is done by the NDOE in consultation with the Provincial Education Boards (PEB), and the schools. Hence, PEBs need to lead the way in ensuring that agriculture and home economics teachers are training in sufficient numbers for a province, and assigned to each school.

How would you describe the success level of the school agriculture and nutrition program in this school?

Fifty percent of the **primary school** interviewees, rated the success level of school agriculture and nutrition activities as “poor” (4 out of 6, 2 unavailable).

Five out of seven primary schools "agree" that students show increased knowledge about nutrition and understand the importance of eating healthy to promote wellness.

Four out of five primary schools "agree" that students demonstrate increased knowledge of how the garden can generate income and provide foods at a lower cost.

Three out of five primary schools "somewhat agree" that teachers (apart from wider improved outcomes – improved crops retained, sold and/or eaten) have increased knowledge from engaging the community (school community and surrounding neighbourhoods) in gardening.

Seventy-one percent of the secondary school teachers interviewed rated their agriculture and nutrition program as "good" (N=14),in some cases, as with Benebena and Iarowari, just commencing investments or planning revival. Classes worked well when there was a Farm Manager to oversee the school farm and class gardens. Also, when agriculture is taught by someone who is a specialist teacher (e.g. from UNRE), the school is seeing progress.

The school teachers and selected students at secondary schools rated the impact of agriculture and nutrition education as follows:

1. Students show an increased willingness to eat more nutritious foods, 6 out of 8 "Agree"
2. Students show increased knowledge about nutrition and understand the importance of eating healthy to promote wellness, 9 out of 11 "Agree".
3. Students show an increase in knowledge of healthy eating habits, 4 out of 10 "Disagree/ Strongly disagree".
4. Students demonstrate increased ability to identify various plants and produce, 7 out of 10, "Agree".
5. Students demonstrate increased knowledge and appreciation for the hard work associated with gardening. 7 out of 8 "Agree".
6. Teachers gain increasing knowledge, skills and confidence for planning and carrying out gardening best practices, 7 out of 9 "Strongly Agree".
7. Teachers have increased knowledge for engaging the community (school community and surrounding neighbourhoods) in gardening, 4 out of "Disagree" that this is occurring, while another 4 out of 12 "Agree" with this statement.

Even though most of the secondary respondents agreed that the outcomes were positive, they stressed that the agriculture subject taught is mainly theory based (learning) and not many practical activities (classes). The primary schools rated their agriculture education as being poor. Both school levels pointed out that there are not enough tools, investment (e.g. in farm capacity, e.g. irrigation, buildings) and a lot of stealing of crops when they are ready for harvest, although this varies from school to school, dependent upon community relations, funding for fencing and related factors. Teachers are expected to produce their own teachers' guides. Teachers are also given soft copies of the syllabus and expected to print it themselves, which is "inappropriate and inconsiderate" for the schools in the province (which largely have limited or no power, computers or printers).

Problems prevail of few or no tools or textbooks for students for Grades 11 and 12, and the facilities (including fencing) being run down (or unavailable) especially for livestock, such as piggeries or poultry sheds. Secondary teachers are largely trained at University of Goroka (UOG) and studied agriculture subjects. 1 teacher graduated from Vudal University and later UoG with a teaching diploma. Initially difficult, but they have managed so far. Big advantage where also have a farm manager, or at least assistant, with practical skills and training, as prevail in some schools, for example at Goroka Secondary.

6. CONCLUDING REMARKS AND RECOMMENDATIONS

The years immediately prior and post-Independence in 1975, saw a rapid increase in school enrolment, bringing the percentage of eligible school age children entering Grade 1 (at age 7) to 67.8% according to the Education Department (Education Staffing and Enrolment Statistics, Aug 1975). The gender inequality at the time was stark with 62.2% boys and only 37.8% girls in Grade 1, with some provinces relatively equitable, but the Highlands provinces with ¾ male and only ¼ female students. Male retention rates in those days was also much higher than for females. The Government's plan in 1978 was to raise primary school attendance rates to 92% by 1985, but over the next decades enrolment and retention rates failed to show the planned increase, until the late 2000s and through the 2010s, when school intakes and retention increased strongly both in primary and secondary schools, but also class sizes, despite an increase in the number of schools established. This resulted in some very large schools, for example Goroka Secondary, reportedly the largest in the country, with approx. 3,600 students, and classes reportedly of up to 120. This has placed major challenges upon the education system, its overstretched budget, institutions and teachers, despite increased teacher numbers through the 2010s. The consequence has been that some schools, like Goroka, have ceased not only to provide boarding facilities, but have even abandoned their mess and school meals, in view of incapacity. The introduction of Tuition Fee Free education in 2012 encouraged school intake, but placed growing demand on the national Budget. The resulting readjustment to a 2/3 government contribution to tuition fees in 2020, with 1/3 parental contribution, combined with major delays in fund release, and in many cases parents not fully paying their contribution, placed further pressure on school budgets, both to deliver education services, but also to adequately feed their students, particularly boarding students, resulting in borderline or in some schools deficient school meals, in terms of basic carbohydrates, protein and other essential nutrients, potentially jeopardising students' health and welfare, including prospective education development.

In the years prior to and post-Independence there was a major focus on human resource development, consistent with objectives under the Eight Aims (1972), focusing on rural development and self-reliance, the National Goals set out in the Constitution, then consolidated into the National Development Strategy and to be applied in practice through the National Public Expenditure Plan (NPEP). The emphasis of public expenditure under the NPEP was for increasing rural welfare, rural education, helping less developed areas, improving subsistence

agriculture, food production marketing and nutrition, economic production, increased Papua New Guinean participation in the economy, urban management, effective administration and environmental protection. As stated in the NPEP 1978-1981 "Malnutrition has become a serious national problem in terms of human suffering and death. The Department of Health estimates that Papua New Guineans consume on average only 80% of the food energy requirements recommended by the WHO. As a result the efficiency of the education system is reduced, worker productivity is lowered and increased demands are made on health services". A major public focus was on addressing malnutrition, "in early 1978 the Government will launch a National Nutrition Programme operating initially through the Departments of Health, Primary Industry and Education and various media agencies" with "reports regularly to the National Planning Committee"; "a core nutrition syllabus, drawn up at a workshop in Goroka in 1977 will be introduced as all agriculture, teacher training and other tertiary colleges during 1978. The training of Papua New Guinean nutritionists will continue" and "important contributions to the Food and Nutrition Programme through education programmes in schools and the establishment of school tuckshops, school gardens and lunch programmes. The Department of Education will feature 'good nutrition' as a major theme in 1978 and at the beginning of the school year the nutritional status of every child attending community school will be assessed".

