



SEEDS FOR NEEDS

PAPUA NEW GUINEA



All information provided in this publication is from the 'Seeds for Needs' initiative in Papua New Guinea, led by Bioversity International in partnership with the National Agricultural Research Institute (NARI) of Papua New Guinea. The initiative also contributes to the CGIAR Research Program on Climate Change, Agriculture and Food Security.

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Cover photo by Paul Quek – *Farmers with varieties of taro and sweet potato*



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Agriculture in Papua New Guinea, the 'Seeds for Needs' initiative and voices from the farmers we work with



PAPUA NEW GUINEA

Nestled between Australia and the Equator, the tropical islands of Papua New Guinea are a treasure trove of biodiversity. With landscapes ranging from coral reefs to mangroves, tropical rainforests and rugged mountains, the country is home to more than 5% of the world's biodiversity in less than 1% of the world's land area.

Its agricultural biodiversity is equally rich – farmers here grow over 200 different crop species, many of which are native to the area. Roots and tubers such as sweet potato and taro are particularly important staple crops, followed by banana, yam and a variety of vegetables, such as the local Aibika (*Abelmoschus manihot*).

Around 70% of Papua New Guinea's 7 million people depend on agriculture, mostly for home consumption, selling only excess produce to local or national markets. While sweet potato dominates the highlands, taro and leafy vegetables are more important in the lowlands and valleys. Banana is widespread throughout the country, and coffee is one of the few crops grown exclusively for market.

Environmental factors such as soil, terrain and water availability strongly influence the crops grown by farmers. Climate variation is also a frequent occurrence, Papua New Guinea being one of the countries that is affected by the El Niño Southern Oscillation – a shift in ocean temperatures that can bring either thunderous hurricanes or parching drought. The last severe episode of El Niño occurred in 1997/98, and Papua New Guinea suffered from a severe, prolonged drought that led to widespread crop loss and hunger, especially in the highlands. Many farmers also lost crop seeds and planting materials during this time, some varieties permanently so.

Scientists predict that climate change may further increase the frequency and intensity of El Niño over the coming years. It is with this premise, that the 'Seeds for Needs' initiative was launched in Papua New Guinea – piloting the use of agricultural biodiversity as a means of mitigating and adapting to the effects of climate change.

SEEDS FOR NEEDS

'Seeds for Needs' is a global initiative led by Bioversity International in 11 countries throughout Africa, the Americas and Asia Pacific. The aim is to build more resilient and adaptable farming and seed systems by exposing farmers to more crop varieties, increasing their first-hand knowledge of different traits (yield, taste, drought resistance etc.) and improving their capacity to save and access good quality seeds or planting materials.

While each country operates slightly differently, a key feature is working with local partners and farmers to decrease their vulnerability to climate change and other risks by using the diversity that exists within important crops.

In Papua New Guinea, Bioversity International works with the National Agricultural Research Institute (NARI) on two main crops: sweet potato and taro. NARI's genebanks hold around 850 taro accessions (samples of plant material) and over 1,300 sweet potato accessions from around the country. Researchers from the initiative began by characterizing the traits of these accessions, while at the same time, using Geographic Information Systems (GIS) technology to predict future

climate scenarios in different parts of the country. The idea was to combine the two sets of information and shortlist crop varieties that would be most useful for farmers to adapt to climate change.

Taking into account farmers' preferences such as taste, yield, appearance and maturing time, 12 varieties of sweet potato and 23 varieties of taro were multiplied and tested in field trials and by participating farmers. A small percentage of these varieties were directly suggested by and sourced from the farmers themselves. In order to increase awareness of these crops and their varieties, several farmer field days and agricultural events were organized with surrounding communities. A radio script was also recorded by NARI and aired widely in rural areas.

Most farmers involved have continued to use varieties introduced through the initiative and many have shared them with neighbouring friends and family. Farmers that were not directly involved frequently showed up to training sessions in order to learn planting techniques that have helped improve yields both in quantity and quality.





GENDER & CULTURE

With almost 1,000 ethnic groups and over 800 languages, Papua New Guinea's diversity is not limited to its flora and fauna. Kinship ties are of extreme importance, and each individual is bound by the *wantok* system – tribal ties that form the basis of mutual support and social obligation.

Local seed systems clearly reflect *wantok*. Most farmers get new planting material from family or kin rather than markets or extension agents. Marriage between different tribes, a common practice, also tends to increase access to new crops and varieties. This can be a disadvantage, however, for farmers who migrate to a new area and are not considered part of the community. Forty per cent of the farmers we spoke to agreed that new migrants do not have access to the same system of planting material exchange, either having to save their own varieties, get them from extension agents or purchase them from the market. Having said that, settlers can also be a source of new materials. One example is a sweet potato variety known as *Peter*, named after the truck driver who introduced it to the Asarenka village in the Eastern Highlands.

