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INNOVATIVE SOIL IMPROVEMENT
TRAINING FOR INCREASING JIWAKA
SEMI-SUBSISTENCE FARMERS SWEET
POTATO PRODUCTION: LESSONS FOR
APPLICATION AND SUSTAINABILITY

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Volume 16, Issue 12
www.pngnri.org

Key Points

- Agricultural extension rarely reaches those in remote areas and those with little formal education. Extension must support farmers with ways to enable increased production and use the income for sustainable family livelihoods.
- Improved farmer learning, application and transfer of soil improvement skills can contribute to increased productivity, income and enhance livelihoods.
- Increased markets for *kaukau* (sweet potato) are an opportunity for farmers to increase production and improve livelihoods.
- Semi-subsistence farming families can be supported to reconfigure farming livelihoods to support change to more equitable and effective farm management.
- Practical and experiential learning helps farmers with little formal education to immediately apply new learning to their farming and build this learning into their existing knowledge and farming systems.
- Partnerships between agricultural agencies and community-based organisations can provide initial low-cost training to farming families who then can share this further through farmer-to-farmer peer learning, making this, cost-effective and sustainable in the long term.

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July 2023



INNOVATIVE SOIL IMPROVEMENT TRAINING FOR INCREASING JIWAKA SEMI-SUBSISTENCE FARMERS SWEET POTATO PRODUCTION: LESSONS FOR APPLICATION AND SUSTAINABILITY

Elizabeth Kopel and Barbara Pamphilon

Papua New Guinea (PNG) smallholder farmers are the backbone of the nation as they produce 80 percent of the nation's food (Bonney, Worinu and Muscat, 2015). Most of these farmers live in rural and remote areas of PNG using farming practices developed over many generations. However, these farmers face many challenges. For example, approximately 80 percent of rural farming households do not have access to electricity and improved sanitation, with a further 60 percent lacking access to safe drinking water (World Bank, 2018). Unexpected and on-going climate events such as drought, frost and rain have led to crop failures and food shortages. COVID-19 forced the closure of local markets and disrupted supply chains to the towns leading to a high proportion of families with little or no income and food insecurity.

As formal employment is quite limited in rural areas, agriculture and its related informal activities have the greatest potential to increase prosperity and reduce poverty (World Bank, 2018). Not surprisingly, farmers across the country are turning to agricultural extension and development agencies to support and guide them in adapting their agriculture. It was not until 2022 that the PNG Government gave prominence to and elevated the status of agriculture by creation of three government ministries in the field of agriculture: agriculture, coffee and oil palm. This should begin to address many of the extension challenges facing farmers.

PNG agricultural extension can be grouped into four models: technology transfer, human resource development, private sector assisted delivery, and participatory or farmer demand-driven extension (Sitapai, 2012). Today, technology transfer is the dominant training model and uses a top-down 'Train and Visit' approach. However, given the challenging terrain, poor roads and low number of agricultural extension staff, in reality the majority of farmers do not have access to the agricultural support they need to address the challenges they face and to take opportunities to increase their production in new market areas. Kopel et al.'s (2021) recent research on innovation in the informal economy showed that most farmers and entrepreneurs have not received any training.

This article discusses the findings of a study which investigated the social and economic impacts of soil improvement training offered to farmers through collaboration between international and national research partners and a community organisation in Jiwaka: Voice for Change (Kopel and Pamphilon, 2022). The paper outlines key factors that improved farmer learning, application and transfer of soil improvement skills which can contribute to increased productivity, income and enhance livelihoods. It also highlights several of the main challenges that limited farmer take-up of the application of soil improvement methods and increased cultivation of a variety of sweet potatoes. The article ends with lessons of farmer learning for agricultural extension strategies aimed at soil improvement and knowledge transfer at the village level.

Key factors that improved semi-subsistence farmer learning, application and transfer of soil management skills

Several key factors contributed to enhance farmer learning, application and sustainability of the newly acquired soil management skills in Jiwaka as outlined below.

Innovative training approach to combine soil improvement methods and the Family Farm Team approach: A recent Australia Centre for International Agricultural Research (ACIAR) pilot project used an innovative training approach to combine soil improvement methods and the Family Farm Team (FFT) approach to help Jiwaka *kaukau* farmers improve their soil fertility in an effective and equitable way. FFT is an approach to training female and male farmers in a household unit to support each other in learning, setting family goals and developing planned farming activities (Pamphilon and Mikhailovich, 2016).

Twenty 'family pairs' (couples, fathers, mothers, sons, daughters, sisters) were trained in manure and plant-based compost production and each pair selected one method to cultivate pathogen-tested *kaukau* vines provided by the National Agricultural Research Institute (NARI). These pairs also completed the FFT workshops which enabled them to work together to develop farm and family goals and to plan their farming activities, daily and across the seasons, and to work as a family team as they apply their knowledge on soil improvement learning. Due to the high local interest in

the new *kaukau* and soil improvement, other farmers were trained by this first cohort.

Harnessing the potential of PNG's *kaukau* market for semi-subsistence farmers: *Kaukau* has valuable markets in major towns such as Mt. Hagen, Lae and Goroka and in the largest market of Port Moresby (Sharp et al., 2022). Such markets create employment and income not just for producers but all those involved along the supply chain, from transportation companies through to retailers in the destination locations. For Jiwaka farmers, the Okuk highway provides access to bigger market opportunities for *kaukau* and the accessibility provides a major incentive for them to increase production. The ability of farmers to engage in a long-term formal market enables them to reconfigure their agricultural activities, increase production and move from semi-subsistence to planned farming. However, such changed production must be supported by appropriate technical skill development, especially the management of soil which can quickly degrade under more intensive cultivation.

