



Australian Government

Australian Centre for International Agricultural Research

ISSUE TWO 2017  
aci-ar.gov.au

# partners

IN RESEARCH FOR DEVELOPMENT



MYANMAR:  
AGRICULTURE  
IN TRANSITION

# THE MYANMAR PROGRAM

Myanmar and Australia are partnering to improve the broadscale food-producing capacity of poor, small-scale farmers in a program overseen within Myanmar by Dr Ohnmar Khaing



PHOTO: ACIAR

Dr Ohnmar Khaing

## BY DR OHNMAR KHAING

Program manager, MYFarm

The research program (known as MYFarm) highlighted in this issue of *Partners* magazine is a collaboration between the Department of Foreign Affairs and Trade (DFAT) and ACIAR. The multidisciplinary approach is very new for Myanmar and is forging new linkages between research groups. The program delivers evidence-based improvement to all aspects of an agricultural value chain. This results in food security and livelihood gains for the poorest food producers. The underlying principle of the program is improved food security and thriving rural economies—essential to the development of the broader national economy in Myanmar. Several key outcomes have already emerged from this collaborative partnership.

The program engages with the sectors that are most important to the rural poor and their food security—the livestock, fisheries and cropping sectors. Support to the government's administration and policy development of the agricultural sector is also available through ACIAR's research innovations and experience.

As well, the program is focused on capacity building in the country's research, development and extension agencies. This will mean they are better able to provide critical services and support to farmers, long after ACIAR's departure.

The value of this integrated and strategic approach can be seen in a project to develop rice varieties that can handle drought or other stresses that afflict rice production zones in Myanmar. In

2016, increased resilience resulted in better rice quality and higher yields (as much as 25%). These gains have translated into an increase in profits of 20–30% from rice farming systems. Collaborating with ACIAR to achieve this kind of outcome has shown how Myanmar can better translate its scientific research capacity into economically viable production gains.

Another example is improvement to the institutional capacity of government departments. Targeted and research-based changes to governance structures are helping to overcome the challenges faced by small-scale food producers. This is assisted by improvements to the technical skills of administrative officials.

Important outcomes include the capacity to measure the socioeconomic impact of all projects and the ability to act collaboratively, pulling together different government departments, the private sector and not-for-profit organisations. This new collaborative approach was apparent in projects that worked with private companies to develop affordable machinery and materials for crop seeding, weeding, harvesting and post-harvest handling. The program has seen the introduction of gender mainstreaming in which the implications of policy actions are assessed for women and for men. This aims to assist the economic empowerment of women through expanded roles in food production and agricultural industries.

Scholarships and research grants available through the program are making it possible for Myanmar researchers to undertake additional training, including at the doctorate level, in

Australia. This is increasing skills in Myanmar and cultivating closer linkages and better understanding between the two partner countries.

Internships to work at the project level are an additional training opportunity. Internships can strengthen Myanmar's academic capacity and introduce research, extension and presentation skills, including stakeholder-driven methodologies.

The majority of staff members in Myanmar have not studied action-learning research methods. The introduction of participatory research and extension tools allows a greater focus on stakeholder outcomes and the ability to engage more collaboratively with farmer groups, not-for-profit organisations and the private sector.

Across projects, we are seeing that improvements to farming systems have nutritional, economic, social and environmental impacts. Rural communities are leveraging off these changes to improve their livelihoods and their quality of life, with farmers reporting a preference for participatory research models.

These are some of the key outcomes I have seen emerge from this program. As the program comes to a close during 2017, I am proud of my association with all of the various project activities and their impacts on the ground. Never before have so many sectors worked together to improve Myanmar's farming systems. The stand-out impact relates to food security and nutrition, with more people having more regular access to nutritious meals. ■

**MORE INFORMATION:** Dr Ohnmar Khaing, [ohnmar.khaing@aciar.gov.au](mailto:ohnmar.khaing@aciar.gov.au)

# GROWING RELATIONSHIPS

Australia's assistance and research programs in Myanmar are focused on collaborating to deliver long-term benefits to the people who need it most



PHOTO: ACIAR

Nicholas Coppel

BY NICHOLAS COPPEL

Australian Ambassador to Myanmar

The Australian Government is committed to supporting Myanmar in its transition to democracy and sustainable economic development through our Official Development Assistance (ODA).

