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IN RESEARCH FOR DEVELOPMENT

**EMPOWERING WOMEN,
CHANGING LIVES**



PHOTO: NARI

While solar dryers were designed to process canarium nuts, women attending the solar-dryer training workshop in Papua New Guinea were delighted to learn they can be used to dry and preserve fruit, particularly mango.

THE HEART OF EMPOWERMENT

BY THE HON. JULIE BISHOP MP

Minister for Foreign Affairs

I am delighted to introduce the latest issue of *Partners* magazine—Empowering Women, Changing Lives—during the week the world celebrates International Women’s Day.

The empowerment of women and girls is a key priority of the Australian aid program. It is one of the most effective ways to achieve higher economic growth and better living standards for the millions of people in developing countries in our region.

In the Indo-Pacific region, agriculture remains a major sector for local economic development and poverty alleviation. Increasing agricultural productivity through market-based research can contribute to national economic growth in ways that are more inclusive of those in rural areas.

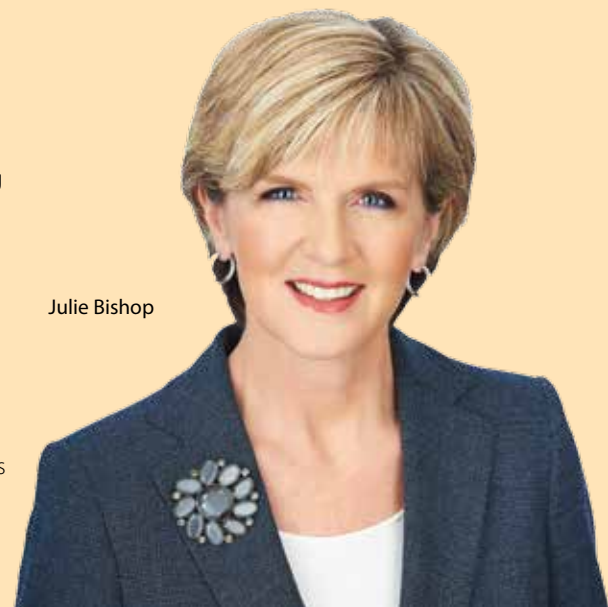
Gender inequality results in reduced

productivity and incomes, as well as food and nutrition insecurity. Conversely, empowering women and girls means communities have a greater opportunity to reach their full potential. When women farmers can access the resources they need, production increases, making it less likely that families are hungry or malnourished.

Enhancing access to financial, technical and marketing services is at the heart of empowering women and girls in the agricultural sector. In this issue of *Partners* magazine we are celebrating women scientists, women entrepreneurs and women smallholder farmers who have worked in agricultural research for development with ACIAR and its partners. Their work has made an impact in many of the least-developed countries of the world.

I congratulate ACIAR for its work that supports women in agriculture. ■

Julie Bishop



REFLECTIONS ON THE WAY FORWARD

BY **NAELA CHOCHAN**

High Commissioner for Pakistan

It is indeed a great privilege for me to write the foreword for this issue of *Partners* magazine.

Pakistan and Australia partner in many sectors, particularly in agriculture, which is very important for Pakistan's economy and its social advancement. Agriculture contributes more than 20% of the national GDP and involves approximately 43% of the labour force, the majority of which is women.

The Government of Pakistan's efforts to strengthen its economy, placing the country on the trajectory of high sustainable growth and development, are showing positive results. The GDP growth is estimated at 5.5% for 2015-16, with the agriculture sector targeted to grow by 3.9%.

The Vision 2025 is to relive and revive the "Pakistan Dream" of a prosperous, equitable, tolerant and dynamic society where all its citizens are empowered irrespective of their religious beliefs, ethnicity or gender. Its aim is to ensure success in achieving the sustainable goals of zero poverty and hunger, and universal access to health services, education, energy, clean water and sanitation. Engaging women in economic growth is one of the priorities of our Vision 2025. The Australian Government's decision to focus its investments on women's economic empowerment through livelihood development, inclusive trade reforms and access to finance, is very welcomed in Pakistan. It is in line with our Vision 2025 and our desire to enhance women's participation in mainstream economy at all levels.

I am blessed to have been born and brought up in an enlightened family that not only supported but also encouraged the education of women. My mentors were my parents: my late father who brought me up like his sons and gave me equal opportunities and my mother who taught me to be proud of my femininity and taught me dignity as a woman. They also gave me the motivation to help those less fortunate. Perhaps that is why I became an ardent advocate of women's rights. I often do my advocacy through the medium of visual arts because, having travelled the globe, I realise that more needs to be done in this world to make it a better place for our coming generations.

Empowerment of women is a priority for my country. Several steps are being taken at national and provincial levels to give women their rights, including the adoption of the National Plan of Action for women and the National Policy for Development and Empowerment of Women.

The National Commission on the Status of Women has also been established along with the Gender Crime Centre.

The establishment of Shaheed Benazir Bhutto Human Rights Centers for Women, the helpline for legal advice on human rights violations, including domestic violence, the Committee on the Elimination of Discrimination Against Women implementation committees at both national and provincial levels, and women's police stations have helped to improve the situation.

In the field of agriculture, it is worth noting that the government is ensuring ownership of land by women. Help for home-based workers and awareness campaigns have also been launched. Women Development Endowment Funds are being created by provincial governments and a policy of zero tolerance on violence against women is being pursued with the support of all stakeholders and a vibrant media playing a strong watchdog role.

We deeply appreciate ACIAR's work in Pakistan, which revolves around the Australia-Pakistan Agriculture Sector Linkage Program (ASLP). Its aim is to encourage and facilitate pro-poor collaborative development in Pakistan through participatory and multidisciplinary approaches in mango, citrus and dairy sectors, as some of the stories in this issue of *Partners* attest. The future activities' areas for enhancing women empowerment through ASLP-II would include gender-inclusive citrus and mango value-chain development, women's entrepreneurship and skills development, and small-scale pilot processing as cottage industries.

I am confident that Australia's support to Pakistan through the new Agricultural Value Chains Collaborative Research (AVCCR) program will continue to contribute significantly to increasing benefits for Pakistani smallholders and poor farmers as well as other disadvantaged groups with greater involvement from women. AVCCR is intended to focus more strongly on collaboration and research in selected agricultural value chains. The rural poor, particularly women, will significantly and equitably benefit from improvements in these strategic value chains.

Women are the backbone of our economy. As a passionate supporter of women's rights and their economic empowerment, I would like to wish you all a very happy and productive International Women Day. It is indeed a moment to celebrate our achievements and reflect on the way forward. ■

THE VISION 2025 IS TO RELIVE AND REVIVE THE "PAKISTAN DREAM" OF A PROSPEROUS, EQUITABLE, TOLERANT AND DYNAMIC SOCIETY WHERE ALL ITS CITIZENS ARE EMPOWERED IRRESPECTIVE OF THEIR RELIGIOUS BELIEFS, ETHNICITY OR GENDER.

Naela Chohan

PHOTO: ANDY HEANEY



HARVEST OF HARMONY

It started as a quest to improve income and protein intake in Papua New Guinea but as project leader Associate Professor Jesmond Sammut explains, his fisheries projects have far greater influence thanks to the participation of a remarkable woman

KEY POINTS

- The aim of the PNG inland aquaculture research project is to improve the practice of fish farming in a region where 80% of the population is unemployed, experiences protein deficiency and is subject to recurring tribal and gang violence.
- The project has been especially beneficial to women because of an innovative training program managed by Sister Pauline Kagl.

BY ASSOCIATE PROFESSOR JESMOND SAMMUT

The highlands of Papua New Guinea (PNG) are some of the world's most culturally and environmentally diverse regions. Although the area is rich in culture and natural resources, ongoing tribal war, gender inequality and social unrest can undermine the quality of life, particularly for women.

Sister Pauline Kagl understands how these factors affect these rural communities, particularly in the brutalising effect on women. But she believes that opportunities to develop and apply life skills through popular 'personal viability training' programs provide a stepping stone to peace, hope and wellbeing.

At the Maria Kwin Training Centre in Banz, Jiwaka province, Sister Pauline brings a unique twist to the training by incorporating the resources and research findings of an ACIAR inland aquaculture project. She is now pivotal to the success of the project's community engagement and training components.

PEACE, HOPE AND FISH IN PNG

The hopes that Sister Pauline has for her training program go beyond the purely nutritional or economic, as her methods also serve to strengthen people physically, socially and mentally. It is an approach influenced by the Sisters of Notre Dame, the mission established in 1961 with a goal 'to spread peace, love and hope'.

Sister Pauline Kagl (right) in Jiwaka province, Papua New Guinea.



PHOTO: JES SAMMUT

Every person, whether they are the perpetrator of crime or the victim, can change their lives. Time and time again we have transformed people through the combined action of fish farming and personal viability training.

– Sister Pauline Kagl

The Sisters founded the Maria Kwin Training Centre to deliver adult learning programs in agriculture, computing, business studies and sewing. The centre also serves as a refuge for women and the vulnerable, and helps people affected by HIV-AIDS.

Sister Pauline joined in 1992 at a time of widespread hopelessness in communities because of poverty, tribal war and gang-based crime. Women in particular were being emotionally and physically harmed because of social conflict and domestic abuse. Early in her vocation, however,

Sister Pauline understood that people needed to be occupied and engaged in life in order to feel accomplished and happy.

"Women are emotionally traumatised by social unrest and gender inequalities," she says. "For example, *raskol* gangs (the PNG term for criminal gang members) and tribal fighters rape and mutilate women, who can also be victims of abuse within their own home. At the Maria Kwin Centre we try to empower women and provide them with skills that can lead to a better life."



PHOTO: JES SAMMUT



PHOTO: PAUL JONES

(Far left) Prisoners from Bihute Prison harvesting fish. (Left) St Peter's fish—tilapia. The pidgin word for fish, *pis*, is a homophone for peace.

Women can also become outcasts because of accusations of sorcery, for which they can be beaten, tortured or killed. Losing a child for no known reason, for example, can result in accusations of sorcery, as can simply falling out of favour with others.

According to Sister Pauline, more than 70% of women in PNG experience brutality and rape in their lifetime. Many are killed or maimed. The frightening figure she quotes is consistent with that of government and aid agency reports.

But Sister Pauline sees beyond the hopelessness: "Every person, whether they are the perpetrator of crime or the victim, can change their lives," she says. "Time and time again we have transformed people through the combined action of fish farming and personal viability training."

FELLOWSHIP THROUGH FISH FARMING

Sister Pauline became involved in fish farming in 2004 when she met Matthew Ten, an ACIAR project team member who was teaching people to farm fish at the Maria Kwin Training Centre. Matthew's evangelical approach to spreading the word on the benefits of fish farming captured Sister Pauline's interest.

"He was promoting St Peter's fish—tilapia—and the pidgin word for fish, *pis*, is a homophone for 'peace,'" she says. "There were many parallels between the principles of fish farming and those of my personal viability training program—I wanted to bring them together.

"I started out as Matthew Ten's bag carrier but could see that fish farming and my vocational work could go hand-in-hand. I saw that fish farming not only helps people feed themselves and earn an income, but also fosters organisational skills, responsibility and self-respect. It could also be used to bring couples, families and even rival or warring tribes together to strengthen relationships."

She immersed herself in the world of fish farming and, with help from Matthew Ten and the National Fisheries Authority, built training ponds and fish-feed manufacturing facilities. Her fellow

ACIAR project team members have, over the years, helped her to deliver training and provided her with technical support.

EMPOWERMENT OF WOMEN

Fish farming is now an accredited course of the vocational training program conducted at the Maria Kwin Training Centre. Along with Matthew Ten and other ACIAR project team members, Sister Pauline treks into remote areas to teach fish farming and the gospel.

Along the way, Matthew Ten and Sister Pauline have introduced fish farming to thousands of people in the highlands and, in the process, helped bring peace between warring tribes.

A recent ACIAR project survey found that Sister Pauline and Matthew Ten have profoundly influenced the lives of rural communities, with women and children benefiting the most.

"It is the women who feed and clothe the children," says Sister Pauline, who views women as the thread that binds communities in the highlands of PNG. "They make and save money for their education and medical care. They are also involved in animal husbandry. Women are inherently responsible and very good at managing a fish farm. They have a lot at stake if the fish farm or any food-producing activity fails."

To make a difference in the lives of women, however, Sister Pauline says that men, too, have to be helped to change. "We teach men to respect and value women, and to respect themselves. Breaking vices like drinking and gambling can be tough for men, but we have had many success stories and fish farming has been central to that success.