Nutrition partially slipped off the agenda of research, health awareness and education in the 1990s and early 2000s, with provincial nutritionist positions unfunded, agricultural extension largely ceasing, school gardens and agricultural programs side-lined. However, as the decade progressed the issue was gaining increased attention, from highlighting of PNG's poor social indicators, the priority on health, education and addressing hunger in MDGs and then in the 2010s a series of international and domestic reports on impending agricultural production deficiencies of both staple foods and gaining an affordable balanced diet for much of the population. The recent nutritional surveys in PNG, albeit localised, have highlighted continued high malnutrition levels in PNG and growing food production and distribution challenges in many rural areas, particularly in the face of higher population densities. Despite the higher rates of school enrolment and retention over the past decade, there is increased recognition that formal sector employment opportunities will remain scarce, particularly with the slow economic and employment growth over the past decade, and that most school leavers will need to return to their land and agriculture. This awareness of the realities of PNG's demography and tight formal job market, has encourage both the national and provincial education authorities to restore emphasis on agriculture, practical education and nutrition. The Budgetary constraint on schools, with their burgeoning student intakes and numbers, in ensuring the provision of an adequate diet for all their charges, particularly boarding students, is recognised by school principals and teachers, many of whom expressed eagerness to establish or restore school gardens, to be able to produce more food and cash crops on school grounds, both to increase food availability and variety, to supplement the limited purchased food (which is largely imported), as well as to enhance school incomes and provide agricultural practicals for students. This awareness of the tight budgets and often delayed release of fund for schools, and the limited, and in many cases inadequate, food supply for students, is also recognised by national and most provincial education authorities, but less starkly than in the schools themselves, and it doesn't yet seem to have got on the National Government's radar, and few MPs have yet provided district funds to assist in this critical area,

being more inclined to commit funds to build new schools and other facilities from their District Service Improvement Grants .

The Department of Education has yet to make deeper commitments in agriculture education as a top priority, and this is shown with little funding provided for its implementation. Agriculture is hardly given a mention in the latest National Education Plan 2020 – 2029.

Apart from being an examinable subject for Grades 9 and 10, school agriculture and nutrition was not compulsory, and students preferred to pursue subjects such as information technology in Grades 11 and 12, that would help them get white collar jobs. The key is to get students interested in agriculture when they are in early primary school grades so that will be motivated to continue learning about Agriculture in senior years.

There is a great need for agriculture teachers to upgrade their qualifications. No incentives are provided at all to enhance teaching of Agriculture. Some members of parliament have taken upon themselves to support secondary school education, such as Central Governor Agarobe in supporting Iarowari and Mainohana Secondary schools with large grants.

The primary purpose of school gardens are for conducting practicals in agriculture education. This is the policy that is implicit in the Agriculture syllabus taught from primary through to secondary levels.

However, schools also cultivate gardens to grow fresh produce for use to feed boarding students. This is a practice that has been carried out since the establishment of boarding schools in PNG since the 1950s. Schools are heavily reliant on the government grants to feed the boarding students, while supplementing meals with produce from their gardens. A policy is currently being developed by the NDOE on feeding school students, which till now has been left to the school boards and administration to manage.

Ways should be found to utilise the school gardens for the purpose of achieving the outcomes specified in the Agriculture Syllabus activities and assessments. Land use by the school has to be planned firstly to accommodate each of the agriculture units' requirements for each academic term. For example Lower Secondary Agriculture Unit one: Soil testing and soil preparation. Ideally each student should have a 'patch' that they can apply the techniques.

Available resources need to be better managed. Although there are some education institutions and schools that have very large allotments of land (over 5 hectares), a large number of schools do not have available land to grow school gardens, due to location but also largely due to landowner problems restricting the use of land (generally rural schools better provided). Several pathways should be developed for each school to choose to take. Such as firstly, where land is available, secondly where land is small limited they can focus on a vegetable patch or peanuts, or livestock; and where no land is available to the school, how might they focus on seeds, technology, etc. Teachers were seen to grow vegetables in their backyard, and were willing to involve students in their gardening activities, or focus on nutritious food preparation.

Recommendations on way forward

Nutrition

- Government to develop its policy on school feeding programs.

- The government will need to increase access of all children to quality education (especially for girls), so that understanding and awareness about nutrition, infant feeding practices and child feeding can be fundamentally changed.

- The government to improve access to clean drinking water, and good sanitation and hygiene at schools and for all communities.

- The national and provincial governments will need to commit sufficient financial and technical resources to support the implementation of the PNG National Nutrition Policy 2016-2026, the School Health Policy, and the National Food Security Policy, supporting schools where necessary.

Up-scaling Agriculture Education

- Ministry of Education to make Agriculture and Nutrition Education as core subjects and to allocate adequate budget for effective implementation.

- To review the curriculum of MAL using the Lower Secondary Agriculture Syllabus and Teacher Guide be adapted for use in primary and upper secondary school levels.

- The government to commit to implementing the Higher Education Strategic Implementation Plan 2017 – 2038. Supporting new scholastic infrastructure, particularly in fields such as agriculture, engineering, and teacher training.