Family and gender roles are also prevalent. Land is inherited and farming knowledge is passed down from generation to generation. Many crops are under either the male or female domain. For example, banana, sugar cane, taro, cassava and cash crops are traditionally only grown by men, while women are responsible for sweet potato, leafy vegetables and beans. Knowledge about these crops is therefore quite divided, and closely linked to other divisions of labour. 'Female' crops tend to be those important for cooking and feeding the family, while many 'male' crops reflect social status and are predominantly for ceremonial use. Taro, for example, is often offered by the groom as part of the bride price during a wedding ceremony.

While the weakening of tradition and increasing market importance have somewhat relaxed crop divisions, many farmers still consider it *tambu* (taboo) for women to be involved in planting taro and other 'male' crops.

CHANGES

“When we expect rain, we get dry; when we expect dry, we get rain”, expressed one farmer. A simple statement reflecting the increasing effects of climate change in Papua New Guinea. To adapt, some farmers have been adopting fast-maturing varieties of crops, leaving plots of land fallow for less time, experimenting with new varieties they come across, and maintaining planting materials near forest streambeds during times of drought.

Sudden fluctuations and extreme weather can also increase pest and disease outbreaks, reducing both yield and marketability of farm produce. But farmers adapt. An outbreak of coffee leaf rust in the late 1980s, for example, led to a switch from coffee to sweet potato in the highlands. More recently, disease has wiped out areas of the much-loved Areca nut (or betel nut), used by the islanders as a chewing pastime. Once again, crop diversification was a common coping method used by farmers, who now grow vegetables and other crops for market instead.

Land is another issue. Inheriting land from parents, usually from father to son(s), is general practice. With each generation, plots become smaller and smaller as

they are divided between siblings. This in turn leads to more intensified agriculture, depleting soil quality and eventually yields. Burning forests and grasslands for agriculture is also a growing environmental problem for both local people and biodiversity.

Increased market links and the growing importance of monetary culture, is also affecting how and what farmers grow. This can of course have both positive and negative effects. More farmers are selling planting materials at the market, increasing access to those who previously could not acquire materials through kinship ties. Diversified income sources can also create new opportunities – many farmers admitted that much of their income went to paying for their children’s school fees. A positive development perhaps, but this could also affect the continued transfer of traditional knowledge to younger generations as they become less and less interested in farming.

Change is at the core of why diversity is so important. Farmers must have access to the seeds that will help them adapt to their changing needs over time.



EASTERN HIGHLANDS

The Eastern Highlands of Papua New Guinea are known for their sweet potato, and many farmers grow up to eight varieties on their farms. Most farmers are semi-subsistent, but coffee is one example of a cash crop, and farmers usually rotate or intercrop sweet potato with maize, beans and vegetables.



NELLIE PANOTE

Nellie is a farmer from Asarenka, higher up the mountain valley. Like many farmers in the area, she practices shifting cultivation with the help of her family, particularly her son, Darius. Through the 'Seeds for Needs' initiative, she experimented with various sweet potato varieties and other crops, and has since kept one variety for its good yield and taste.

"I grow sweet potato for special occasions, like death ceremonies, bride price and sing sings," says Nellie, referring to gatherings and festivals where people dress up, dance and play music. Sweet potato is also an important food source, and Nellie expressed having problems with yield and pests and diseases, especially in the dry season. Some of the planting techniques she learned through the initiative have helped.

"I have changed a lot of my farming practices. Before, I did not use spacing, and planted crops all over the garden. I've noticed that I now harvest higher yields, and rotating crops has made the soil more loose and soft," says Nellie.

"Now we also plant different crops and at the right time to avoid the build up of pests and diseases," adds Darius.



MARIE JOP

Marie Jop is a farmer from the coast, but now lives in the Eastern Highlands with her five children.

She learned some new techniques through the initiative, "I am using green manure and know to leave plant debris on the soil for some time before I cultivate it the year after. I also know how to collect clean planting materials and remove infected plants to avoid pests and diseases."

Marie has kept three sweet potato varieties from the trials. "They have high yield, good taste, and are pest- and disease- resistant," she says. "They add to my collection, so I have more to eat and sell. We also have some semi-commercial farmers who come buy sweet potato at our farm gate."

When asked about continuing to work with us, she shared, "Previously I did not know what NARI did, but now I am keen to work with them because it's the only way to acquire knowledge and get different varieties of good quality seeds."

Marie was keen to try more new varieties, but also keeps those that she already had, like *Gimane*, which she grows organically and sells to markets in Lae and Port Moresby.



TIMO JACK



Lower down the valley, Timo Jack decides when and what to plant with his wife Nelma and the rest of his family. Sweet potato and the vegetables they grow are important for food but also in high demand at the market.

"The varieties we tried were of good taste and appearance but they were new to the soil and environment, so some did not yield too well," says Jack. One variety however performed well and the couple has shared it with other community members.