"Training in fish farming is the bait that brings the men in. They then get hooked on the associated personal viability principles we teach. They soon realise that to be successful they must be responsible and respect the contributions of women. We are creating a new generation of good role models to break the cycle of abuse."

Sister Pauline's fish farming training program also helps drug addicts, delinquent youths and criminals to change their lives for the better. This is important work. It is idleness, unemployment, the ravages of ongoing tribal war and a lack of successful role models that lead to addictions and crime. Women are the main victims because they are considered easy targets.

"Rape and murder of women is commonplace during tribal war," Sister Pauline says. "The whole community suffers. We have seen how fish farming can bring peace and stability. Men don't fight when they are preoccupied with fish farming. In fact, they end up cooperating and sharing resources with their former adversaries."

Sister Pauline and Matthew Ten reach out to anyone who needs help, and that includes people who commit crimes. Sister Pauline has turned the lives of many people around—some have gone from being hardened criminals or prisoners to community leaders and politicians through fish farming and personal viability training.

"We have been able to help people end their drug addictions through our fish farming training. Similarly, we have turned some well-known *raskol* gang members into fish farmers and facilitated peace between warring tribes by introducing them to fish farming. It's a win for all, especially women."

Sister Pauline continues her work under the latest phase of the ACIAR inland aquaculture research program in PNG. ■

ACIAR PROJECT: FIS/2014/062: 'Improving technologies for inland aquaculture in Papua New Guinea'

MORE INFORMATION: Associate Professor Jesmond Sammut, project leader, j.sammut@unsw.edu.au

MEDIA LINKS: Jesmond Sammut's videos: <https://vimeo.com/110546170>

Project Facebook page: www.facebook.com/inlandaqua2014/?ref=hl

Sisters of Notre Dame: <http://snd1.org/en/where-we-are/papua-new-guinea-kumdi-delegation>

BLAZING A TRAIL FOR WOMEN IN TREE BREEDING

In Vietnam, significant steps towards gender equality have opened up new opportunities for women. ACIAR is contributing by supporting talented women—such as Dr Nghiem Quyen Chi—to pursue careers in agricultural research

KEY POINTS

- With ACIAR support, talented young women in developing countries are building their careers in agricultural research, with benefits that span individual, societal and national levels.
- Collaborative research on acacia breeding in Vietnam has so far helped more than 250,000 smallholder farmers to improve their livelihoods, with ongoing national research programs to further improve the production of high-quality acacias over the next few years.

BY ANNE MOORHEAD AND TONY BARTLETT

Dr Nghiem Quyen Chi says, “I love my job,” with genuine passion. Dr Chi is a forestry scientist carrying out cutting-edge research on polyploidy* in tropical acacias as a way to further improve wood yield and fibre quality as well as enhance the prospects for achieving genetic resistance to serious diseases.

She has been part of the ACIAR forestry team in Vietnam since the early 2000s, when she was a junior researcher at the Forest Science Institute of Vietnam. In 2007 she was awarded a John Allwright Fellowship by ACIAR, which enabled her to carry out her PhD work at the University of Tasmania. Dr Chi now leads the tissue culture program at the Institute of Forest Tree Improvement and Biotechnology at the Vietnamese Academy of Forest Sciences (VAFS),

and remains actively involved with ACIAR’s forestry program in Vietnam.

“I have been very lucky,” adds Dr Chi. “I have had some great opportunities and I have made the most of them.” Growing up in Hanoi with three sisters, Dr Chi credits her parents for providing a supportive and enabling environment for their daughters, which gave her the confidence to follow her heart and enter the male-dominated field of agriculture. Early on she began to specialise in the genetics and breeding of tropical acacias and has built her career around the development of polyploid hybrids.

ACACIAS IN VIETNAM —A VITAL PLANTATION TREE

Acacias were introduced to Vietnam from Australia in the 1990s. They are now one of the most important plantation trees across the country, with currently around 1.2 million hectares planted. A large proportion of these plantations is managed by smallholder farmers, who earn a living by selling to the growing wood-processing industry.

More than 250,000 smallholder farmers have improved their livelihoods by growing the trees in 5-to-7-year rotations. Over 20 years, ACIAR projects have supported research on the domestication and improvement of tropical acacias, which has enhanced local capacity and supported dedicated scientists such as Dr Chi.

“I spend a lot of time in my job,” she says. “I think if you are a woman you have to try harder

than a man. But I really enjoy my work, so it is not a problem for me.”

Research has resulted in a 15–25% improvement in wood yields and improved stem form, but there is still much to be done to safeguard this important industry in Vietnam. Polyploid plants have more than two sets of chromosomes, which can confer advantages over haploid or diploid plants in sustaining acacia productivity. Polyploidisation is also used to expand the gene pool of plants.

As Dr Chi explains, with acacias we currently rely on a very narrow genetic base derived from only 12 clones and this needs to be broadened to improve productivity and guard against pests and diseases.

In 2004, Dr Chi started working with Professor Rod Griffin from the University of Tasmania and other Vietnamese researchers on an ACIAR project (FST/2003/002) undertaking research on polyploidy in *Acacia mangium*.

That project aimed to develop and assess polyploid breeding methods for commercially important acacia species, including for the production of sterile, high-yielding triploid plants from elite germplasm. Dr Chi went on to complete her PhD at the University of Tasmania on aspects of acacia polyploidy.

A VERY POSITIVE EXPERIENCE

Dr Chi’s experience in Australia, and working with ACIAR and project partners, has been very



Tropical acacias play an important role in Vietnam's forestry systems. Helping to ensure the acacias' performance is Dr Nghiem Quyen Chi of the Vietnamese Academy of Forest Sciences.

PHOTO: SALLY INGLETON

positive. "As a young woman working with Australian scientists, I have been treated with respect and consideration," she says.

When Dr Chi returned to work in Vietnam, she was appointed as the leader of the tissue culture program, becoming one of the more senior female researchers in VAFS. She continued her work on triploid acacia clones under ACIAR's project FST/2008/007.

The production of triploid acacia seedlings proved to be a difficult and slow process. At the end of more than 10 years of ACIAR-supported research, the team had successfully produced only 14 acacia triploid clones.

Dr Chi used her new skills to develop the technique for reproducing hybrid triploid seedlings by tissue culture, which enhances the ability to develop more clones for field testing.

After using techniques to induce polyploidy, determining whether or not plants are polyploids is difficult. Researchers from the University of Tasmania working on the ACIAR project

developed a technique using a flow cytometer, which substantially improved the reliability of the testing for polyploidy. In 2015, ACIAR provided funding to purchase a flow cytometer for Dr Chi's laboratory in Hanoi. This has enabled Dr Chi and her team to reduce the costs of these tests and to speed up the screening of potential polyploid plants.

The team can now conduct thousands of tests each year, including testing seed from progeny trials to better understand what the natural frequency of triploids is within a population.

Since the completion of the ACIAR polyploidy project, Dr Chi has been successful in obtaining a US\$300,000 grant from the Government of Vietnam to continue her research, representing a major government commitment to adopt ACIAR research outcomes.

Dr Chi leads a team of 10 staff on this project, which aims to scale up the production and testing of triploid acacias and establish 15 ha of pilot plantation trials within five years. It is hoped

that these trials will provide sufficient high-quality triploid acacias to enable a larger scale deployment to farmers to commence.

Dr Chi also has a role in a new ACIAR project FST/2014/068 'Management strategies for acacia plantation diseases in Indonesia and Vietnam'. In this project she will explore the opportunities to use polyploidy breeding techniques to broaden the genetic base within *Acacia mangium* for resistance to the damaging crown wilt disease (caused by the fungus *Ceratocystis*), which is killing large areas of acacia plantations in Vietnam and Indonesia. ■

MORE INFORMATION: Tony Bartlett, research program manager for forestry, tony.bartlett@aciar.gov.au

ACIAR PROJECT: ST/2014/068 'Management strategies for acacia plantation diseases in Indonesia and Vietnam'

MEDIA LINKS: <https://youtu.be/Wgbz5-bAHUQ>

*Polyploid cells and organisms are those containing more than two paired sets of chromosomes.

LEFT BEHIND WOMEN FIND EMPOWERMENT

A helping hand is being extended to millions of smallholder farms—many increasingly headed by women—in the eastern Gangetic Plain

KEY POINTS

- An A\$11 million project has been launched to improve the sustainability and resilience of farming systems in a region with the greatest concentration of rural poverty in the world—the eastern Gangetic Plain.
- Women-headed households especially stand to benefit, with the project adopting gender-sensitive designs and extension tools.

Out-migration has given rise to a new caste—the so-called 'left behind' women.



BY DR GIO BRAIDOTTI

The households that farm the flood and drought-prone lands of the eastern Gangetic Plain of Bangladesh, India and Nepal rely on tiny parcels of land to sustain the food security and livelihoods of more than 300 million people. These lands are home to the highest concentration of people living in rural poverty in the world.

An emerging trend has seen women rise as heads of these households, left to run the farm as men leave in search of work. This out-migration has given rise to a new caste—the so-called ‘left behind’ women.

Women-headed households face formidable challenges, as farming in the eastern Gangetic Plain is fraught with difficulties.

There are extreme weather events—floods, droughts and cold snaps—which are intensifying in their effects on farming. The region lacks crop management technology and water management policies, in part, due to weak institutions. Most farmers have limited access to credit, quality seeds, fertilisers, irrigation or formal extension services, and face water and labour shortages.

Dr Kuhu Chatterjee, ACIAR’s regional manager for South Asia, says that rice and wheat productivity is low and diversification limited. According to ACIAR, that makes new crop management systems and institutional innovations critical to the welfare of the region.

“At the moment markets are poorly developed and volatile, while agricultural knowledge and service networks are sparse,” she says. “However, there is great potential to introduce and scale out more sustainable production practices that have the potential to improve productivity, reduce rural poverty and boost water use efficiency.”

Helping smallholder farmers tap this potential is the goal of the Sustainable and Resilient Farming Systems Intensification (SRFSI) project, which was launched in July 2014.

SRFSI is a collaborative undertaking drawing on 20 partners based in Bangladesh, India, Nepal and Australia and funded by ACIAR and the Australian Government Department of Foreign Affairs and Trade (DFAT) through the Sustainable Development Investment Portfolio (SDIP). Assistance available through the project extends from more water-efficient production methods, such as conservation agriculture, through to policy innovations and linking farmers to markets. Lead activities include field research and the design of scale-out extension to enable at least 130,000 farmers to adopt technologies that improve crop yields and reduce rural poverty within the next 10 years.

However, Dr Chatterjee notes that for these developmental efforts to be effective, it was critical to include gender equity as a key component of the design of SRFSI.

THE GENDER FACTOR

Despite the rise of women-headed households, gender equity is severely lacking throughout the eastern Gangetic Plain region and is particularly acute in the agriculture sector.

Dr Chatterjee cites the example of women being paid at 60–70% of male rates. “In patriarchal societies such as those in South Asian countries, women rarely hold land titles, making them ineligible for formal credit,” she says. “These exclusionary practices are exacerbated by historical low levels of education of women.”

The cumulative effect can be illustrated by Nepal where only 3% of women-headed households use mechanical equipment compared to 8% for households headed by men.

“It has been estimated that women could boost agricultural yields by as much as 20–30% just through access to the same resources as men and also result in higher rates of uptake of introduced technologies,” Dr Chatterjee says.

“Despite these implications, many development projects have, in general, failed to recognise the specific requirements of women.”

GENDER EQUITY

The SRFSI project focuses on empowering women through farming improvements, policy innovation and access to training. The idea is not just to include women, but to actively target them through project activities.

“Traditional linear approaches to technology transfer—from researchers through extension services to farmers—have not been sufficient to reach female farmers,” Dr Chatterjee explains. “Alternative approaches are being trialled that are gender sensitive by involving women in all aspects of the research and scaling out.”

These approaches can take the form of women-only focus group discussions and the collection of gender disaggregated data. Women are included during testing of technology and disseminating viable innovations, even as interactions with the women help researchers build up understanding of their perspectives, assets, needs and opportunities.

This consideration extends to gender roles across a community and even looks at long-term effects of change. Dr Chatterjee cites the example of machinery that can reduce the drudgery associated with transplanting and weeding, but also places downward pressure on daily labour rates offered to women.

“Women already are paid at a fraction of men’s wage, so the introduction of mechanisation needs to be complemented by other employment opportunities for women labourers,” she says.