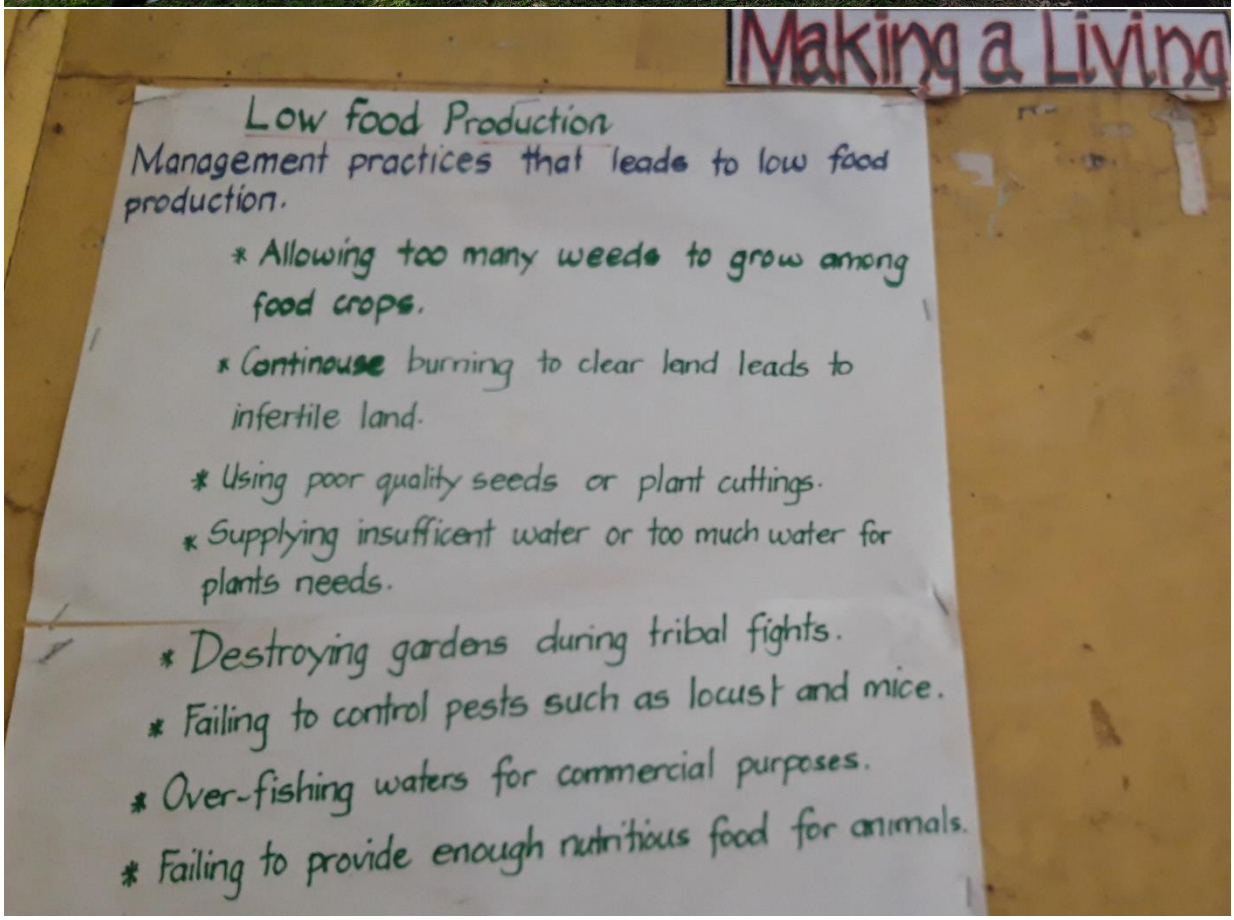
- To supply text books and teaching materials to schools. There is a need for high quality learning materials and text books with garden practices, nutrition guides, cooking guides and recipes etc.

- Schools should use advanced methods in gardens such as small machines, irrigation, high quality planting material. Money for a shed and fencing were also expressed needs. Schools can buy small scale machinery to teach upper primary and secondary students how to process foods, how to plough the ground using small tractors, and care and maintenance of these. The Highlands Agriculture Training College offers Certificate in rural engineering which covers water, mechanical, small engines, soil management which teachers can be supported to do the course.

- Position of Farm Manager to be created and funded for each school.

- Teacher training colleges, and schools need to be able to visit a nearby model school farm with crops, livestock and fisheries. This could be set up by the agriculture training institutions or at the teachers colleges. Such farms could be set up under a pilot project initially.

- Each year baseline data be collected on each student on the weight and height by age and sex, by grade for each primary and secondary school, by health teams and reports produced. In addition, the female adolescent students be tested to monitor anaemia levels.



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ANNEX 1: SCHOOL QUESTIONNAIRE

Institute of National Affairs

School Agriculture and Nutrition Survey

Schools Questionnaire

Name:_____

Position: _____

Institution:_____ Province: _____

Date of interview: _____ Location: _____

Name of School: ----------

Delivering agency Type (tick one)	**Number of Female students currently enrolled**	**Number of Male students currently enrolled**	**Number of boarders**
Government			
Church			

Comments ----------

How many students are currently taking the School Agriculture Syllabus?

Year 2021

	Males	Females	Total
Elementary			
Lower Primary			
Upper Primary			

Lower Secondary				
Upper Secondary				

2

Distance from the nearest Service Centre/ main store (hours/minutes); ----------

To town: ……

3

What is the most commonly used mode to travel to the nearest Service Centre by teachers from the school : ----------

How do students normally travel to the institution/school? ----------

What is the average cost of travel to and from schools for students? _____

4

Does this institution/school have land for agriculture? If yes, how many hectares or square meters?

What are the crops being grown by the school currently?

List from largest to smallest (land usage):

Name of Crop or Livestock	**How much of each crop is produced over last 6 months? (Kilograms)**	**What proportion is consumed by the teachers? (Percentage)**	**How much garden produce is consumed by students? (Percentage)**	**What proportion is sold?**

	Any comments? ---------- ----------
5	What kind of financial and resource support (seeds, tools, materials etc. is the school getting for its School Agriculture And Nutrition program? National: ---------- Provincial: ---------- District: ---------- Agency (church) : ---------- Others (Parents, Businesses, Development Partners): ---------- ----------

6	**School Meals feeding plan (Breakfast, lunch and/or dinner)** h) Does the school have a school feeding program? Yes No i) If YES, since when has it been running? (years) j) If no, would they be interested in one? k) How are the school meals planned? i.e. who decides which foods/meals to cook and serve, do people follow nutritional guidelines, if so which ones? l) How are the foods sourced (i.e. from where are the foods bought)?

Food sources from:	**Proportion in percentages**
Garden	
Store bought	
Donations	

m) What is the budget that is used to determine meals (e.g. Kina/meal per student)?

n) What other considerations are included (other than cost) when determining what school meals will consist of?

o) Who is involved with the cooking and serving of school meals?

p) What are the main barriers to providing more nutritious foods to students (e.g. money, skill/time to prepare foods, facility to prepare food, facility to store food (i.e. buy in bulk to save costs))?

Please provide information on which meals are offered in an average week, and the number of students who receive them. If a meal is not offered indicate with N/O

	Number of students Breakfast	Number of students Lunch	Number of students Dinner	Other
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				

Please provide information on all foods and drinks provided to the students based on the actual meals that were provided during LAST WEEK.

If possible, please provide an estimate on the quantities of each food/serving.

Note: Main food = rice Sweet potato banana, wheat based, Suppliments = greens, meats, fish, fruits, other.