The three objectives of Australia's aid program in Myanmar are to: enhance human development by improving access to quality education; promote peace and stability through support to the peace process and elections, and humanitarian assistance to promote inclusive economic growth and improved governance.

On a global level, Australia's ODA—including through the Australian Centre for International Agricultural Research (ACIAR)—helps improve agricultural productivity and reduce post-harvest losses. More importantly it contributes to food security.

Australia is the third-largest donor to the United Nations Office for Project Services (UNOPS) Livelihoods and Food Security Trust Fund – or "LIFT" in Myanmar. LIFT is currently assisting Myanmar's Ministry of Agriculture, Livestock and Irrigation in preparing Myanmar's Agricultural Strategy, Agricultural Investment Plan and proposal to the Global Agriculture and Food Security Program.

Australia is also providing scholarships for two Government officials from the Ministry's livestock and irrigation sections to study in Australia, and skilled Australian volunteers to contribute to Myanmar's agriculture sector reform plan.

---

**"I AM PROUD OF THE PROMINENCE THAT AUSTRALIA HAS GIVEN TO AGRICULTURE, FISHERIES AND WATER IN OUR GLOBAL AID PROGRAM. IT IS SMART, COST-EFFECTIVE DEVELOPMENT."**

---

In Myanmar, the agriculture, fisheries and livestock sectors account for about 30% of gross domestic product (GDP), with about 70% of the population depending on these sectors for their livelihoods.

Over the years, ACIAR has sent many Australian scientists to Myanmar to assist in building the sustainability of Myanmar's agricultural sectors. Through ACIAR, strategic assistance is being provided to livestock, fish, pulses, rice and social research projects in Myanmar.

It has been well documented globally that public sector investment in agricultural research is one of the highest payoff investments governments can make to address poverty and stimulate growth. ACIAR knows well the value of private sector engagement and the empowerment of women and girls to sustainable economic development.

One of the benefits of establishing a continuing strategy for research collaboration between Myanmar and Australia is that it allows

us to focus on developing the skills of the next generation of researchers and research managers both in government and non-government organisations.

These are the people who will be needed to address the problems and enormous opportunities in developing more sustainable and profitable smallholder agricultural livelihoods.

The ultimate goal in our research initiatives is to unlock the potential of Myanmar's agricultural sector. With that goal in mind, it is very pleasing that the Government of Myanmar looks to a long-term research collaboration strategy with Australia that can inform policy development.

In recognition of the importance of our relationship, Australia's Commission for International Agricultural Research will visit Myanmar in March this year. This visit will give commissioners the opportunity to see first-hand the impacts of our ten-year partnership.

I am proud of the prominence that Australia has given to agriculture, fisheries and water in our global aid program. It is smart, cost-effective development. It's about building enduring people-to-people ties and sharing our knowledge and creative thinking. It's highly effective as agriculture is one of our biggest national strengths.

I am also delighted to be asked to contribute to this special issue of ACIAR's *Partners* magazine, which focuses on Myanmar and the outcomes of ACIAR's research collaborations over the past 10 years.

I hope you enjoy reading the articles within it as much as I did. ■

# FOCUS ON MYANMAR

**A**fter years of isolation, Myanmar has emerged as a significant player in mainland South-East Asia. As the largest country by land area, it has significant natural resources and a young population. Abundant arable land, forests, natural resources, minerals, gas, oil and freshwater and marine products abound. Myanmar has significant potential to benefit from closer integration with global markets.

ACIAR has been working in Myanmar since 1988, when the Burmese Breeding and Veterinary Department collaborated on research on the control of Newcastle disease in village chickens using oral V4 vaccine. Our research, which has continued since that time, has been designed to secure improvements in food security and rural incomes for smallholders through increased production and enhanced access to markets and services.

Most of the research highlighted in this issue of *Partners* is the result of co-investment between DFAT and ACIAR. The articles highlight that working through government research agencies, international organisations and non-government organisations (NGOs) with a longstanding presence on the ground has proved an effective and accountable way for ACIAR and DFAT to deliver assistance with Myanmar.