FARMERS GIVEN A VOICE

As of December 2014 the project had established 40 nodes of research across the targeted areas. Nodes

include field sites managed using the principles of conservation agriculture, a comprehensive program of long-term kharif (summer) and rabi (winter) crop research, and dissemination initiated through training and demonstration events.

A comprehensive program of surveys and discussions are helping to inform project activities, with insight gathered from both female and male farmers, service providers, input dealers, self-help groups and community leaders in each of the 40 nodes.

The program builds a comprehensive picture of cropping systems, natural and economic resources, people’s livelihood strategies, their attitudes to risk and innovation, and an understanding of the status and requirements of women farmers.

The means to mainstream gender equity within SRFSI project activities have also been devised and presented during the project-planning meeting held in Nepal in November 2014. Following the meeting, Dr Fay Rola-Rubzen and Dr Roy Murray-Prior conducted training on ‘engendering’ project activities and objectives, which was attended by Australian and developing country partners.

A resulting draft gender strategy paper included principles such as:

- recognition of diversity and understanding of gender roles, needs and motivations
- gender inclusion in all activities—technology dissemination, training, capacity building and extension
- gender sensitivity in designing and disseminating technologies in training and extension
- gender-responsive policy suggestions.

A data-rich baseline picture of farming communities has emerged. It includes the incidence of women-headed households in various socioeconomic groups, the scope to introduce crops to the cropping season, the potential for a mechanical hub to overcome the lack of access to machinery, the preferred means of receiving information and women’s roles in decision-making.

“Empowering women, a major aspect of the agricultural workforce, will only benefit the goals of the SRFSI project,” Dr Chatterjee says. “This should be done through regular updates to the gender strategy and addressing the needs of all stakeholders—men and women. It is through the effective implementation of such strategy and actions that real and enduring change can be realised in the eastern Gangetic Plains.” ■

ACIAR PROJECT: CSE/2011/077 ‘Sustainable and resilient farming systems intensification in the eastern Gangetic Plains (SRFSI)’

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THE EMANCIPATING POWER

A lifelong dedication to adult education and community development has allowed Professor Barbara Pamphilon to build up women farmers' learning and address gender equity issues in remote regions of Papua New Guinea



PHOTO: BARBARA PAMPHILON, UNIVERSITY OF CANBERRA

KEY POINTS

- Adult education programs are helping women in PNG break down gender barriers and acquire new skills in managing farm productivity and marketing.
- The well-received program is now being scaled out to reach even more remote communities in rural PNG.

BY DR GIO BRAIDOTTI

The role education plays in everyday problem solving can easily be taken for granted, but it is profound. Education spans the ability to readily access and analyse information through to understanding diagrams, maps and spreadsheets ... in other words, information displayed flat, on the written page, in two dimensions.

Lack of schooling diminishes people's abilities in these skills, creating difficulties that can constrain life outcomes. For rural communities in Papua New Guinea (PNG), this form of disadvantage means that opportunities for women to benefit from their daily labour on household farms and gardens are needlessly limited.

One person who understands and can help overcome these difficulties is Professor Barbara Pamphilon, director of the Australian Institute for Sustainable Communities at the University of Canberra.

Professor Pamphilon was recruited by ACIAR to use the sum of her expertise in adult education

and community development to help rural women in PNG. The project's overarching aim is to deliver training that can support the development of agribusiness-orientated farm management practices.

Early on, Professor Pamphilon decided to focus the pilot program on the more disadvantaged communities in four of the target areas in East New Britain and the Western Highlands.

In many remote areas of PNG, up to 30% of women have never been to school and many more did not complete primary school. Yet, it is these women that Professor Pamphilon describes as the 'backbone of the country', producing the food that sustains many households.

When she surveyed the women's needs, the most important issue she identified was low literacy rates. Low literacy is a consequence of a poor record of girls' education in PNG's past compounded by a sheer lack of schools in remote and rural regions.

"The status of education in PNG is changing," Professor Pamphilon says. "There is a real valuing of education. Now, rural families are keen to see their children receive schooling and the women were extremely keen to learn themselves. They just did not have any accessible opportunities."

As a consequence, the training provided through ACIAR went out to the women and did not expect them to come to central towns. The program had to be packaged in ways that allowed women

to learn 'how to learn' while also empowering them to act within the broader context of their own household, farms and communities.

It took a careful blend of adult learning skills, tools, methods and strategies to realise that outcome, and even more skill to achieve it in ways that are self-perpetuating.

THE TWO-WAY LEARNING GENDER EQUITY 'CLASSROOM'

Having rarely opened a book or sat in groups to solve problems, many of the women were naturally hesitant, uncertain and anxious to please. But Professor Pamphilon's participatory and strengths-based approach cut through all that. Based on acknowledging the abundance of strong local knowledge, it is an extremely empowering approach.

"We go in and work with their strengths and assets," she says. "Sure, we prepare activities, worksheets and the like, and we put in place channels to access a greater network of expertise, like the resources available at PNG's National Agricultural Research Institute (NARI). But we capitalised on women's skill with informal learning and the abundance of local knowledge. We then provide tools to further build those strengths. And in turn we learn about the challenges faced by women. It is really two-way learning."

The lessons learned from every village-based training activity contributed to the action research

OF WORKING TOGETHER



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PHOTO: KATYA MIKHAILOVICH



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PHOTO: KYMA SIMONICINI

1. Susan Trapu, Kwinkya project leader, working with women farmers in the Western Highlands.

2. Professor Barbara Pamphilon addressing gender equity through education in Tubuseria, Central Province, Papua New Guinea.

3. Women farmers in the Gazelle Peninsula, East New Britain, present their ideas for the Maria Books, developed as part of an ACIAR-funded project to teach key agricultural messages to women smallholders and to improve literacy skills.

that furthered the project's goal. For example, interactions at the village level revealed that many farmers were marketing the same kind of produce at the same time, causing market prices to drop. This understanding created opportunities to provide training on seasonal planning, crop diversification and introduce, with NARI's assistance, new production capabilities. With these new skills came greater resilience, including resilience to production constraints such as drought.

The training allowed the villagers to break out of habitual behaviours and see the household's strengths and assets. Training helped them acquire the means to map pathways to highly desired outcomes, such as educating children and increasing the family assets, for instance by building a house.

From the outset, some villagers were selected to receive extra training to become village community educators. These people act as peer educators who roll out the training they have received in ways they know will build on local skills and needs. In the future, these educators can further access outside sources of assistance and they remain in the village after the project team leaves. They also become the role models for more productive and gender-equitable ways to manage the family farm.

Both women and men took on these educator roles.

Professor Pamphilon explains that in targeting gains for women, she prefers to focus on gender equity, which recognises the strengths of both men and women, rather than on women's rights. While a rights-based approach works well in terms of legal frameworks, Professor Pamphilon says it can prove confrontational and divisive in the more intimate setting of households and communities.

"A strong family is a goal shared by men and women," she says. "So we encourage a family team philosophy. In the process, we make visible gender inequality and show how it will be limiting the family's prospects. So it is important to include men. After all, social change can only occur when both women and men change."

That strategy has seen families acquire the ability to plan together, with women's voices included in deciding the family's aspirations and the management changes needed to achieve those goals. That approach included blurring the hard distinction between cultivating food for the family (traditionally women's business) and cash crops (the domain of men). Instead, farming systems and paths to markets are now viewed more holistically. The emphasis is on providing nutritious food for the family, optimising income-earning opportunities and gaining access to micro-financing and savings accounts to build resilience so families can invest back in the farm.

As a development model, it is applicable to other domains, including achieving better health

outcomes. The project ran for four years from 2011 and is now completed. Comparisons of baseline and endline studies are impressive.

As one participant in Kwinkya in the Baiyer Valley, Western Highlands, put it: "In the past our family never talked together. My husband never discussed plans or worked with me. I did things on my own. After the training, my family sits together and discusses our goals. My husband and the children work with me and we always plan together. My husband and I work together as best friends and I am so happy (*mi hamamas tru*)."

So extensive were the gains that a second project has been launched to scale up and roll out the program to more regions. This project will involve training an even larger number of village community educators, led by a women's leadership team in each area, as the project continues to reach out to the most vulnerable women.

Since success tends to breed imitation, however, the families that are achieving more by working together more equitably are providing a beacon and that too is creating an impetus for change. ■

ACIAR PROJECT: ASEM/2010/052 'Improving women's business acumen in PNG: working with women smallholders in horticulture'

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MEDIA LINKS: <http://pngwomen.estem-uc.edu.au>

THE ORGANIC APPROACH

PHOTO: MICHAEL JONES



Ms Buachanh leads efforts to expand the number of farmers in the northern Lao province of Xieng Khouang that benefit from growing and selling organic vegetables.

In Lao PDR, an ACIAR project is helping women farmers spread the word about the multifaceted benefits of growing organic vegetables, including opportunities to increase income by selling in local markets

KEY POINTS

- Women in Lao PDR villages are producing and jointly marketing a surplus of organic vegetables, increasing their family income while improving consumer health and environmental sustainability.
- ACIAR support is helping the women's association spread economic benefit by expanding its organised marketing from fewer than 30 women to include more than 160.

BY MICHAEL J JONES (ADJUNCT RESEARCH FELLOW), JOHN G CONNELL (ADJUNCT SENIOR RESEARCH FELLOW) AND PROFESSOR PETER C CASE

College of Business Law and Governance,
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In the northern Lao province of Xieng Khouang, nearly 30 women produce organic vegetables for sale in a dedicated, twice-weekly organic market in the provincial capital of Phonsavan. Sales are brisk, with each producer

selling out her produce in just a few hours of morning trading. Total sales volumes reach upwards of 15,000,000 kip (about A\$2,665) per month during the peak season.

For most families, income from organic vegetables was unanticipated but is highly valued, allowing important investments in the family's future. Education costs for children, capital costs and health care are among the top-mentioned expenses covered by this extra income.

So beneficial have been the outcomes that the women formed their own organic vegetable producers' association and are spreading the word across the district about the good health and environmental protection possible through organic production.

The farmers' own outreach efforts are supported by a Vientiane-based non-government organisation, Sustainable Agriculture and Environment Development Association (SAEDA), with funds from donors including Oxfam and Bread for the World. While activities are not designed to focus exclusively on women, more

than 75% of members are women and the association's management and board are almost all women.

Together, the farmers, the local agriculture office and SAEDA have reached hundreds of farmers who have been taught helpful techniques for growing organic vegetables in Xieng Khouang's unique high-altitude environment (greater than 1,000 metres above mean sea level). Farmers have also engaged in marketing activity, cultivating consumer interest in the locally produced organic vegetables.

Despite the support and interest generated over more than a decade, the association faces a major limitation. The number of farmers selling organic produce—and getting markedly better prices than conventional markets—is stagnant at about 30 producers.

Ms Buachanh, the elected president of the association's board of directors, expresses disappointment with this lack of growth. "The association has a goal of helping as many people as possible eat organic food to promote the health

of people and the land," she says. "But if less than 30 people produce organic vegetables for sale, then most of the people in Xieng Khouang are still consuming conventional produce."

According to the provincial agriculture office, more than 10 tonnes of vegetables is sold in the markets every week; the organic market sells less than that over six months.

To bump up the number of people who can buy and consume organic produce, Ms Buachanh wants to expand the number of association members that market organic vegetables. ACIAR has offered critical support to help Ms Buachanh and the general association membership create strategies and plan this new phase.

EXTENDING THE MESSAGE

Leaders from two ACIAR projects are cooperating with the local government to improve the management of agricultural extension services. These same efforts are also promoting the participatory development of methods to better support farmer organisations.

One important shift in extension management introduced by the ACIAR projects is the concept of district-wide orientation replacing the common village-by-village focus within the local government District Agriculture and Forestry Office (DAFO) planning.

Previously, DAFO looked at one village at a time and was quite satisfied with the success of 30 families selling organic produce. However, when they used the project's tools they identified more than one billion kip (about A\$180,000) in

potential increased annual sales from organic vegetable production.

In that context, the small number of sellers no longer seemed impressive; annual sales currently amount to just over one hundred million kip (less than A\$18,000). At this point, DAFO leadership became serious about supporting the same kind of expansion Ms Buachanh aspires to achieve, albeit from a different perspective.

EXPANSION RE-IMAGINED

A major challenge faced by both DAFO and the association's leadership was providing a framework for substantial expansion in activity. DAFO revisited its services to cover as many of the villages in the district as possible, rather than focusing on a few.