	Main Food Staple food (e.g. rice, Sweet potato, banana, bread) and	**Supplements Served with (list all ingredients e.g. beef, chicken, fish, egg, carrot, greens, sago, papaya etc.) and quantity**	**Drink**

	quantity (Number of items or servings)			
Monday				
Breakfast	e.g. Bread 2 slices	1 egg, 1 slice papaya	Cup tea with milk	
Lunch				
Dinner				
Other snacks (describe)				
Tuesday				
Breakfast				
Lunch				
Dinner				
Other (describe)				
Wednesday				
Breakfast				
Lunch				
Dinner				
Other (describe)				
Thursday				
Breakfast				
Lunch				
Dinner				
Other (describe)				

Friday				
Breakfast				
Lunch				
Dinner				
Other (describe)				
Saturday				
Breakfast				
Lunch				
Dinner				
Other (describe)				
Sunday				
Breakfast				
Lunch				
Dinner				
Other (describe)				

Any other comments regarding meals?: ----------

7

Are there students with disabilities who participate in the School Agriculture and Nutrition learning and practical activities? Circle

Yes No

If so how many disabled students? Males Females

And in what ways? ----------

Is the School Agriculture And Nutrition program design gender sensitive? (Circle)

Yes No

Do males and female participate in all activities? ----------
----------If No, which activities do females NOT participate in and why?

8

What priority is given by the school to teaching Agriculture and Nutrition Syllabus? Please explain ----------
---

9

Canteens and food sellers

Does your school have a canteen where students buy food and drinks? Circle

Yes No

What items are sold at the school canteen?

Item	Price

Does the school allow for outside vendors or informal sellers to sell outside the fence or on the school grounds?

What items are sold by vendors?

Item	Price

Do the teachers (or others) monitor the sale of food items to the children?

If the school want the vendors to improve the sale of food to the child, who can they speak to address this issue? (for example related to food safety, quality, choice)?

<u>Evaluating the immediate outcomes of school garden projects.</u>

How would you describe the success level of the school agriculture and nutrition program in this school?

If yes, How successful? Circle Poor Good Very good

After schools have taught the agriculture education curriculum, do you observe the following outcomes?

(Circle the level that you agree or disagree with)

1. Do you observe students show an increased willingness to eat more nutritious foods (i.e. fresh fruits and vegetables)
(1 = *Strongly Agree*, 2 = *Agree*, 3 = *Somewhat Agree*, 4 = *Neither Agree nor Disagree*, 5 = *Somewhat Disagree*, 6 = *Disagree*, 7 = *Strongly Disagree*).

2. Do students show increased knowledge about nutrition and understand the importance of eating healthy to promote wellness.
(1 = *Strongly Agree*, 2 = *Agree*, 3 = *Somewhat Agree*, 4 = *Neither Agree nor Disagree*, 5 = *Somewhat Disagree*, 6 = *Disagree*, 7 = *Strongly Disagree*).

3. Do students show an increase in knowledge of healthy eating habits
(1 = *Strongly Agree*, 2 = *Agree*, 3 = *Somewhat Agree*, 4 = *Neither Agree nor Disagree*, 5 = *Somewhat Disagree*, 6 = *Disagree*, 7 = *Strongly Disagree*).

4. Do Students demonstrate increased ability to identify various plants and produce (i.e.
fruits and vegetables)

(1 = *Strongly Agree*, 2 = *Agree*, 3 = *Somewhat Agree*, 4 = *Neither Agree nor Disagree*, 5 = *Somewhat Disagree*, 6 = *Disagree*, 7 = *Strongly Disagree*).

5. Do students demonstrate increased knowledge and appreciation for the hard work associated with gardening

(1 = *Strongly Agree*, 2 = *Agree*, 3 = *Somewhat Agree*, 4 = *Neither Agree nor Disagree*, 5 = *Somewhat Disagree*, 6 = *Disagree*, 7 = *Strongly Disagree*).

6. Do students demonstrate increased knowledge of how the garden can generate income

and provide foods at a lower cost

(1 = *Strongly Agree*, 2 = *Agree*, 3 = *Somewhat Agree*, 4 = *Neither Agree nor Disagree*, 5 = *Somewhat Disagree*, 6 = *Disagree*, 7 = *Strongly Disagree*).

7. **Are teachers increasing knowledge, skills and confidence for planning and carrying out gardening best practices**
(1 = *Strongly Agree*, 2 = *Agree*, 3 = *Somewhat Agree*, 4 = *Neither Agree nor Disagree*, 5 = *Somewhat Disagree*, 6 = *Disagree*, 7 = *Strongly Disagree*).

8. Are teachers have increased knowledge for engaging the community (school community and surrounding neighbourhoods) in gardening

(1 = *Strongly Agree*, 2 = *Agree*, 3 = *Somewhat Agree*, 4 = *Neither Agree nor Disagree*, 5 = *Somewhat Disagree*, 6 = *Disagree*, 7 = *Strongly Disagree*).

THANK YOU VERY MUCH

ANNEX 2: TEACHER TRAINING & EXTENSION INSTITUTIONS QUESTIONNAIRE

Institute of National Affairs

School Agriculture and Nutrition Survey

Teacher Training Institutions

Name:_____

Position: _____

Institution:_____

Province: _____

Date of interview: _____ Location: _____

1	Name of Institution: ---------- Location: ---------- Address: ---------- Phone: ---------- Email: ---------- Contact Person: ---------- Could you please tell us about this institution: When was it established? What type of institution? Circle Government Church We are here to find out about the National School Agriculture And Nutrition policy and if any curricula is designed around meeting these requirements by your institution? Please explain. _____ _____ _____

	Does your institution focus on Primary School teacher training? Circle Yes No Does your institution focus on Secondary School teacher training? Circle Yes No
2	**Enrolment** Total number of students enrolled in this institution; Males ☐ Females ☐ Does the institution have a target for Agriculture and nutrition students? Is the institution able to achieve the target? If not, why not?
3	**Curriculum** What are the main subjects students are being trained to teach at the training institution? --- Is Agriculture & Nutrition training part of the curriculum? Circle Yes No Number of Students majoring in Agriculture & Nutrition: ☐ Males Females ☐ How long do students take to complete the Diploma and the Degree? Does the institution have gender sensitive training programs for Agriculture & Nutrition trainees? If Yes please describe; ---------- ---------- Does the institution cater for people with disabilities?