"We had a lot of sweet potato varieties before, but now many people in this area are growing a variety called *Gimane*, popularly known as 'I don't care', because it adapts to any weather or soil type," explains their neighbour Jeffrey.

More importantly, Timo Jack expressed having improved his knowledge of farm and time management, cultivation techniques, and combating pests, diseases and weather changes due to the initiative. "I have plenty [of food] now, enough that I can feed the surplus to the pigs," says Timo Jack.

"It is important for us to have good yields and sale from sweet potato so that we can get seeds like cabbages, carrots and onions," adds Nelma.

MARKHAM VALLEY

Markham Valley lies between the coast and the highlands of Papua New Guinea. A local banana variety, known as *Kalpua*, is the main staple here, often intercropped with taro and yam. Peanut is an important cash crop, especially since pest and disease outbreaks have led to a decline in Areca nut production.

ALBERTA KASI

Alberta Kasi and her mother work together on their small farm. They have continued to grow two of the varieties they acquired through the 'Seeds for Needs' initiative. "These ones have less fibre and taste good when cooked with coconut milk," smiles Alberta.

Despite learning about many new varieties, Alberta has kept many of their traditional taro varieties as she fears that traditional knowledge is disappearing. Ms Serah, her mother, plans to organize a 'Women in Agriculture' group for single mothers who grow and market taro. "A lot of people from our community, and also outside, have come to get information about the new taro varieties," explains Alberta. "We have also learned how to plant in rows and many new agricultural techniques."

Alberta and her mother plant taro by observing strict rules to prevent poor yields and taro pests.

For example, women cannot plant taro during menstruation or early pregnancy.

The pair also manage to sell banana, cucumber, peanut and watermelon to the local market and bigger shops in Lae, where they can get better prices.





PHILIP NOAH

Philip and his wife Miti grow many types of bananas, including red bananas, as well as sweet potato, cassava and taro, which is commonly used for church gatherings and other big events.

Miti and Philip have only just started trying out taro varieties from the 'Seeds for Needs' initiative and introduced us to some of the varieties they grow: "*Madibu* is a variety that grows well in this soil," explains Philip. "It has a soft texture and is easy to cook. It also matures faster than other varieties, taking 3 to 4 months to harvest rather than 5 to 6. It produces lots of leaves and corms [edible root]."

Although slash-and-burn techniques to prepare the land for taro planting are traditionally done by men, Miti also assists with clearing and planting.

Much of their taro and other crops are sold to help make ends meet. The dry season is particularly difficult. "When it is dry, there is a shortage of red cooking banana. I try to plant drought-tolerant taro and yam earlier so that we can still have some food until the rains come," says Miti.





POAHOM

Poahom is situated just outside Lae, the second largest city in Papua New Guinea. Farmers here tend to be more market-oriented and include a mix of locals and newcomers. Taro is the main staple, and most farmers grow at least three or four varieties. They also have more exposure to NARI-released varieties, which are the only 'improved' varieties available in the country.



PERIK MATTHEW

Perik Matthew grows 13 local varieties of taro with her husband and children. Through the 'Seeds for Needs' initiative, she has started to grow four more varieties that have good yield and taste. Perik has also shared these new varieties with other members of the community. Her husband has also provided a small plot of land to a church group to multiply taro planting materials.

"Some popular local varieties are *Numkovi* and *Lae Yellow*, which taste and smell good and we use for customary obligations," says Perik. "We can eat the leaves and shoots as well, which you can make with any protein and spices like ginger, curry and onion. But I also sell taro to buy soap, things for the house and pay for hospital visits."

Perik is not convinced that the future generation will continue farming, "In 10-15 years, nobody will be interested in working the land. People will rely on money to buy food." But her children seem to have an interest in the new varieties and farming methods taught by NARI: "My young son followed us around whenever the NARI staff came. He tries to practice the skills they introduced. I am also changing some of my techniques."

LOOKING AHEAD

Through the introduction of many new crop varieties, farmers are now more aware of the diversity available to help them adapt to the effects of climate change and cater to potential market needs.

As a result of the 'Seeds for Needs' initiative in Papua New Guinea, many farmers have been empowered to form self-help groups and take advantage of agricultural biodiversity to improve their livelihoods.

We would like to thank all our partners and supporters for helping to make this initiative successful.



Bioversity International is a global research-for-development organization. We have a vision – that agricultural biodiversity nourishes people and sustains the planet.

We deliver scientific evidence, management practices and policy options to use and safeguard agricultural and tree biodiversity to attain sustainable global food and nutrition security. We work with partners in low-income countries in different regions where agricultural and tree biodiversity can contribute to improved nutrition, resilience, productivity and climate change adaptation.

Bioversity International is a member of the CGIAR Consortium – a global research partnership for a food-secure future.

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