The association was similarly no longer thinking narrowly about helping a few centrally located farmers produce for the provincial capital. Rather, the thinking extended to involving women from across the district—especially those with larger production areas—in producing organic vegetables for local and possibly distant markets.

Important issues for the association members were ensuring that all new members maintained organic standards and that the market could handle increased production.

In response, the ACIAR projects coordinated a series of studies carried out by representatives of both the potential new members and association leadership in partnership with DAFO.

These studies identified organisational changes that would allow association members, working

together in teams, to monitor and coach new producers to ensure quality and organic standards. At the same time, by bulking their product at the village level, they have designed new ways for members to sell their product efficiently.

Willingness to take these steps was a major breakthrough; previously, the association remained wedded to the idea of each producer selling her own produce directly to consumers at the organic marketplace. Allowing women to sell through peer groups allows more distant and smaller producers to get their produce to market in a cost-effective way.

Once the study participants—and their friends and neighbours—analysed, discussed and understood these new mechanisms, more than 500 women and men indicated interest in joining the association to produce and sell organic vegetables.

Supported by ACIAR funds, the DAFO team has worked with association members to introduce nearly 200 families in 10 villages to the basics of organic farming and positioned them to join the ranks of association members producing for the market.

Ms Khamdta is a grower who has attended the technical training provided by the association and has turned her garden into a model of integrated organic farming. She grows onions, lettuces, Chinese cabbages, shallots, peas, mustard greens, cilantro, celery leaves, dill and lots more on a small plot behind her house.

She is producing a surplus, she says, but has been waiting for induction into the association to be allowed to sell at the dedicated organic market.

The association, working hand-in-hand with DAFO, is in the process of expanding membership by at least 160 households in the next six months. It is recruiting new members to produce vegetables with a strong focus on sale rather than consumption.

Changes in the way farmers market their produce are also being considered. Ms Khamdta, for example, would struggle to attend the twice-weekly market. If the new method of selling through a representative were adopted, she could concentrate on production and would happily pay a fee (to cover the marketer's time and costs) in order to benefit from greater sales of her produce.

If these milestones are achieved, the women will have made serious strides towards increasing the local economy by adding billions of kip in local sales of healthy, environmentally sustainable organic vegetables. ■

ACIAR PROJECTS: ASEM/2011/075 'Enhancing district delivery and management of agriculture extension in Lao PDR' and ASEM/2014/102 'Critical factors for self-sustaining farmer organisations in northern Lao PDR'
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Mrs Khamdta (right) has turned her garden into a model of integrated organic farming. She is pictured with Ms Buachanh, the president of the board of directors of the organic vegetable growers' association, which is expanding market opportunities for farmers such as Mrs Khamdta.



Organically grown lettuce and onions in the northern Lao province of Xieng Khouang.



Mrs Pew and the son she supports in college in Vientiane with the proceeds from her organic vegetables.

PHOTOS: MICHAEL JONES

**DULCE SIMMANIVONG—REGIONAL MANAGER
FOR LAO PDR, CAMBODIA, MYANMAR AND THAILAND**



A dedicated social development professional, Dulce Simmanivong has more than 25 years of program management experience, where she has overseen projects focusing on rural livelihoods, community-based infrastructure, agrarian reform and farmers' organisational capacity building. Prior to joining ACIAR in November 2015 as the regional manager for Lao PDR, Cambodia, Myanmar and Thailand, Ms Simmanivong worked for Australia's Department of Foreign Affairs and Trade (DFAT), the Australian Agency for International

Development, Asian Partnership for the Development of Human Resources in Rural Areas (AsiaDHRRA) and the National Confederation of Small Farmers' and Fishers' Organizations in the Philippines (PAKISAMA). She obtained her master's and bachelor's degrees from the Ateneo de Manila University, the Philippines.

**DR KUHU CHATTERJEE—REGIONAL MANAGER
FOR SOUTH ASIA**



Dr Kuhu Chatterjee's program for South Asia focuses on improved and sustainable smallholder farmer production. This outcome is achieved through better management of water resources, improved varieties of crops in rice-wheat systems, efficient and sustainable farming practices and an understanding of policy constraints and options. Dr Chatterjee has 15 years experience in project management in international organisations dealing with natural resource management and six years of scientific

research experience. She has been with ACIAR since 2000. Prior to this she worked with the British Council and World Wide Fund for Nature (WWF) and managed projects funded by the UK's Department of International Development and other international donors. She holds a PhD in environmental sciences with research experience in aquatic ecology.

**LIZ OGUTU—REGIONAL MANAGER
FOR EASTERN AND SOUTHERN AFRICA**



Currently based in Nairobi, Kenya, Liz Ogutu previously spent 15 years working for companies in the corporate sector in information technology, sales and marketing before joining the UNICEF Kenya Country Office as a consultant for Private Sector Partnerships. Her mandate in UNICEF included fundraising from the private sector as well as donor relationship management for projects relating to water and environmental sanitation, child participation, health and nutrition. She has spent the past five years at the International

Livestock Research Institute in Nairobi as the resource mobilisation officer in charge of fundraising and relationship management. Ms Ogutu holds a Bachelor of Science and Postgraduate Diploma in Information Technology from The Open University (UK) and a Diploma in Computer Systems Design. She also holds a Master of Business Administration from the Edinburgh Business School at Heriot-Watt University.

**MIRAH NURYATI—COUNTRY MANAGER
FOR INDONESIA**



Based within the Australian Mission/Embassy in Indonesia, Mirah Nuryati leads a team of four staff that liaises with the many and diverse stakeholders engaged with ACIAR's Indonesian programs and projects. The team provides strategic input and perspectives on project activities, identifying potential risks that may affect ACIAR. Ms Nuryati joined ACIAR in 1991 as an administrative staff member after working with the Australian International Development Assistance Bureau for a year. She has seen ACIAR's engagement

with Indonesia transform from a relatively small program to become the largest and most complex ACIAR program overseas. In 2007, Ms Nuryati was awarded the Australian Public Service Medal and, together with 10 other awardees, she participated in the 2015 John Dillon Fellowship program. She attended the leadership course at the Mt Eliza Business School and visited a number of Australia's research institutions and the University of Tasmania.

**EMILY FLOWERS—COUNTRY MANAGER
FOR PAPUA NEW GUINEA**

Emily Flowers aims to secure improvements in food supply and rural incomes for smallholder farmers in Papua New Guinea (PNG) based on increased productivity and improved access to markets and services. The focus is on plantation crops, root and other horticultural crops, forestry and fisheries. Ms Flowers has been with ACIAR for the past 10 years, becoming the PNG country manager in 2009. Prior to this she held a variety of roles, most recently as communications officer managing the ACIAR website. Ms Flowers holds a Bachelor of Science (Hons) in resource and environmental management from the Australian National University.



Emily Flowers with the 2014 winners of the Australia Week Essay competition (from the left): Eunice Yakipu, Jaclyn Ume, Kimberly Sarabei, James Lunge, Emily Flowers (ACIAR Country Manager), Grace Thoa and Charlene Joseph.

CECILIA O HONRADO—COUNTRY MANAGER FOR THE PHILIPPINES



Cecilia O Honrado leads a country office team that provides support for developing and implementing ACIAR's programs in the Philippines. Prior to joining ACIAR, Ms Honrado worked for the National Economic and Development Authority (NEDA), the central planning body of the Government of the Philippines, the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture

(SEARCA). She obtained her bachelor's degree in agriculture from the University of the Philippines and her master's in management and supervision from Central Michigan University in the USA.

NGUYEN THI THANH AN—COUNTRY MANAGER FOR VIETNAM

Nguyen Thi Thanh An has been with ACIAR since 2008 and is experienced in program management and stakeholder relations. She supports a Vietnam-based program that currently focuses on resource management, market linkages, higher-value products from forestry and fisheries, and policy options for climate change impact and adaptation. ACIAR Vietnam works closely with Australia's Department of Foreign Affairs and Trade (DFAT), Austrade and Education sections at the Australian Embassy, the Vietnamese Government, research partners, the private sector and international donors to contribute to agricultural development in Vietnam. Ms Thi Thanh An has extensive knowledge in communications in the private and public sectors. She holds a Master of Communication for Development from the University of Queensland.

PHOTO: ACIAR



Nguyen Thi Thanh An (left) with two colleagues visiting organic farming systems managed by an NGO near Hanoi in December 2014.

PROFILE—DR ANASTACIA NOTARTE THE FACE OF CHANGE

Since 2013 Dr Anastacia Notarte has managed agricultural research and development for her province of Davao del Norte—an area of more than three million square kilometres with a population of nearly one million people, on the southern Philippine island of Mindanao.

This province is the Philippines' leading banana producer—with many plantations run by multinational organisations—and is also Mindanao's leading rice producer. Other crops include mango and tropical fruit, coconut, cocoa and coffee, and fibre crops such as abaca and ramie.

On top of managing the agricultural R&D for her province, Dr Notarte also leads her team in two ACIAR projects: management of fungus (tropical race 4), which causes disease in bananas, and integrated pest management in mango.

Filipina women, such as Dr Notarte, have been increasing their presence in professional and managerial positions, particularly in agricultural innovation where women have strong footholds in both management and research.

According to the World Economic Forum's *Global Gender Gap Report*, the Philippines ranks ninth in a global survey based on indicators of gender equality.

A possible reason for the success of Filipina in charge of creating an innovation culture is their communal, communicative, sharing and supportive leadership style. Studies show that this contrasts with the agentic leadership style traditionally preferred by many men, which embraces more assertive, competitive and independent characteristics.

The women's more democratic and communal leadership style is also helping to counter the Philippines' culturally high Hofstede's Power Distance Index, which is defined as the extent to which the less powerful members of organisations and institutions accept and expect that power is distributed unequally.

These influences mean women such as Dr Notarte are changing not only the face of R&D but also an established management culture, as reflected in the current management ratio of 1.5 women to every man.

In Dr Notarte's case the effect is especially stark given that agriculture, the dominant industry in her province, is typically dominated by men and combines a competitive private sector with an expanding network of public-sector support organisations. Nonetheless, Dr Notarte has successfully engaged private-sector organisations within her public-sector developments that are geared towards alleviating poverty and improving livelihoods.

Along the way, she has raised a family and reached the top of her profession as an R&D manager, researcher and innovator. She credits plenty of hard work and the role of ongoing education in her success. She has earned a doctorate and two master's degrees, one from the University of Queensland. In 2012, Dr Notarte was awarded an ACIAR John Dillon Fellowship, reflecting ACIAR's commitment to her and the province of Davao del Norte as a long-term research partner.



Dr Anastacia Notarte, recipient of the ACIAR John Dillon Fellowship.



New methods are being introduced to Papua New Guinea to process the nut-bearing fruit produced by *Canarium indicum* trees.

PHOTO: PAUL JONES

TRADITIONAL LORE, NATIVE NUTS AND ENTERPRISE

The opportunities for women to earn cash and status are being cultivated in Papua New Guinea on the basis of marketing a Melanesian delicacy—the canarium nut

KEY POINTS

- Women in PNG are being helped to adapt traditional nut-harvesting roles into modern, value-adding agribusinesses.
- The market potential of these novel products is currently being tested in Port Moresby.

BY DR GIO BRAIDOTTI

The world's growing appetite for healthy nuts is providing the backdrop and rationale for an ACIAR project that is creating important opportunities for rural women in Papua New Guinea (PNG).

Traditional gender roles mean PNG women are custodians of the nut-bearing fruit produced by *Canarium indicum* trees. The nuts are a delicious

traditional food thought to possess nutritional and medicinal value. But harvesting, cracking and marketing canarium are difficult and methods have changed little in hundreds of years.

In 2015, an ACIAR project introduced novel nut handling and processing technology to PNG women. This innovation is enabling the development of women-led agribusinesses with enormous growth potential. It is also



PHOTO: HELEN WALLACE

Damage to the Vanuatu landscape following Cyclone Pam.



PHOTO: NARI

Attendees at the solar dryer training workshop in Papua New Guinea compared the texture and taste of canarium that were insufficiently dried and those that were adequately dried to 1.5% kernel moisture. They also compared nuts that were dried, roasted and salted.

promoting the empowerment and status that come with participating in the development of a new industry.

The project has already created some income-earning opportunities for women selling nuts to a pilot processing plant established by PNG's National Agricultural Research Institute (NARI) for use in market research.