<table>
<tr><td></td><td>If Yes, please describe: ----------

_____</td></tr>
<tr><td>4</td><td>How many Agriculture & Nutrition teachers has the institution graduated in the last 5 years?

<table><tr><th>Subject</th><th>Number of male graduates</th><th>Number of female graduates</th></tr><tr><td>Agriculture (Crops & Livestock)</td><td></td><td></td></tr><tr><td>Home Economics</td><td></td><td></td></tr><tr><td>Making a Living</td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>
Does the institution monitor the appointments and teaching performance of its former trainees?

If yes describe the trends; ----------

----------</td></tr>
<tr><td>5.</td><td>Does the institution have plans for improving Agriculture & Nutrition training in the next 5 years?

I yes, describe; ----------
_____

_____</td></tr>
</table>

Section Five: Agriculture Extension Training Institutions

Name:_____

Position: _____

Institution:_____ Province: _____

Date of interview: _____ Location: _____

1	Name of institution ; ---------- Address: ---------- Telephone; ---------- Email: ---------- Contact Person; ----------
2	How many trainees are enrolled now? Males Females Is courses gender sensitive? Describe; ---------- ---------- Do you enrol people with disabilities? Yes No If yes, how many has this institute enrolled in the last five years? Describe what special coursed are designed for PLWD; ----------

3	Does this institute get involved in teach training in teachers'' colleges? If yes which colleges? ---------- What courses does this institute teach in teacher trainees? ----------
4	If this institute is not involved in teacher training, are there any plans to participate in teacher training in the agriculture making a living, and home science subjects? If Yes, explain, ----------

ANNEX 3: FOOD SERVED AT SECONDARY BOARDING SCHOOLS

Name of secondary school: Benabena Secondary School

	Main Food Staple food	**Supplements Served**	**Drink**
Monday			
Breakfast	Portion white rice	Tin fish (Ocean Blue Tuna in Oil Tuna in oil) with Noodles (Maggi)	Water
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi) stew, pumpkin, English cabbage.	Water
Other snacks (describe)			
Tuesday			
Breakfast	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi) stew, pumpkin, English cabbage.	Water
Other (describe)			
Wednesday			
Breakfast	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with	Water

		Noodles (Maggi) stew, pumpkin, English cabbage.	
Other (describe)			
Thursday			
Breakfast	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi) stew, pumpkin, English cabbage.	Water
Other (describe)			
Friday			
Breakfast	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi) stew, pumpkin, English cabbage.	Water
Other (describe)			
Saturday			
Breakfast	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi) stew,	Water

		pumpkin, English cabbage.	
Other (describe)			
Sunday			
Breakfast	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi)	Water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil) with Noodles (Maggi) stew, pumpkin, English cabbage.	Water
Other (describe)			

Any other comments regarding meals? Special Occaision meals twice a term (public holidays or exam time): Cream bun, cordial, lamb flaps, red sausages, and rice.
Every pay day fortnight, students are allowed to go home for the weekend.

Name of secondary school: Markham Valley Secondary School

	Main Food Staple food	**Supplements Served**	**Drink**
Monday			
Breakfast	1 bun or 4 biscuits (Snax) packet flavoured biscuits		Water 1 cup
Lunch	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Dinner	1-2 cups white rice, 1 serve sweet potato, cooked	Tin fish stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup

	banana. Pack of noodles		
Other snacks (describe)			
Tuesday			
Breakfast	1 bun or 4 biscuits (Snax) packet flavoured biscuits	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Lunch	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Dinner	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Other (describe)			
Wednesday			
Breakfast	1 bun or 4 biscuits (Snax) packet flavoured biscuits	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Lunch	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Dinner	1-2 cups white rice, 1 serve sweet	Tin fish stew with vegetables (aibika,	Water 1 cup

	potato, cooked banana. Pack of noodles	tomatoes, beans, carrots)	
Other (describe)			
Thursday			
Breakfast	1 bun or 4 biscuits (Snax) packet flavoured biscuits	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Lunch	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Dinner	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Other (describe)			
Friday			
Breakfast	1 bun or 4 biscuits (Snax) packet flavoured biscuits	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Lunch	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Dinner	1-2 cups white rice, 1 serve sweet	Tin fish stew with vegetables (aibika,	Water 1 cup

	potato, cooked banana. Pack of noodles	tomatoes, beans, carrots)	
Other (describe)			
Saturday			
Breakfast	1 bun or 4 biscuits (Snax) packet flavoured biscuits	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Lunch	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Dinner	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish stew with vegetables (aibika, tomatoes, beans, carrots)	Water 1 cup
Other (describe)			
Sunday			
Breakfast	1 bun or 4 biscuits (Snax) packet flavoured biscuits	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water
Lunch	1-2 cups white rice, 1 serve sweet potato, cooked banana. Pack of noodles	Tin fish (Ocean Blue Tuna in Oil) stew with vegetables (aibika, tomatoes, beans, carrots)	Water
Dinner	Rice, sweet potato.	Tin fish (Ocean Blue Tuna in Oil)	Cordial drink

		or tin meat (SITA brand)	
Other (describe)			

Any other comments regarding meals?: Special meals two times in one 10 week term, in week 6 and week 9. Stew with chicken pieces, carrots, tomatoes, onions, beans, eggplants.

Name of secondary school: Mount Diamond Adventist Secondary School

	Main Food Staple	**Supplements Served**	**Drink**
Monday			
Breakfast	4 wholemeal biscuits (Snax)		Cup Milo with milk
Lunch	Portion mixed white & brown rice, noodles (Maggi)	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens.	Tang cordial drink
Dinner	Portion mixed brown & white rice, noodles (Maggi), sweet potato.	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens, pumpkin, English Cabbage stew.	Tang cordial drink
Other snacks (describe)			
Tuesday			
Breakfast	4 wholemeal biscuits (Snax)		Cup Milo with milk
Lunch	Portion mixed white & brown rice, noodles (Maggi)	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens.	Tang cordial drink
Dinner	Portion mixed brown & white rice, noodles (Maggi), sweet potato.	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens, pumpkin, English Cabbage stew.	Tang cordial drink
Other (describe)			
Wednesday			