Soil management methods complemented farmers' existing knowledge: An impact evaluation was done on the pilot extension training of the first cohort of farmers who were trained in soil management techniques and supported by FFT trainers. The results showed that the soil improvement methods complemented farmers' existing knowledge of *kaukau* cultivation, an important staple crop in the Highlands. Offering practical and experiential training to farmers through demonstration, using familiar materials that farmers had easy access to, was a much-valued opportunity. This approach enabled FFT farmers with little or low levels of literacy to participate in not just the learning and application of soil management but also transfer of these skills to others.

Use of freely available soil improvement materials: Plant vegetation that can easily be made into compost at the household level are freely available and there is a range of animal manure from pigs, chicken or goats that farmers raise at home. This continues to make it easy for farmers to learn through observation as they apply soil improvement methods.

Higher yields and improved appearance of produce: The pathogen-tested *kaukau* produces clean, smoother *kaukaus* which taste better, attract buyers and sell very well compared to other varieties sold in the local markets. The soil improvement techniques led to higher yields which is rewarding for farmers. Farming pairs and groups tried out the application of different materials and continue to apply materials that yield the best harvest.

Challenges limiting farmer expansion of soil improvement activities

Although the composting and high yielding *kaukau* variety have created important incentives for the pilot farmers, the farm work involved in new soil management techniques

requires intensive labour investment and technology to till the land. Few families had accumulated savings as past production had been only just sufficient for home consumption, while any small surplus was sold in the village, roadside and local markets when cash was needed.

Farmers therefore require:

- credit to purchase new tools to work efficiently to increase production; and
- some families needed to find money for additional labour.

There was a gender difference in the farmers' challenges.

- Women farmers lacked knowledge of effective ways of addressing *kaukau* pest and diseases as production increased. As women did a lot of the labour, their focus was on purchasing new tools to ease their labour and finding paid labour to manage new and larger fields for extra *kaukau* growing.

Single women were particularly disadvantaged. As one said: "No one will help me. I must cook food [for labourers] or give money. Otherwise, I do everything on my own". Women also expressed the need for training in budgeting and saving and further extension training on how to raise pigs and poultry to enable them to set up additional high income generation activities.

- Male farmers also noted the need for new tools; however, their focus was on being able to work more effectively and efficiently. These farmers gave examples of the need for wheel-barrows, spray pumps for killing overgrown bushes and equipment for watering *kaukau*.

Through the FFT learning, families now have long-term plans to venture into other agricultural-based income generation activities using the income earned from *kaukau*. However, both women and men are aware of the need for further learning in areas such as financial literacy, livestock skills and in managing the increasingly dry seasons.

Lessons of farmer learning for agricultural extension strategies

Several lessons emerged from this work. These include the following:

Participatory farmer learning is sustainable:

Although there was initial expert input from NARI on soil improvement and two follow-up support visits, much of the learning happened within the farming households as they applied the soil improvement techniques and then became confident to share this widely through peer-to-peer learning. As the farmers applied their new learning on composting, farmers were building on their existing knowledge about *kaukau* production. The learning approaches that were

used could easily be replicated to teach other farmers. Most of the farmers shared their knowledge through direct demonstrations. One male explained:

“They [farmers] asked too many questions, so we took them to our garden and showed them how to do it. They helped to do our planting. Now they can plant their own using the new methods”.

Such practical hands-on learning was easily understood by farmers with any level of education. Being taught by local family members and working alongside them was an accessible and non-threatening learning approach.

Delivery of FFT training by experienced local peer educators:

In contrast, the FFT training was not delivered by experts, but by four highly experienced local FFT trainers. Although the FFT training was divided into four modules, these trainers selected what they believed were the most relevant activities and repackaged them into a logical program. They integrated *kaukau* as an example wherever possible, which enabled the farmer participants to directly link the FFT and soil management training. It was clear that the FFT trainers were able to integrate their agricultural and cultural contextual knowledge, and to raise gender issues that they saw as the most important ones to be addressed.

Place-based and place-informed training was essential:

The foundation to the innovative training approach of combining scientific learning with socio-cultural learning was that the training was place-based and place-informed. This led to situated learning where the local knowledge of the learning group was harnessed in the learning experience. The integration of local knowledge plays a vital role in the uptake of new practices as it gives learners confidence and provides a context for the introduction of new knowledge (Sumane et al., 2018). Further, as one enumerator reported, there was evidence that families had integrated and applied both the soil management knowledge and the FFT learning:

“This couple has used the training skills and shared their workload, assisted by a daughter. Both men and women transported, and women did the selling, and jointly made financial decisions ... soil improvement skills gained from NARI also helped them to apply to other crops to improve their Family Farm Plans to meet their financial dreams”.

Conclusion

Semi-subsistence farmers can easily be trained on soil management and application of skills using appropriate training delivery methods. Collaboration between donor partners, local community organisations and government agencies can add much value to farmer learning of new knowledge and skills at the village level. Working with farmers to improve production of crops that farmers are already

familiar using local materials like *kaukau* in the current study enhances sustainability of farmers' learned skills.

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