Heading these initiatives is a researcher who previously assisted the macadamia industry to get off the ground in Australia—Helen Wallace, Professor in Agricultural Ecology at the University of the Sunshine Coast. She believes the canarium nut (*galip* in PNG) has the same potential as macadamia to grow from a cottage industry into a worldwide export.

Since 2008, Professor Wallace has been working across Melanesia to develop markets for canarium, along with simple but effective nut processing technology.

"Immediately in 2008 I fell in love with the work ACIAR does and I have been involved ever since," she says.

"ACIAR projects are incredibly valuable, covering every base needed to make a difference—the technical, social and economic."

In November 2015, new techniques developed through the project were introduced to women in PNG at a training workshop held at Kerevat in the Gazelle district of PNG's East New Britain province.

Present at the workshop were women who represented 22 cooperatives of smallholder farmers who come from nearly the entire geographic span of the East New Britain arm of the organisation Women and Youth in Agriculture.

"Women in PNG traditionally harvest the nuts but they are cracked manually using stones, with no further processing," Professor Wallace explains. "This is extremely labour intensive and time consuming. They also limit women to selling raw nuts with a short shelf life in local markets."

The ACIAR project has established that the quality, taste and texture of canarium lends itself extremely well to more extensive processing; for example drying, baking, coating and grinding to a biscuit meal. It can also be made into oil for personal care products.

The processing extends shelf life and results in products that have performed well in product-testing research undertaken with confectionery companies in Australia and New Zealand.

Central to transforming canarium cottage industries into viable agribusinesses are two machines that attracted a great deal of attention during the workshop.

The first involves nutcrackers modelled on the machines used by the Australian macadamia industry. A small version for use in villages has been developed along with a larger model for food processing plants, with the blades manufactured in PNG.

"The macadamia industry people are directly involved in the ACIAR project and they applied their wealth of knowledge on nuts to assist in modifying the crackers," Professor Wallace says.

"At the workshop, all the women wanted a village-scale cracker, so we have to find a way to supply them."

The second machine is a solar dryer that was developed in Vanuatu and constructed for the PNG workshop by NARI.

The solar dryer performs the same job as an oven without the associated cost or energy requirements. It can dry nuts—in or out of the shell—to optimum kernel quality (1.5% kernel moisture) in just six hours on a sunny day.

Making the dryer even more appealing to the PNG women is its ability to also process fruit, allowing excess fresh mango, for example, to be converted into longer lasting—and tasty—commodities that are especially valued during droughts.

"Some of the women were keen to have access to a solar dryer in their village for small-scale processing," Professor Wallace says. "The cost of raw materials sourced locally was 560 kina (A\$250)

THE CANARIUM 'CAFE' IN THE PACIFIC REGION

When Cyclone Pam ripped across Vanuatu in 2015 it was one of the worst natural disasters in that country's history. The extent of the damage meant the most advanced attempts in Melanesia were needed to bring high-value processed canarium nuts to global markets.

Central to Vanuatu's canarium industry is entrepreneur Votausi Mackenzie-Reur and her Lapita Café brand of native products, which include canarium nuts (called *nangai* in Vanuatu).

By 2014, Mackenzie-Reur had established supply chains for canarium nuts with more than 100 farmers across four districts. The nuts were being processed in her factories into a range of highly popular products sold in supermarkets and tourist resorts.

Returning from a visit to Vanuatu in December 2015, Professor Helen Wallace reports the industry is slowly getting back on its feet. "They suffered a lot of damage to their infrastructure but it is being repaired and production is slowly coming back. So we are forging ahead with that project"

As the canarium tree is native to the region and has evolved to withstand cyclones, trees survived the recent category 5 tempest. However, in the worst-hit areas, the trees will not produce nuts for a season. It was the nut processing facilities, particularly the nut dryers, that did not fare as well.

"It was quite tough for Votausi after the cyclone," Professor Wallace says. "She had lost a lot of her processing infrastructure and all the businesses she normally supplied to were closed."

ACIAR's forestry program manager Tony Bartlett recently visited Vanuatu to discuss how ACIAR's financial assistance to project partners such as Lapita Café was being used to replace damaged research facilities.

Ms Mackenzie-Reur reported that ACIAR's support gave her the capacity and optimism to continue her business. "I realised that the only way for my business to survive was to ensure that I could meet the market demand for the nut products," she said.

"So I set a target of collecting and processing 2.5 tonnes of cracked nuts this year, mostly from regions that were not badly affected by the cyclone. This will help farmers in these regions to maintain interest in growing and collecting *nangai* nuts."



PHOTO: HELEN WALLACE

Damage to Vanuatu's industrial canarium-nut dryers and buildings in the wake of Cyclone Pam.

and NARI is willing to construct them free of charge if women pay for the raw materials."

Also covered at the workshop were issues relating to the entire value chain needed to get processed canarium products to a larger market, including postharvest physiology, good handling practices, value-adding, food safety and hygiene.

"We also provided hands-on exercises in nut grading and simple but efficient methods for depulping, cracking, drying, roasting, making oil and packaging," Professor Wallace says. "The women also compared the texture and taste of nuts that were adequately and insufficiently dried in addition to comparing nuts that were dried, roasted and salted."

A tour of NARI's pilot plant completed the bird's-eye view of the fledgling supply chain. The women were invited to sell directly to the plant—and help sustain the market research that got underway in 2016.

"We want to create demand for the nut products that the factory can produce," Professor Wallace explains. "So we are doing research around what kind of canarium product the market wants, which products sell the best, how do we package it and what volume do we need to process."

That means two income-earning options are being created for smallholder farmers. Women can value-add at the village level by harvesting and solar drying for local markets or they can supply the pilot factory to produce high-value packaged products for more extensive marketing in Port Moresby.

These amount to important first steps towards greater agribusiness opportunities for women who often exist on less than A\$1,000 per year. But Professor Wallace is certain that much bigger outcomes are possible, even within just five to 10 years.

"When we started in 2008 there was just one canarium nut processor in all of the Pacific region and it needed nuts to be delivered frozen—an unrealistic technique for most villagers," Professor Wallace says.

"Now we have established that the nuts can be dried efficiently in the villages to extend their shelf life and that more extensive markets can be developed."

The workshop closed with the presentation of Certificates of Participation to each attendee. The chairwoman of East New Britain Women and Youth in Agriculture, Lanieth Aua, presented Mari blouses and gifts to the project team. ■

ACIAR PROJECT: PARDI 2012–16 FST/2010/013

'Developing markets and products for the PNG and Pacific canarium nut industry'

MORE INFORMATION: Professor Helen Wallace, hwallace@usc.edu.au



1. Simple but effective nut-processing technology is essential to the development of a canarium nut industry in Papua New Guinea.

2. Women from the East New Britain Women and Youth in Agriculture were keen on the modified TJ's nutcracker developed by ACIAR to process canarium nuts.

3. Canarium nut products produced in Vanuatu by Ms Votausi Mackenzie-Reur.

PROFILE—DR MAR MAR WIN BREEDING EQUAL OPPORTUNITY

Dried pulses produced by legumes are an important source of protein for humans. These crops provide farmers the additional benefit of adding nitrogen to soils, thereby improving soil fertility without expensive inputs.

A much-loved and highly versatile pulse is the chickpea. In Burma, chickpea is processed in several ways, including grinding to produce a tofu-like paste used in popular recipes such as warm tofu noodle soup.

Among Burma's pulses, chickpea (ka-la-be) is unusual. Pulses are by far the most valuable agricultural export commodity for the country. Yet a fair proportion is consumed locally rather than exported. In 2011–12, the Department of Agriculture estimated the area sown to chickpea at 327,795 hectares for a total production of 441,000 tonnes produced at an average yield of 544 kilograms per acre.

Domesticated chickpea, however, has a narrow genetic base, limiting where it can be grown and reducing its resistance to fungal diseases. As such, work by breeders is essential to ensuring chickpea varieties can keep pace with challenges in farmers' fields.

One chickpea breeder whose work has important bearing on smallholder farmers is Dr Mar Mar Win, who is based at the Myanmar Department of Agricultural Research.

Dr Mar Mar Win says she became a crop specialist in chickpeas in order to help farmers obtain and benefit from improved varieties. She credits working on ACIAR projects since 2007 for helping to develop her capabilities and career.

"I like ACIAR projects for covering multilateral programs to improve the wellbeing of [the] rural population," she says. "We need to do more participatory research with farmers, because most farmers lack knowledge about improved varieties, cultural practices, insect and disease control, and market information of their crops, as well as access to the inputs of crop production."

She has adopted the practice of engaging farmers in the project by making field visits where she uses field demonstrations and promotes discussions on problems in chickpea production.

ACIAR has also facilitated engagement with the chickpea crop-improvement programs at the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) in India and the University of New England in Australia.

"I am proud of International Women's Day," she adds. "Women play a significant role in agricultural production. I think that long-term and sustainable development will only be possible when women and men enjoy equal opportunity to rise to their potential."



Dr Mar Mar Win, second from left, at a chickpea field trial site, Burma.

THE WOMEN WHO BROKE THE POULTRY DISEASE CYCLE IN AFRICA



PHOTO: ROBYN ALDERS, UNIVERSITY OF SYDNEY

Carolina Mwaluko (right) works as a “community vaccinator” in her village in central Tanzania, administering a thermotolerant vaccine as an eye drop to chickens in exchange for a small fee from farmers. Vaccination programs against Newcastle disease, a key production constraint in many developing countries, allow chicken flocks to increase in size and households to benefit from the sale or consumption of poultry products. Since Carolina was trained in May 2014, local traders have noticed the greater availability of chickens for sale and the reduced risk of disease among birds in transit to regional markets. Sustainable Newcastle disease control programs are part of an integrated approach to increasing income and improving nutrition for households in Tanzania and Zambia.

KEY POINTS

- A team led by Associate Professor Robyn Alders has pioneered an effective way to treat malnutrition among smallholder farmers through the use of a vaccine that protects poultry from Newcastle disease.
- First trialled in three African countries, the method is now being adopted in other countries, including Timor-Leste.

BY DR GIO BRAIDOTTI

When vaccines work, the effect on human health can be astounding, but vaccines are not limited to tackling human diseases.

Vaccines that protect farm animals are essential to human health too, especially in communities adversely affected by poor nutrition and childhood stunting. The outcomes are especially stark with regard to poultry.

Requiring little in the way of feed or pasture, village chickens provide smallholder farmers with the most readily available source of vital nutrients, including essential amino acids, of all livestock.

Improvements to village poultry value chains not only improve food security and generate income, but also target these benefits to women, who are often responsible for rearing village chickens.

As such, healthy and abundant poultry can improve the status of women and the health of pregnant women, and reverse rates of unacceptably high childhood stunting.

In African countries affected by Newcastle disease each year, wild hosts bring in a virus that can kill up to 90% of flocks in just a few days. It is in places such as Malawi, Mozambique, Tanzania and Zambia, for example, where the link between human and livestock health was once particularly stark.

The turning point came when Professor Peter Spradbrow of the University of Queensland developed a 'thermotolerant' vaccine against Newcastle disease in chickens. Since the vaccine does not require constant refrigeration or rigorous cold chains, it was especially suited for use in remote African communities.

However, creating a viable vaccine delivery system for African smallholder farmers amounted to the extension challenge of a generation.

Central to the success of the vaccination program, created with ACIAR's assistance, was a team of women with a lifelong love of Africa. The women were led by Associate Professor Robyn Alders, who returned to the University of Sydney in 2012.

"The thermotolerant vaccine itself solves only about 25% of the problem," Associate Professor Alders says. "The remainder comes down to the time spent on the ground collaborating with the people who are the intended beneficiaries."

Over seven intense years, starting in 1996, Associate Professor Alders researched, tested and rolled out—all with rigorous community consultation—an appropriate and viable vaccine delivery mechanism and a supply chain that are used to this day. That system continues to be rolled out to even more African nations and is currently being introduced to Timor-Leste.

The program's durability is something Associate Professor Alders deliberately built into it from the start.

"In the history of development work, many vaccination programs have failed once external funding ends and project staff leave," Associate Professor Alders explains. "From the outset of the

Newcastle disease project, the aim was to develop a locally run program with villagers managing the knowledge and resources to maintain healthy flocks of chickens."

Underlying the program's sustainability are local production centres for the vaccine, the creation of a culture of timely vaccination for chickens, fee-charging community-based vaccinators, and culturally appropriate extension material.