Breakfast	4 wholemeal biscuits (Snax)		Cup Milo with milk
Lunch	Portion mixed white & brown rice, noodles (Maggi)	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens.	Tang cordial drink
Dinner	Portion mixed brown & white rice, noodles (Maggi), sweet potato.	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens, pumpkin, English Cabbage stew.	Tang cordial drink
Other (describe)			
Thursday			
Breakfast	4 wholemeal biscuits (Snax)		Cup Milo with milk
Lunch	Portion mixed white & brown rice, noodles (Maggi)	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens.	Tang cordial drink
Dinner	Portion mixed brown & white rice, noodles (Maggi), sweet potato.	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens, pumpkin, English Cabbage stew.	Tang cordial drink
Other (describe)			
Friday			
Breakfast	4 wholemeal biscuits (Snax)		Cup Milo with milk
Lunch	Portion mixed white & brown rice, noodles (Maggi)	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens.	Tang cordial drink
Dinner	Portion mixed brown & white rice, noodles (Maggi), sweet potato.	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens, pumpkin, English Cabbage stew.	Tang cordial drink
Other (describe)			
Saturday			
Breakfast	4 wholemeal biscuits (Snax)		Cup Milo with milk

Lunch	Portion mixed white & brown rice, noodles (Maggi)	Chicken pieces, Aibika Greens, Watermelon.	Tang cordial drink
Dinner	Portion mixed brown & white rice, noodles (Maggi), sweet potato.	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens, pumpkin, English Cabbage stew.	Tang cordial drink
Other (describe)			
Sunday			
Breakfast	4 wholemeal biscuits (Snax)		Cup Milo with milk
Lunch	Portion mixed white & brown rice, noodles (Maggi)	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens.	Tang cordial drink
Dinner	Portion mixed brown & white rice, noodles (Maggi), sweet potato.	Tin fish (Ocean Blue Tuna in Oil), Aibika Greens, pumpkin, English Cabbage stew.	Tang cordial drink
Other (describe)			

Name of secondary school: Iarowari Agro Technical Secondary School

	Main Food Staple food	**Supplements**	**Drink**
Monday			
Breakfast	Portion of white rice medium grain (Trukai)	Tinned meat (Sita) or tin fish (Ocean Blue).	1 cup tea with milk
Lunch	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup cordial
Dinner	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup water
Other snacks (describe)			

Tuesday			
Breakfast	Portion of white rice medium grain (Trukai)	Tinned meat (Sita) or tin fish (Ocean Blue).	1 cup tea with milk
Lunch	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup cordial
Dinner	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup water
Other (describe)			
Wednesday			
Breakfast	Portion of white rice medium grain (Trukai)	Tinned meat (Sita) or tin fish (Ocean Blue).	1 cup tea with milk
Lunch	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup cordial
Dinner	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup water
Other (describe)			
Thursday			
Breakfast	Portion of white rice medium grain (Trukai)	Tinned meat (Sita) or tin fish (Ocean Blue).	1 cup tea with milk
Lunch	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup cordial
Dinner	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup water
Other (describe)			
Friday			

Breakfast	Portion of white rice medium grain (Trukai)	Tinned meat (Sita) or tin fish (Ocean Blue).	1 cup tea with milk
Lunch	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup cordial
Dinner	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup water
Other (describe)			
Saturday			
Breakfast	Portion of white rice medium grain (Trukai)	Tinned meat (Sita) or tin fish (Ocean Blue).	1 cup tea with milk
Lunch	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup cordial
Dinner	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup water
Other (describe)			
Sunday			
Breakfast	Portion of white rice medium grain (Trukai)	Tinned meat (Sita) or tin fish (Ocean Blue).	1 cup tea with milk
Lunch	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup cordial
Dinner	Portion of white rice, noodles.	Tinned fish (Ocean Blue Tuna in Oil), Pak choi, onion, aibika. Tin meat (Sita)	1 cup water
Other (describe)			

Any other comments regarding meals?: Special meals are provided where Saveloy sausages, sometimes chicken pieces in stew with carrots, sweet potato and rice. Cordial drink is given.

Name of secondary school: Mainohana Catholic Secondary School

	Main Food **Staple food**	**Supplements** **Served with**	**Drink**
Monday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita).	Cup water
Lunch	2 buns or scones		Cup water
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita), local greens	Cup water
Other snacks (describe)			
Tuesday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita).	Cup water
Lunch	2 buns or scones		Cup water
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita), local greens	Cup water
Other (describe)			
Wednesday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita).	Cup water
Lunch	2 buns or scones		Cup water
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita), local greens	Cup water
Other (describe)			
Thursday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or	Cup water

		Tin meat (Sita).	
Lunch	2 buns or scones		Cup water
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita), local greens	Cup water
Other (describe)			
Friday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita).	Cup water
Lunch	2 buns or scones		Cup water
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or	Cup water
Other (describe)			
Saturday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita).	Cup water
Lunch	2 buns or scones		Cup water
Dinner	Portion of white rice	Tin meat (Ox & Palm) or Saveloys sausages, local greens	Water
Other (describe)			
Sunday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or Tin meat (Sita).	Cup water
Lunch	2 buns or scones		Cup water
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil), or tin meat (Sita)	Cup water
Other (describe)			

Any other comments regarding meals?: None

Name of secondary school: Malabanga Secondary School

	Main Food **Staple food**	**Supplements** **Served with**	**Drink**
Monday			
Breakfast	1 bread roll, or 4 biscuits (Cabin)		Cup tea with milk
Lunch	Sweet potato.	Tin fish (Diana tuna), local greens (aibika, aupa)	Cup of Cordial
Dinner	Portion white rice, sweet potato.	Tin meat (Globe), local Greens stew.	Cup of cordial
Other snacks (describe)			
Tuesday			
Breakfast	1 bread roll, or 4 biscuits (Cabin)		Cup tea with milk
Lunch	Sweet potato.	Tin fish (Diana tuna), local greens (aibika, aupa)	Cup of Cordial
Dinner	Portion white rice, sweet potato.	Tin meat (Globe), local Greens stew.	Cup of cordial
Other (describe)			
Wednesday			
Breakfast	1 bread roll, or 4 biscuits (Cabin)		Cup tea with milk
Lunch	Sweet potato.	Tin fish (Diana tuna), local greens (aibika, aupa)	Cup of Cordial
Dinner	Portion white rice, sweet potato.	Tin meat (Globe), local Greens stew.	Cup of cordial
Other (describe)			