Myanmar is the largest producer and exporter of beans and pulses within the Association of Southeast Asian Nations region. Despite its potential for growth, the agriculture sector persistently experiences insufficient investment in research, extension, technology transfer, infrastructure development, value-chain upgrading and marketing.

Promising results have been achieved in a multilateral ACIAR project led by the University of New England, and involving the International Crops Research Institute for the Semi-Arid Tropics, on improving the productivity of legumes in the central dry zone (CDZ) of Myanmar. As you will read, improved varieties of legumes being promoted under MYPulses are benefiting farmers in the CDZ of Myanmar.

With about 75% of the total population residing in rural areas, cropping, livestock, fishery and forestry sectors are the principal agricultural livelihoods. Rice is the most important crop,



**ONE OF THE AUSTRALIAN GOVERNMENT'S MANDATES IS TO SUPPORT THE EMPOWERMENT OF WOMEN AND GIRLS IN ALL ITS OFFICIAL DEVELOPMENT ASSISTANCE ACTIVITIES. ACIAR IS WORKING HARD IN ALL OUR PROJECTS IN MYANMAR TO HELP ACHIEVE THIS AIM.**

– ACIAR CEO Andrew Campbell

accounting for about 80% of the value of agricultural sector production.

The MYRice project demonstrates that improving the drying and storage of rice reduces yield losses by 10% and produces better quality grain for the market, while best postharvest practices reduce physical losses by 10–13%.

Fish is also an extremely important component of the Myanmar diet. MYFish, supported by WorldFish, aims to support the emergence of small-scale aquaculture as an alternative source of fish for poorer households, as well as contributing to a better understanding of fishery management. The work has led to the introduction of small indigenous fish into carp polyculture systems, assessment of fish yields in modified rice fields and cost-effective eel culture in homestead ponds.

Livestock, too, plays a critical role in the smallholder mixed fishing and livestock systems in Myanmar. ACIAR signed a memorandum of understanding with the Ministry of Livestock and Fisheries in June 2013 and the Ministry of Agriculture and Irrigation in November 2013 to facilitate implementation of the ACIAR fish and livestock program. Two ACIAR-funded projects being developed—one on cattle and forages, and one on small ruminants—will improve cattle health and production in Myanmar. In central Myanmar, ACIAR is working with the University of Melbourne, Yezin Agricultural University and the Myanmar Department of Agriculture (Land Use Division) to address issues of soil fertility management and land suitability assessment.

The research is complemented by training of Myanmar agricultural scientists and academics to

help sustain and promote improved management practices—and resulting improvements to livelihoods—well into the future.

One of the Australian Government's mandates is to support the empowerment of women and girls in all its official development assistance activities. ACIAR is working hard in all our projects in Myanmar to help achieve this aim. Many farmers in Myanmar do not typically receive an appropriate remuneration for their products, causing declining rural incomes. This particularly affects rural women who are among Myanmar's most marginalised groups, with high vulnerability to food insecurity and poverty.

I hope you enjoy this issue of *Partners*. I am delighted that its release coincides with a visit by ACIAR's Commission to Myanmar, where it will conduct its 38th meeting and participate in field trips to ACIAR projects, including the joint Australian Department of Foreign Affairs and Trade–ACIAR investments in fisheries, livestock and cropping research. The meeting will coincide with the launch of a new 10-year strategy to guide the growing Australia–Myanmar agricultural research collaboration. ■

**PROFESSOR ANDREW CAMPBELL**  
CEO of ACIAR



**ACIAR**  
aciar.gov.au

**partners**  
IN RESEARCH FOR DEVELOPMENT

*Partners in Research for Development* is the flagship publication of the Australian Centre for International Agricultural Research (ACIAR). *Partners* presents articles that summarise results from ACIAR-sponsored research projects and puts ACIAR research initiatives into perspective. Technical enquiries will be passed on to the appropriate researchers for reply. Reprinting of articles, either whole or in part, is welcomed, provided that the source is acknowledged.