In the process, team members have become experts in all matters relating to transporting, handling and distributing the vaccine. That expertise was recently collated into a Cold Chain Manual—the first of its kind in the veterinary world—that includes innovations such as the use of evaporative coolers for the thermotolerant vaccine and mobile, solar-powered refrigerators to transport vaccines to remote areas.

Ensuring the Newcastle disease program's sustainability is a system of cost-recovery in which households pay the equivalent of a few cents for each chicken jabbed—an affordable price given that village chickens can sell for up to A\$12. That choice was driven by important considerations relating to asset ownership and the empowerment of village women. Associate Professor Alders explains that if a woman is given a goat by an NGO, it may be taken away from her since goats are men's business in many parts of the world. "However, if women buy the vaccine, raise chickens and sell five roosters to buy a goat, then the goat is seen to belong to her."

Another benefit from improved flock survival rates is the production and consumption of a unique commodity—a storable superfood in the form of eggs.

"Where Newcastle disease is not controlled, eggs are not available for food but must either be used to hatch chickens or are exclusively eaten by men," Associate Professor Alders says. "That means the disease is robbing communities of a nutritionally dense, balanced food in the midst of unacceptably high rates of childhood stunting."

Cost-recovery has also ensured that vaccinators earn the income needed to purchase more vaccine, thereby ensuring its ongoing production.

The benefits have been widespread and self-perpetuating—an achievement that saw Associate Professor Alders invested as an Officer of the Order of Australia in 2011. However, she is adamant that the program's many successes owe much to the work of the remarkable women who participated in the Newcastle disease project in many guises.

THE SOCIAL ANTHROPOLOGIST

Described by Associate Professor Alders as her 'greatest asset', Dr Brigitte Bagnol is a social anthropologist who played a pivotal role consulting with smallholder farmers for developing culturally appropriate participatory communication processes, including extension methods.

Dr Bagnol makes it possible to circumvent cultural blunders that can badly compromise the delivery of aid projects. An example is the difficulty that villagers can have reading two-dimensional instructional images if they have done little learning from books. To highly educated Westerners, this is a hidden variable that requires special expertise to recognise and circumvent.

So too are theories of disease that vary from scientists' germ theory and the cynicism surrounding vaccines caused by past experiences in which the arrival of vaccinators coincided with the occurrence of disease.

Dr Bagnol made it possible to confront and overcome such factors and she implemented a model in which villagers are actively involved with participatory monitoring and impact assessment to ensure the vaccination program's long-term viability.

THE COLD CHAIN SPECIALIST AND VACCINE QUALITY CONTROL

Dr Mary Young, a senior technical officer with the KYEEMA Foundation, has been crucial to ensuring that the thermotolerant Newcastle disease vaccine purchased by vaccinators and farmers is safe and potent. She has done this through her expertise in vaccine production quality control and the establishment and maintenance of cold chains to support the distribution and administration of effective vaccine.

THE PROJECT MANAGER

The KYEEMA Foundation is a Brisbane-based not-for-profit organisation that supports activities that help to build sustainable communities in rural



PHOTO: SALLY INGLETON

Robyn Alders visits Tanzania's Singida district in July 2012 with Asha, the community's star vaccinator (rear, wearing the yellow cap). "I had just been given this rooster as a gift by Asha," Robyn reports. "I asked her to keep the rooster for me and said that I looked forward to viewing its progeny on my next visit."

and per-urban areas. Celia Greening, executive director of the KYEEMA Foundation, has managed Newcastle disease vaccination projects from her Brisbane office since 2003 when she oversaw the southern Africa Newcastle disease project.

IN-COUNTRY COUNTERPARTS

Dr Rosa Costa was the director of the Mozambican National Veterinary Research Institute in the 1990s and early 2000s when the Newcastle disease laboratory and field trials were conducted. Her support was vital to the success of the research.

Where Newcastle disease is not controlled, eggs are not available for food but must either be used to hatch chickens or are exclusively eaten by men. That means the disease is robbing communities of a nutritionally dense, balanced food in the midst of unacceptably high rates of childhood stunting.

– Associate Professor Robyn Alders

Wende Maulaga is the current Tanzanian country coordinator of the ACIAR-funded project ‘Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia’, which aims to reduce child undernutrition by improving family poultry and crop production, primarily by working through women smallholder farmers. Ms Maulaga is an animal nutritionist at the Tanzania Veterinary Laboratory Agency, and has a flair for community development.

Dr Hilda Lumbwe is the Zambian country coordinator with the same project. Dr Lumbwe is a veterinarian with a background in poultry health. She is acutely aware that 40% of Zambian children under the age of five years are affected by stunting, 15% are underweight and 6% are affected by wasting caused by nutritional deficiencies. As women are largely responsible for household nutrition they are a primary focus for the project.

Dr Joanita Jong is the head of animal health in the Ministry of Agriculture and Fisheries in Timor-Leste. She is also the country coordinator of the ‘Timor-Leste village poultry and biosecurity project’. This project, which is funded by the Australian Government Department of Foreign Affairs and Trade and implemented by the Department of Agriculture and Water Resources, is adopting the same approach as that being used in Tanzania and Zambia.

THE FEMALE COMMUNITY ASSISTANTS AND VACCINATORS

Rosemary Ackley (community assistant) and Carolina Mwaluka (poultry vaccinator) are important members of the ACIAR project team, working tirelessly for improved food and nutrition security in their communities.

THE NEXT GENERATION

The next generation of interdisciplinary researchers are early-career researchers building their research skills in association with ACIAR-associated food and nutrition security research. Julia de Bruyn is an Australian veterinarian researching for the One Health initiative—a global movement to unite human and veterinary medicine. She is undertaking her PhD research in Tanzania in association with ACIAR project FSC/2012/023. Her research is entitled ‘Healthy chickens, healthy children: sustainable contributions to infant nutrition through the control of Newcastle disease in village poultry’.

Dr Johanna Wong, a second Australian veterinary PhD student and One Health researcher, is working on ‘Discovering the links between poultry health and human diets and nutrition in Timor-Leste.’

THE VACCINATORS

Over time, it became clear that women often make the best village-based vaccinators. Associate Professor Alders says they are more persistent, know the households and tend to be less mobile than young men, who sometimes leave the village in search of paid work. “Communities usually start to preferentially select women once they see their results,” she says.

Although ACIAR covered vaccination costs during the trial phase, the cost-recovery system subsequently used makes the system sustainable. The two cents paid for each bird vaccinated ensures the vaccinators can purchase more vaccine and make a small profit from their work.

The women who farm the village chickens are also able to consult with the village-based vaccinator, gauge demand for the vaccine and ensure its ongoing supply and production.

Although subsidy models exist, and vary from country to country, Associate Professor Alders believes cost recovery works best as government funding can unpredictably dry up. “It better serves women’s prospects for improved livelihoods, nutrition and animal health,” she says. ■

ACIAR PROJECT: FSC/2012/023 ‘Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia’

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MEDIA LINKS: 360degreefilms.com.au/productions/dr-robyn-alders

PROFILE—KHIN LAY KYU THE SCIENCE OF MAKING A DIFFERENCE



Khin Lay Kyu of the Department of Agricultural Research in Myanmar.

At the Department of Agricultural Research in Myanmar, the perennial pigeon pea is of interest to breeders as much for the plant’s hardy, widely adaptable and heat-tolerant characteristics as for the nutritious grain it produces. Being a legume, the plant can also fertilise soils through fixing nitrogen.

These properties of pigeon pea are of great interest to breeder Khin Lay Kyu, who works for the Department of Agricultural Research and has developed new pigeon pea varieties adapted for farmers in Burma.

She has been involved with ACIAR projects since 2007, particularly working with Professor David Herridge at the University of New England in Australia and Dr K.B. Saxena at the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) in India.

“These projects have helped me to develop skills in plant breeding,” she says. “A highlight of participating in ACIAR projects is that I am part of the international science community and have access to the wisdom and experience of international experts in the field. These connections also allow me to access modern approaches to breeding that I can apply to helping poor farmers of Myanmar.”

The exposure to collaborative, international plant breeding research has opened the way for Khin Lay Kyu to undertake additional training abroad. She completed a master’s degree in India at the Acharya N.G. Ranga Agricultural University and conducted research for her thesis at ICRISAT under the guidance of Dr Saxena.

“There, I learned about the hybrid pigeon-pea breeding program and low-cost production technologies,” she says. “I am now applying these approaches in Myanmar, breeding pigeon pea varieties suitable to our growing conditions and seasons. I want to be a smart plant breeder and develop new, high-yielding varieties that have wide adaptability, high yield and good quality.”

“I just want to work for our farmers and country, and the ACIAR projects are helping me to do this. In Myanmar many of the best agricultural scientists are women, and I hope that they will have as much chance of success and high ranking as men.”

EXTENSION SERVICES SUCCEED BY INVOLVING THE WHOLE FAMILY

Innovation in the way extension services are delivered to Pakistan's subsistence dairy farmers is raising productivity



PHOTO: ACIAR

Sobia Majeed (centre) with some of the female dairy farmers she worked with in Sindh, Pakistan, over the four projects in which extension services were innovated and tested in partnership with ACIAR.

KEY POINTS

- Women and children proved instrumental to the rollout of productivity-enhancing extension services to Pakistan's dairy sector.
- Women have helped raise productivity both as farmers and as extension officers, demonstrating talent that has opened doors to their higher education.

BY DR GIO BRAIDOTTI

Subsistence farmers in Pakistan rear up to 60% of the nation's buffalo and cattle, mostly in herds of fewer than 10 animals. The milk produced from these herds is hugely important to Pakistan's food security and to the economy.

In 2005, total milk production in Pakistan exceeded 29 million tonnes and has increased 5% per year for the past 15 years. As the world's fourth-largest milk producer, Pakistan's dairy industry is the largest livestock sector in Pakistan and is valued at Rp360 billion (A\$4.9 billion) per year.

Demand, however, is anticipated to more than treble by 2020, requiring a faster boost in production. This growth in demand makes smallholder farmers essential to national

aspirations to raise productivity, and creates opportunities to reduce poverty. To that end, dairy is a central focus of research, development and extension activities within the Australia–Pakistan Agriculture Sector Linkages Program (ASLP).

Improving extension services—and the way they interface with researchers and farmers—was identified as a major bottleneck in the development of the dairy sector and was targeted for Australian technical support through the ASLP.

Of particular concern was the style of communication with farmers, the information available to extension staff, the skills and numbers of extension staff and a failure to consider problems and solutions within whole-of-farm systems.

With phase two of the extension project now complete, farmers are finding it is possible to double milk production.

However, uptake of these farming innovations was found to hinge on a critical factor—the ability to include women and children in extension activities, according to Dr David McGill of Charles Sturt University, who has played critical roles throughout the project.

Dr McGill explains that many aspects of dairy farming—other than marketing—are performed by

women and children. Yet extension services were male dominated and targeted to the male heads of households ... to the consternation of these men.

As one male farmer said to Dr McGill: "Why were extension officers talking to me? I have never touched a calf. They need to tell my wife because she won't listen to me."

To reach the women, ACIAR commissioned Professor Peter Wynn of Charles Sturt University to head a project that saw Dr McGill travel to Pakistan. There he assembled a team that included many young early-career scientists and interns from the University of Veterinary and Animal Sciences of Lahore. The aim was to innovate the way extension services are delivered.

Essential to his team's success was the recruitment of women, who paired with a male extension officer to visit villages. Together they disseminated relevant information in a way that targeted entire farming families. The female staff included Zahra Batool, Shumaila Arif, Sobia Majeed and Khadija Javed.

"The most important people to work on these projects are the women who work on the ground, on a day-to-day basis," Dr McGill says. "In the [past] five years we had about five women within our team who established and maintained discussion groups of both male and female farmers running concurrently. The impact has been incredible."

Impressive gains in husbandry and milk production were achieved often on the back of simple changes to farm practices.

For example, high calf mortality rates (50–60%) were reduced simply by allowing newly born calves to receive disease-fighting antibodies that are present in colostrum (produced by their mothers' mammary glands late in pregnancy) as soon as possible rather than waiting, as farmers were doing, until the placenta was expelled.

"Smallholder farms have the means to reduce calf mortality rates and the project confirmed

that their herds have the genetic potential to produce more milk," Dr McGill explains. "Tapping that potential can be a matter of adopting simple measures, such as fencing animals so that they can roam and have free access to water, rather than being tied up all day."

Dr McGill is also justifiably proud of the early-career researchers on his team who subsequently won an impressive list of scholarships and fellowships to support their further training. Included are three John Allwright Fellowships, a Fulbright Award and several other scholarships including one to undertake further research in Norway.