Thursday			
Breakfast	1 bread roll, or 4 biscuits (Cabin)		Cup tea with milk
Lunch	Sweet potato.	Tin fish (Diana tuna), local greens (aibika, aupa)	Cup of Cordial
Dinner	Portion white rice, sweet potato.	Tin meat (Globe), local Greens stew.	Cup of cordial
Other (describe)			
Friday			
Breakfast	1 bread roll, or 4 biscuits (Cabin)		Cup tea with milk
Lunch	Sweet potato.	Tin fish (Diana tuna), local greens (aibika, aupa)	Cup of Cordial
Dinner	Portion white rice, sweet potato.	Tin meat (Globe), local Greens stew.	Cup of cordial
Other (describe)			
Saturday			
Breakfast			
Lunch			
*Dinner**	Portion of rice, sweet potatoe.	Pieces of chicken or beef sausage fresh fish, local greens	
Other (describe)			
Sunday			
Breakfast	1 bread roll, or 4 biscuits (Cabin)		Cup tea with milk
Lunch	Sweet potato.	Tin fish (Diana tuna),	Cup of Cordial

		local greens (aibika, aupa)	
Dinner	Portion white rice, sweet potato.	Tin meat (Globe), local Greens stew.	Cup of cordial
Other (describe)			

Any other comments regarding meals: * The special meal is given once a week to the boarding students. The meal is alternated on Thursday prior to their departure to go home for the weekend each fortnight.

Name of secondary school: Cameron Secondary School

	Main Food Staple food	**Supplements Served**	**Drink**
Monday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Lunch	Portion of white rice	Tin fish (Ocean Blue Tuna	Cup cordial
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Other snacks (describe)			
Tuesday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Lunch	Portion of white rice	Tin fish (Ocean Blue Tuna	Cup cordial
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Other (describe)			
Wednesday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Lunch	Portion of white rice	Tin fish (Ocean Blue Tuna	Cup cordial
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar

Other (describe)			
Thursday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Lunch	Portion of white rice	Tin fish (Ocean Blue Tuna	Cup cordial
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Other (describe)			
Friday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Lunch	Portion of white rice	Tin fish (Ocean Blue Tuna	Cup cordial
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Other (describe)			
Saturday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Lunch	Portion of white rice	Packet of 4 biscuits (Snax	Cup Tang cordial
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Other (describe)			
Sunday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Lunch	Portion of white rice	Packet of 4 biscuits (Snax	Cup Tang cordial
Dinner	Portion of white rice	Tin fish (Ocean Blue Tuna	Tea with milk/sugar
Other (describe)			

Any other comments regarding meals?: Tinned meat (Ox & Palm) is given once a week, and for those students who are adverse to tin fish. Once a month, chicken is cooked for the boarders. Three chickens is shared among 150 students.

Name of secondary school: Hagita Sacred Heart Secondary School

	Main Food Staple food	**Supplements Served**	**Drink**
Monday			
Breakfast	3 biscuits (Snax)		Cup of tea or Milo with milk
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Other snacks (describe)			
Tuesday			
Breakfast	4 slices of bread with butter		Cup of tea or Milo with milk
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Other (describe)			
Wednesday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of tea or Milo with milk
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Other (describe)			
Thursday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of tea or Milo with milk
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Other (describe)			

Friday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of tea or Milo with milk
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Other (describe)			
Saturday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of tea or Milo with milk
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Other (describe)			
Sunday			
Breakfast	Portion of white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of tea or Milo with milk
Lunch	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Dinner	Portion white rice	Tin fish (Ocean Blue Tuna in Oil)	Cup of water
Other (describe)			

Any other comments regarding meals?: Sometimes fresh fish is bought from locals and prepared for the students. At least once a week also, the students will eat chicken or Saveloy sausages, depending on funds available.

Note: No date collected on menu for Asaroka Lutheran Secondary School.

ANNEX 4: LIST OF PERSONS CONTACTED AND/OR INTERVIEWED

Name	Title	Organisation	Province
Dr Michael Bourke	PNG agriculture expert/Senior Fellow	Australian National University	Canberra
Prof. Peter Heywood (retired)	Honorary Professor, International Health	University of Sydney	Sydney
Neil Nicholls	Former Education Advisor	City Mission	NCD
Ms Mary Kalit	Principal	Salvation Army Primary School	NCD
Mr Laurie Fooks	Program Director	National Agricultural Research Institute	Morobe
Mr Gandhi Lavaki	A/Assistant Secretary	Department of Education – Curriculum Division	NCD
Ms Annie Teibulu Dominic	Curriculum Officer – Agriculture & Resource Management	Department of Education	NCD
Mr Allan Jim	Assistant Secretary – Teacher Education Division	Department of Education	NCD
Mr Mirou Avosa	Senior Curriculum & Assessment Officer, Curriculum Division	Department of Education	NCD
Mr Gilbert P. Ikupu	Senior Curriculum Officer - Sciences	Department of Education	NCD
Ms Dynah Kyakas	Staff Development Officer, Teacher Education Division	Department of Education	NCD
Mr Keith Tangui	Education Advisor	Provincial Administration	Morobe
Mr Joseph Tounokon	TFF Coordinator	Provincial Administration	Morobe
Mr Levi James	Deputy Principal	Ragiampun Adventist Primary School	Morobe
Mr Willie Jeremiah	Senior Teacher	Ragiampun Adventist Primary School	Morobe
Mr Billy Kayo	Principal	Markham Valley Secondary School	Morobe
Anton Paglau	Deputy Principal	Taraka Primary School	Morobe
Ms Belinda Haringke	Senior Teacher – grade 8	Taraka Primary School	Morobe