"It has truly been inspirational watching the significant contributions and impacts the women in our team have made and, furthermore, seeing them start as interns or junior staff and end up

in leadership positions or embarking on PhD opportunities," Dr McGill says.

Along the way, highly innovative methods were developed to disseminate information. Methods include extension in the form of a play and a competition in which children schooled in improved calf-rearing practices competed for prizes when they paraded their impressively hefty animals at a farmers' festival.

"The children's calves achieved impressive growth rates," Dr McGill says. "At four months the calves were huge, with some weighing over 80 kilograms, nearly double what we would generally see in villages. And the farmers saw the children parade these great-looking animals that highlighted the value of the practices we were promoting."

Overall, the project demonstrated that newly developed extension methods and materials

can improve the profitability of smallholder dairy farmers. Uptake of the fencing innovation, for example, led to increases in milk production of about 1.5 litres per day, reduction in health-related issues and significant reduction in labour. ■

ACIAR PROJECT: Australia–Pakistan Agriculture Sector Linkages Program (ASLP) 'Dairy Project Phase 2: Improving dairy production in Pakistan through improved extension services'

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MEDIA LINKS: With a group of other early-career researchers working on similar projects, Dr McGill has helped to establish the Researchers in Agriculture for International Development (RAID) network at www.raidaustralia.net.



PHOTO: MUHAMMAD ZULFIQAR

The most important people to work on these projects are the women who work on the ground, on a day-to-day basis.

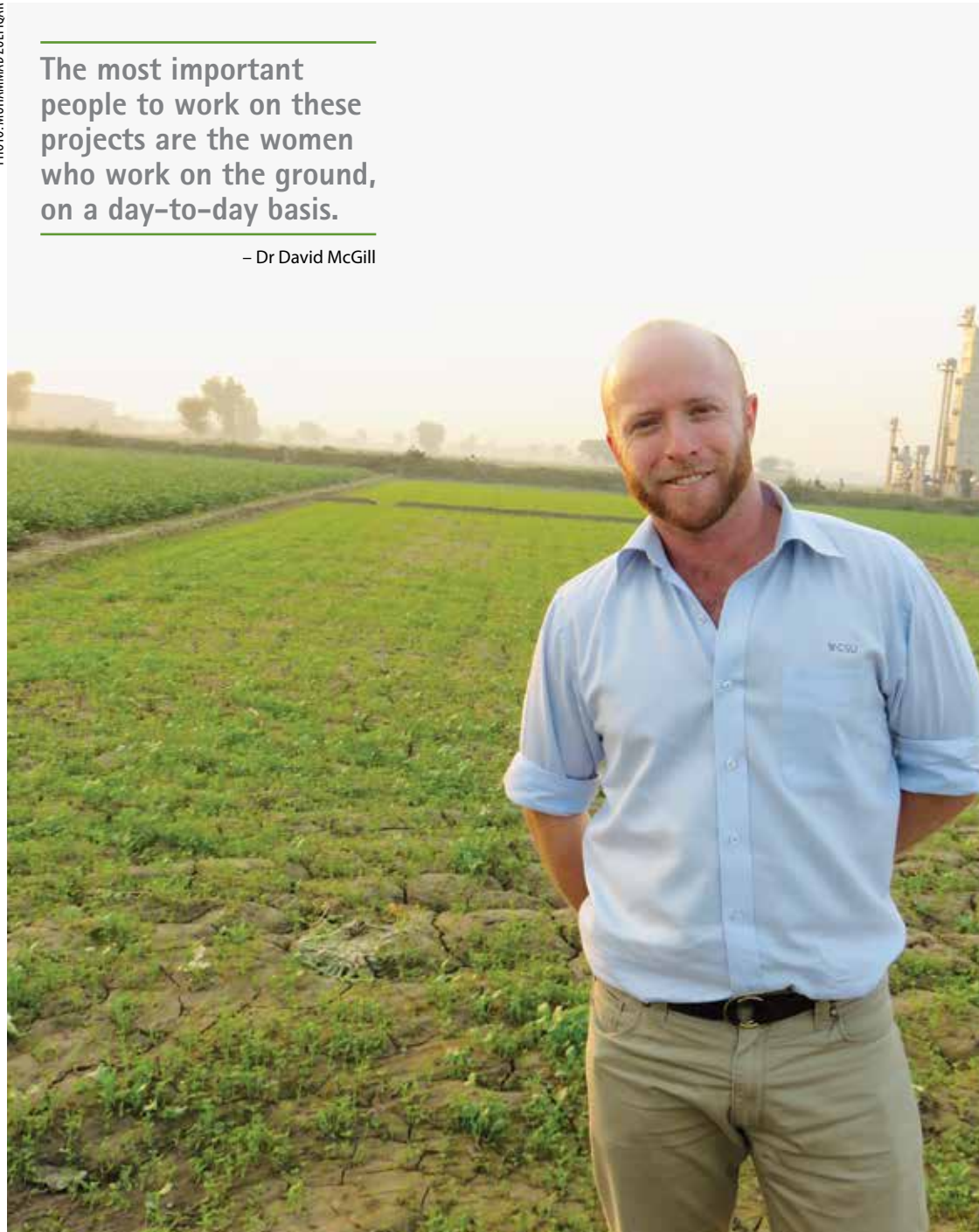
– Dr David McGill

Zahra Batool started working in the Pakistan dairy sector extension program as an intern and quickly impressed ACIAR researchers. For several years she organised and ran workshops and farmer discussion groups but she now leads younger team members and has received a John Allwright Fellowship to further her education.



PHOTO: AZAR BHATTI

The family-orientated approach taken by an ACIAR team charged with innovating extension services to Pakistan's dairy sector extended to children, who subsequently demonstrated their newly acquired husbandry prowess by rearing remarkably hefty calves.



Mother and child in Vietnam's north-western highlands.



PHOTO: PHAN THUY HIEN

MADE IN VIETNAM BY WOMEN

Women farmers in Vietnam's impoverished north-western highlands are the essential ingredient needed to solve a set of inter-related nutrition, poverty and marketing problems involving vegetables

KEY POINTS

- Vietnam's north-west provinces face a dual need for improved vegetable production systems and access to markets.
- An ACIAR project working to achieve both goals in ways that reduce poverty and malnutrition has found that the key to success is women.

BY DR SUZIE NEWMAN

Global Food Studies, University of Adelaide

Lao Cai in north-west Vietnam is renowned for its spectacular mountains, stunning vistas and vibrant ethnic minorities.

Despite its strong tourism sector, Lao Cai continues to be one of the poorest regions in Vietnam, with 40% of the population below the poverty line.

Poverty is particularly rampant among the ethnic minorities that inhabit the region, with Mung, Nung and Dao peoples experiencing poverty levels greater than 70%. These communities face not only poverty, but also

chronic malnutrition, with one in three children under five years experiencing stunting.

Improving nutritional security through increased vegetable consumption and farmer access to market opportunities are vital to improving the livelihoods of these farming families.

Central to any assistance provided to the region is the recognition that it is women farmers who play important roles in horticulture production and marketing. This situation was clearly demonstrated in an earlier ACIAR research project (AGB/2006/112), which found women were

involved in the decision-making in all aspects of day-to-day farming life. Further, 62–93% of women were primarily responsible for marketing and selling produce (depending on the commune).

The prospects of these women farmers achieving nutritional and livelihood gains through improved productivity and marketing are high. Lao Cai, together with other north-west provinces, has the potential to be a major vegetable supplier to northern markets, mimicking Da Lat's role in the country's south.

The north-west provinces are well endowed with natural resources, enabling year-round vegetable production. The ability to produce in the off-season and a wealth of indigenous vegetable varieties also provides a marketing edge for smallholder producers. Further, research found that Lao Cai vegetables are perceived by consumers as safe and nutritious and are in strong demand, particularly during the off-season (summer).

Despite these opportunities the region has failed to fully exploit these advantages. Many of the reasons cited for this relate to an inability to effectively access lucrative market opportunities in urban and regional centres.

MARKET ACCESS

In 2014, ACIAR commissioned a project (AGB/2012/059) to improve the profitability and sustainability of smallholder vegetable farmers in north-west Vietnam through improving market engagement and adopting integrated resource and disease management practices.

Led by the University of Adelaide and the Vietnam Women's Union, the project is focusing particularly on women and ethnic minorities who are engaged in horticultural value chains in Sa Pa and Bac Ha in Lao Cai province.

ACIAR's engagement with Lao Cai vegetable producers introduces a capacity to undertake targeted market research, so that constraints can be overcome and opportunities better exploited. With market development an important focus, research is helping us to understand how smallholder farmers can effectively access local, provincial, urban and regional markets.

The project uses a participatory approach—the collaborative problem-solving methodology—whereby supply chain stakeholders will determine the interventions to be tested. To this end, stakeholders are driving the R&D agenda.

In October 2014, two stakeholder workshops were held in Sa Pa. The first, for government officials at the district level, was organised to gain an understanding of policies that affect the vegetable sector and opportunities for the project to support existing government priorities, such as through the provision of technical information.

The second workshop was held with the suppliers of vegetables from farms to markets—including farmers, collectors, wholesalers and retailers—to identify priorities for future intervention, such as improvements in postharvest management. The workshop led to the formation of a steering committee to build linkages more effectively with the private sector and act as a sounding board for the project team.

The project's next phase will focus on market development initiatives.

Consistently meeting retailer and wholesaler volumes is a challenge that smallholder farmers face. Group marketing through cooperatives is one way to meet this demand and address logistics constraints such as transport.

In Bac Ha, a group of 43 women farmers has formed the Di Thang Cooperative to produce

and market their vegetables. The ACIAR project has supported the cooperative in providing training in vegetable production, pest and disease management and marketing, including participation in trade fairs, study tours and a restaurant challenge. For example, early in 2016, two trade fairs held in Hanoi were designed to link farmers and cooperatives with retailers and wholesalers in Hanoi.

The Di Thang Cooperative is also participating in some of the ongoing research to evaluate new crops and off-season production using low-cost protected cropping structures. Now the project is looking to work with other cooperatives in Bac Ha and Sa Pa to support similar marketing initiatives. Recently a new cooperative has formed in the Ta Chai commune in Bac Ha.

Working with women and the Women's Union (a sociopolitical organisation) is central to the success of the project. Women are the drivers of vegetable production and marketing, as they are involved in all aspects of the supply chain from farm to market.

The Women's Union draws from a membership of 13-million-plus members spread throughout national, provincial, district and commune levels of society. This network enables information and issues to be communicated in both directions. We anticipate that this network will be critical as we enter the scaling-out phase of the project. ■

ACIAR PROJECT: AGB/2012/059 'Towards more profitable and sustainable vegetable farming systems in north-western Vietnam'

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MEDIA LINKS: <https://youtu.be/CHKtaNkheYo>

Vegetable market in Sa Pa, Vietnam.



Women at a farmers' meeting in north-western Vietnam.



PHOTOS: SALLY INGLETON

A NEW LEASE OF LIFE FOR SWEETPOTATO

Thanks to a dedicated team of mainly women researchers, a potential crisis in sweetpotato production in Papua New Guinea has been averted and, as a result, sweetpotato could make the transition from staple to commercial cash crop

KEY POINTS

- A remarkable team of women has been working on the sweetpotato projects at Aiyura in PNG over recent years. Working under difficult conditions, they were the first ones to achieve thermotherapy of the PNG sweetpotato varieties—and thus provide the basis for the clean seed scheme.
- The success of their work opens up the potential for sweetpotato as a commercial cash crop, which would bring livelihood benefits for smallholder sweetpotato farmers, who are mainly women.

BY ANNE MOORHEAD

Sweetpotato is a women's crop in the highlands of Papua New Guinea (PNG). The country's number one staple food is planted, nurtured and harvested mainly by women. Women also take the lead in preparing meals from the nutritious root. So it is perhaps not surprising that, when the crop appeared to be in trouble, it was a team of mostly women researchers that responded to the crisis.

Like the women who grow it, sweetpotato is resilient, producing a crop even on poor soils and surviving the occasional severe drought. Despite this, over recent years people began to notice

a decline in yield. The reasons were complex but generally attributed to population pressure reducing land availability, leading to shorter fallow periods; this in turn has resulted in a combination of declining soil fertility and increasing pests and diseases affecting the crop.

Years of ACIAR research, in partnership with the PNG National Agricultural Research Institute (NARI), have tried to tease apart and understand the contribution of these various factors to sweetpotato yield decline. One result was clear: much of the sweetpotato in PNG was found to be infected with viruses, some of which were shown to severely reduce yield.

PHOTO: RICHARD MARKHAM



Winnie Maso in the tissue culture laboratory at Aiyura.

The first attempt at a solution was to introduce virus-free stock of high-yielding varieties from Australia. Some farmers liked these for their high yield, but they did not appeal to the majority of consumers, who preferred the PNG varieties.

An obvious solution was to remove the viruses from PNG's own sweetpotatoes, but this proved to be easier said than done. Although the principle of 'thermotherapy' (growing the plants at raised temperatures for a period, followed by transfer to tissue culture) is well established as a way to remove plant viruses, in practice it is often difficult. The first batches of PNG sweetpotato, heat-treated by researchers in Australia, were killed by the treatment, and the work stalled for a few years.

A BREAKTHROUGH IN THE LAB

One of the young PNG researchers, Dorcas Homare (now Walters), was not deterred. After training in the thermotherapy approach from Sandra Dennien of the Queensland Department of Agriculture and Fisheries (under ACIAR project SMCN/2004/071), she continued the painstaking work in her lab at NARI. Her perseverance paid off and Ms Walters became the first person to deliver PNG's preferred sweetpotato varieties free from the damaging viruses.

"It was a breakthrough," Ms Walters says. "I was really pleased with the result, because I knew we would now be able to deliver benefits to the farmers."

This was just the first step. To deliver sufficient volumes of 'clean' (also known as PT or

pathogen-tested) cuttings to farmers requires a whole system that includes virus identification and elimination, followed by propagation and multiplication, all the while ensuring the plants remain free of viruses. Developing and implementing this system became the work of a dedicated team at NARI's Aiyura research station.

Winnie Maso is a key member of the team. She manages the tissue culture stage, where virus-free material is maintained and micro-propagated. With support from ACIAR and the Crawford Fund, she has built a vital skillset that allows production of many thousands of clean sweetpotato plantlets at NARI.

The next stage is to raise the plants in screen-houses, ensuring that they are kept safe from insects (which might carry viruses and infect the plants). This is now the work of Myla Deros. She nurtures the 'mother-stock', regularly producing bundles of cuttings that can be taken for field multiplication. This task requires constant vigilance to ensure that the plants remain virus-free—which is done either by grafting onto a related plant, *Ipomoea setosa*, which is very sensitive to viruses and quickly shows symptoms, or by molecular tests. Here again, Ms Maso works with Ms Dennien in Australia to keep abreast of the latest developments in technology and virus diagnostics.

After that, the plants are tested in the field—and this is where the research results start to matter to the farmers. "The first time we took the virus-free materials out into the field was amazing,"

Ms Walters says. "It was enlightening for me, to see the plants yield so much more." Field trials showed that the virus-free sweetpotatoes could produce a yield as much as 80% higher (and, on average, about one-third higher) than the same variety with its 'normal' load of virus.

"We had a breakthrough in the lab, but the important part was taking it to the farmers. We were able to give them back their own planting materials, cleaned of viruses. They were so happy—it was very rewarding for me," Ms Walters adds.

RISING DEMAND FOR HIGH-QUALITY SWEETPOTATOES

After the research station phase, field multiplication provides the thousands of cuttings needed by farmers. Opportunities are created here for enterprising people—such as Agnes Jonah—to establish a business, selling PT cuttings to other farmers. "I have four screen-houses and I'm growing three varieties of PT sweetpotato," Ms Jonah explains. "I am also training a large group, around 30 farmers, mainly women, how to grow them. The yield is very high and now all farmers are going for the PT sweetpotato. And demand is high in the market too."

Indeed, women selling the roots in roadside markets are finding that buyers much prefer their PT sweetpotatoes, because the roots are larger and more consistent in shape.

Demand for these high-quality roots is also growing in the urban centres. Increasingly, sweetpotato is 'exported' from the highlands to the big cities in the lowlands, especially Lae, and via Lae to Port Moresby. If farmers can rise to the various challenges of supplying these markets there is great potential for sweetpotato to evolve from a staple crop of the highlands to a commercial cash crop.

A new ACIAR project launching in 2016 (HORT/2014/097), funded by the Australian Department of Foreign Affairs and Trade under the Transformative Agriculture and Enterprise Development Program (TADEP), will seek to support this transformation of sweetpotato from staple to cash crop. The project will also link with another TADEP project that focuses on women's enterprise development (ASEM/2014/095), and two technical projects—one to ensure soil sustainability (SMCN/2012/105) and one to manage the growing problem of sweetpotato weevils (HORT/2014/083).

Researchers and farmers alike believe that this new technology can truly transform the prospects for this humble but rugged crop, and the lives of the women who grow and sell it. ■

MORE INFORMATION: Dr Richard Markham, research program manager for horticulture, richard.markham@aciar.gov.au



Selling (non-pathogen-tested) sweetpotato at a roadside market in Mt Hagen.

PHOTO: RICHARD MARKHAM

WOMEN IN THE PHILIPPINES TAKE THE LEAD

Women rule in an integrated crop management project that is improving vegetable profitability and food security in the southern Philippines and Australia

KEY POINTS

- In 2015, the Philippines climbed to ninth in the World Economic Forum's report measuring gender equality among 145 countries, the highest rank in the Asia-Pacific region.
- The strength of women is on display in an ACIAR project that is helping smallholder vegetable producers in the southern Philippines overcome low yields, pests and diseases so as to meet local market demand and improve nutrition and livelihoods.

BY DR SANDRA MCDUGALL

Leader of Southern Irrigated Cropping Systems, Plant Systems at the NSW Department of Primary Industries

One ACIAR project that stands proud for the preponderance of women taking part as researchers and farmer trainers is an integrated crop management (ICM) project that is testing and rolling out improvements to vegetable production systems in the southern Philippines.

The project's aim is to improve livelihoods and the food security of smallholder vegetable farmers. This is being achieved through research and extension into protected cropping systems, good agricultural practice and integrated pest management. A sub-component also

looks to produce clean seed potatoes through aeroponic techniques.

Female academics lead each of the research groups participating in this ACIAR project from five collaborating universities in the Philippines. Each of these women provides technical and research leadership to our collaborators at the smaller, principally teaching, agricultural universities:

- Dr Zenaida C. Gonzaga is the Philippine vegetable ICM project leader and component leader for agronomy. She is based at the Visayas State University (VSU), Baybay City, Leyte province
- Dr Lucia Borines is the component leader for plant pathology
- Professor Reny Gerona is the component leader for entomology.

Additionally, of the nine research assistants employed on this project, five are women.

Farmer training, using the farmer field school model, is delivered by East-West Seeds training teams, Landcare Philippines and a senior plant protection specialist at the University of the Philippines, Los Banos. All but one trainer is female.

THE PROJECT LEADER

Dr Zenaida C Gonzaga is an associate professor in the Department of Horticulture at VSU. She currently leads the ACIAR vegetable ICM project

and previously led an ACIAR project that improved farmers' yields by developing cost-effective structures to protect vegetable crops from torrential rain and typhoons. In 2011, she received a John Dillon Fellowship.

THE PLANT PATHOLOGIST

Dr Lucia Borines is professor at the Department of Pest Management, VSU. She teaches courses in plant pathology and plant protection to undergraduate and graduate students. She leads the plant pathology component of the vegetable ICM project. Additionally, she is component leader of the current ACIAR project 'Tropical tree fruit research and development in the Philippines and Australia to improve productivity, resilience and profitability'.

This follows on from engagement with a previous ACIAR project 'Integrated management of *Phytophthora* disease of durian and jackfruit in the southern Philippines and Australia'. She also served as plant pathologist in a previous ACIAR protected cropping project. Further, she heads VSU's Plant Disease Diagnostic Laboratory, advising farmers, researchers, students and other clients in the Eastern Visayas region on plant disease problems. She was a John Dillon Fellow in 2015.

THE PEST SPECIALIST

Besides leading the entomology component of the vegetable ICM project, Dr Reny G. Gerona is an associate professor in entomology and the Plant Pest Clinic coordinator at the Department of Pest Management, VSU. In her 35 years of experience in instruction, research and extension she received the Most Outstanding Teacher Award in 2003, was a visiting scientist to Japan under a Japan Society for the Promotion of Science (JSPS) grant in 1992 and a John Dillon Fellow in 2013. She was the entomologist on the ACIAR project 'Development of a cost-effective protected vegetable cropping system in the southern Philippines and Australia'. ■

ACIAR PROJECT: HORT/2012/020 'Integrated crop management (ICM) to enhance vegetable profitability and food security in the southern Philippines and Australia'

MORE INFORMATION: Dr Sandra McDougall, sandra.mcdougall@dpi.nsw.gov.au

MEDIA LINKS: Protected vegetable cropping in Visayas, the Philippines at www.youtube.com/watch?v=fKkNb0CN0xs



PHOTO: ACIAR

(From left) Dr Zenaida Gonzaga, Dr Lucia Borines and Dr Reny Gerona.

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SCIENTIFIC PUBLICATIONS

Trajectories of rice-based farming systems in Mainland Southeast Asia

Cramb R.A., Gray G.D., Gummert M., Haefele S.M., Lefroy R.D.B., Newby J.C., Stür W. and Warr P.

MN177

<http://aciar.gov.au/publication/mn177>

Strategic plan for ACIAR engagement in capture fisheries research and capacity development in Indonesia, 2015–25

Pusat Penelitian Pengelolaan Perikanan dan Konservasi Sumberdaya Ikan (Centre for Fisheries Research and Development) and ACIAR

This strategic plan was developed in response to a request from the Centre for Fisheries Research and Development within the Indonesian Ministry of Marine Affairs and Fisheries. The process was led by the Centre and the Australian Bureau of Agricultural and Resource Economics and Sciences in collaboration with the Commonwealth Scientific and Industrial Research Organisation. TR88

<http://aciar.gov.au/publication/tr88>

A comparison of three empirical models for assessing cropping options in a data-sparse environment, with reference to Laos and Cambodia

Camilla Vote, Oeuring Chantha, Sok Ty, Chanseng Phongpacith, Thavone Inthavong, Seng Vang, Philip Eberbach and John Hornbuckle TR87

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Spiny lobster aquaculture development in Indonesia, Vietnam and Australia

Jones C.M. (ed) 2015

PR145

<http://aciar.gov.au/publication/pr145>



PROFILE—SUSAN MAY INU OPPORTUNITIES FOR MARKETING COFFEE

The increased demand for cash and better access to markets is significantly transforming land use in rural communities in Papua New Guinea (PNG). In the past 10 years socioeconomic change in the country has been dramatic. The rate of change in PNG is accelerating with the mining boom, improved market access and the rapid and widespread adoption of social media through the use of mobile phones. Such change is enabling the rural population to engage with new market opportunities emerging for fresh food, including fruit. It also poses a challenge for the PNG coffee industry—how does it maintain farmers' interest in coffee production near towns where there are so many new income opportunities emerging?

Farmers in communities within 10 to 20 kilometres of main highways and feeder roads have high market access and thus have more income opportunities than farmers in remote regions. Population growth and the need for food and income security are influencing coffee households' investment decisions. The introduction and development of fruit and vegetables such as pineapple and broccoli as alternative cash crops to coffee have significantly affected how households allocate resources such as land and labour. Understanding some of these changes and factors playing out at household level will enable the coffee industry to develop policy frameworks for smart agriculture interventions that maintain farmers' interests in coffee production.

The customary land tenure system is becoming more individualised as villages increase production of food crops for urban markets. This trend is pushing coffee households to become more individualised units of production, which means households are less able to call on the extended family to help with harvesting and other tasks during peak periods of labour demand. This process is also influencing gender roles and behaviours as households intensify their market engagement.

Susan May Inu has been working with the PNG coffee industry and involved with ACIAR projects since 2006 as a socioeconomic researcher. She says: "ACIAR provided me an opportunity to undertake research to understand some of the forces on the livelihoods of the rural population. It was an enlightening experience working with the PNG coffee industry and partners such as ACIAR. "The thrill of fieldwork and seeing the strategies households pursue to better people's livelihoods made research a worthy path. I completed my Master in Philosophy in July 2015 at Curtin University under a John Allwright Fellowship. My thesis title was 'The influence of socioeconomic factors on farm investment decisions and labour mobilisation in smallholder coffee production in Eastern Highlands, PNG'."

PHOTO: ACIAR



Susan May Inu

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