Mr Kumaye	Senior Teacher – grade 5	Taraka Primary School	Morobe
Mr Waugo Mack	Lecturer	Balob Teachers College	Morobe
Ms Maria Kidup	Lecturer	Balob Teachers College	Morobe
Mr Hillary Siamoli	Lecturer	Balob Teachers College	Morobe
Mr Brandy Koldop	Superintendent – High/Secondary & TVET	Provincial Administration – Education Division	Western Highlands
Mr Phillip Senat	Principal	Highlands Agriculture College	Western Highlands
Ms Sonia Bonney	Secretary	Highlands Agriculture College	Western Highlands
Mr Joe Muna	Registrar	Highlands Agriculture College	Western Highlands
Ms Aroai Afing	Librarian	Highlands Agriculture College	Western Highlands
Mr Michael Miamel	Principal	Holy Trinity Teachers College	Western Highlands
Mr. Kennedy David	Deputy Principal – Academic	Kui Wampga Secondary School	Western Highlands
Mr Richard Arawana	Teacher in Charge-Livestock	Iarowari Agro Technical Secondary School	Central
Ms Rose Onne	Deputy Principal, TVET	Iarowari Agro Technical Secondary School	Central
Mr Max Yalupa	Teacher in Charge - Agriculture	Mainohana Catholic Secondary School	Central
Mr Lenyves Amos	Deputy Principal - Administration	Mount Diamond Adventist Secondary School	Central
Mr Rickly Aite	Agriculture Teacher	Mount Diamond Adventist Secondary School	Central
Mr Gaile Gaoma	Acting Advisor Education	Provincial Administration – Division of Education	Central
Mr Yamuia	Headmaster	Sogeri Primary School	Central
Ms. Rachael Warilaka	MAL Teacher	Sogeri Primary School	Central
Mr Horai Bagi	Headmaster	Kerekadi Primary School	Central
Mr Makan Sale	Superintendent Operations	Provincial Education Office	Milne Bay
Ms Tracy Gorden	Senior Teacher	Lelehudi Primary School	Milne Bay
Mrs Betty Kehara	Deputy Principal - Administration	Hagita Sacred Heart Secondary School	Milne Bay
Mr Obeddie Wayuelo	Agriculture Teacher	Hagita Sacred Heart Secondary School	Milne Bay
Mrs Edilesi Peter	Agriculture Teacher	Hagita Sacred Heart Secondary School	Milne Bay
Mr Matei Yas	Principal	Gaulim Teachers College	East New Britain

Mr Fhox Yenga Ha	Head of Education, Academic & Curriculum Affairs	Kabaleo Teachers College, Divine Word University, Kokopo	East New Britain
Mr Wesley Albert	Education Adviser	Provincial Education Office	Eastern Highlands
Mr Edwin Wairan	Principal	Benabena Secondary School	Eastern Highlands
Mr Homura	Agriculture Teacher	Benabena Secondary School	Eastern Highlands
Mr Propert Waleka	Senior Teacher MAL	Kapakamarigi Primary School	Eastern Highlands
Mr Ezekiel Oyekana	Teacher	Kapakamarigi Primary School	Eastern Highlands
Mr John Raga	Grade 8 teacher	Kapakamarigi Primary School	Eastern Highlands
Mr Duncan Boina	Grade 7 teacher	Kapakamarigi Primary School	Eastern Highlands
Mr Aki Olisagave	Principal	Asaroka Lutheran Secondary School	Eastern Highlands
Mr Orokolo	Agriculture Teacher	Asaroka Lutheran Secondary School	Eastern Highlands
4 x Grade 12 students	Students – from Hela, SHP Okapa and Asaro	Asaroka Lutheran Secondary School	Eastern Highlands
Dr Sangion Tiu	Director	Research and Conservation Foundation	Eastern Highlands
Ms Elizabeth Kaulei	Education program manager	Research and Conservation Foundation	Eastern Highlands
Prof Alan Quartermain	Professor of Agriculture and Dean of Science	University of Goroka	Eastern Highlands
Mr Gordon Wallangas	Head of Department – Agriculture Extension	University of Goroka	Eastern Highlands
Dr Alois Ndrewou	Lecturer rural development	University of Goroka	Eastern Highlands
Mr Api Gibson	Lecturer – Agricultural Extension /education	University of Goroka	Eastern Highlands
Mr Joe Egenae	Lecturer – Livestock /crop protection	University of Goroka	Eastern Highlands
Mr Warigiso Jaybanse	Principal	Goroka Secondary School	Eastern Highlands
Ms Merolyn Fifine	Head of Agriculture	Goroka Secondary School	Eastern Highlands
Mrs Karani	Teacher - Agriculture	Goroka Secondary School	Eastern Highlands
Mrs Sylvie, Kepa, Mr Nate, Hennington	Teacher Agriculture and farm assistant	Goroka Secondary School	Eastern Highlands

A group of students (Gwenda)	students	Goroka Secondary School	Eastern Highlands
Mr. Warigiso Jaybanse	Grade 11, Agriculture/Rural Tech Student	Goroka Secondary School	Eastern Highlands
Ms Karista Jonduo	Grade 11, Agriculture/Rural Tech Student	Goroka Secondary School	Eastern Highlands
Mr. Rex Hemsley	Grade 11, Agriculture/Rural Tech Student	Goroka Secondary School	Eastern Highlands
Mr. Wartovo Kilala	Provincial Education Research Officer	Provincial Education office	East New Britain
Mr. Bruno Kulai	Principal	Malabunga Secondary School	East New Britain
Mrs. Lyneth Vuru	Subject Master – Agriculture	Malabunga Secondary School	East New Britain
Mr. Emos Malalia	Board Chairman	Vunairima Primary School	East New Britain
Ms. Lila Wolia	Teacher	Vunairima Primary School	East New Britain
Mrs. Roselyn Tenanga	Snr Teacher	Vunairima Primary School	East New Britain
Mr. William Maira	Head Teacher	Vunairima Primary School	East New Britain
Mr. Viviran Teko	Grade 7 Teacher	Vunairima Primary School	East New Britain
Tonit Alex	Teacher	Vunairima Primary School	East New Britain
Ms Mary Gumia	Teacher	Vunairima Primary School	East New Britain
Ms Jessica Basil	Teacher	Vunairima Primary School	East New Britain
Ms Darusila Francis	Teacher	Vunairima Primary School	East New Britain
Ms. Jacklyn Todol	Grade 6 Teacher	Vunairima Primary School	East New Britain
Mr William Maira	Head Teacher	Vunairima Primary School	East New Britain
Gwenderlyn Malagun	Senior teacher	Vunairima Primary School	East New Britain
Leonie Varnet	Senior teacher	Vunairima Primary School	East New Britain
Nicole Baroro	Senior teacher	Vunairima Primary School	East New Britain
Mrs. Kot Isikel	Head Teacher	Tudungan Primary School	East New Britain
Mr. Matei Yass	Principal	Gaulim Teachers College	East New Britain
Mr. Richard Periwanga	Executive Officer to the VC	University of Natural Resources & Environment	East New Britain
	1. a/HOD –	University of Natural Resources & Environment	East New Britain

	Fisheries 2. a/HOD - Animal Science 3. Lecturer – Crop & Soil Science 4. Acting Dean - School of Sustainable Resource Management & Business Studies, & HOD – Tourism & Hospitality 5. a/Head Teacher- Honey Bee Play & Elementary School.		
	Principal and selected Agriculture teachers & students	George Brown Memorial School	East New Britain
Mr Geoff Thompson	Former Education Adviser	Department of Education	