This publication is freely available from ACIAR's website at [aciar.gov.au](http://aciar.gov.au). It is also freely available on request from ACIAR. The use of a trade name does not constitute any endorsement of, or discrimination against, any product by ACIAR.

For further information contact:

Robyn Henderson,  
ACIAR Communications and Stakeholder Engagement,  
+61 2 6217 0500

Letters from readers are welcome and should be addressed to:  
The Editor

Partners in Research for Development, ACIAR  
GPO Box 1571, Canberra ACT 2601, Australia  
Email: [aciar@aciar.gov.au](mailto:aciar@aciar.gov.au)

ISSN 1031-1009 (Print)  
ISSN 1839-616X (Online)

Managing editor: Brad Collis, Coretext Pty Ltd, [coretext.com.au](http://coretext.com.au)  
Editor: Dr Gio Braidotti, Coretext Pty Ltd, [coretext.com.au](http://coretext.com.au)  
Design: Fiona James, Coretext Pty Ltd, +61 3 9670 1168



Australian Centre for International Agricultural Research (ACIAR), [aciar.gov.au](http://aciar.gov.au)  
GPO Box 1571, Canberra ACT 2601, Australia

© Australian Centre for International Agricultural Research (ACIAR)  
This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from ACIAR.



## THIS ISSUE ...

- 02** | FOREWORD  
The Myanmar program  
Dr Ohnmar Khaing, program manager
- 03** | INTRODUCTION  
Growing relationships  
Nicholas Coppel, Australian Ambassador to Myanmar
- 04** | EDITORIAL  
Focus on Myanmar  
Andrew Campbell, ACIAR CEO
- 06** | MYRICE  
Rice—the pulse of life in Myanmar
- 10** | RICE  
Traditional floating rice systems
- 11** | ANIMAL HEALTH  
Livestock pave paths to prosperity
- 13** | ANIMAL HEALTH  
Future work
- 15** | ANIMAL HEALTH  
Faces of the Dahat Pan project
- 18** | MYFISH  
Making institutional impact
- 21** | FISHERIES  
Securing coastal fisheries
- 24** | MYFISH  
Supporting small-scale fish farming
- 26** | MYPULSES  
The role of legumes in food security
- 28** | MYPULSES  
Groundnuts: producing the good oil for Myanmar
- 30** | PRODUCTIVITY  
Rural changes

FRONT COVER:  
Rice planting near Yezin, Myanmar.

PHOTO: Ian Willett

# RICE—THE PULSE OF LIFE IN MYANMAR

PHOTO: GRANT SINGLETON

**Smallholder farmers and researchers in lower Myanmar are partners in improving the country's agricultural profitability and productivity through adaptive research trials on rice-rice and rice-pulse cropping systems.**

Smallholder farmers in lower Myanmar have struggled with low yield and income from rice farming. ACIAR's MYRice program has brought these farmers together to become partners in agricultural development.

**BY RONA NIÑA MAE ROJAS-AZUCENA AND DR GRANT SINGLETON**

International Rice Research Institute

**M**yanmar was once considered the 'pearl of the orient'. In the 1960s, the nation was a leading rice exporter in the global rice market. Events in the country, however, closed off the nation from neighbouring trade and international activities and dampened its once-illustrious rice sector.

In recent years Myanmar has slowly reopened its doors to global trade and re-established connections with other countries. New plant varieties and agricultural expertise are now available to Myanmar farmers.

The country's economic growth hinges on the development of its agricultural sector, particularly the rice sector. The Ministry of Agriculture, Livestock and Irrigation (MOALI) is keen to regain the country's status as a major rice exporter and to increase the income of its rice farmers. So it is essential to increase the efficiency of production and rice quality.

ACIAR's MYRice project is aiming to do just that, working in partnership with MOALI and others. The project is looking at best practice management, new varieties and rodent management.

Rice is very important in Myanmar and is cultivated on 64% of the country's arable land—

more than eight million hectares. Rice farming involves more than five million rural households.

Myanmar has rich natural resources of land and water, yet rice farmers are well behind their Asian neighbours, with yields along the country's fertile Ayeyarwady Delta only reaching half of those along Vietnam's Mekong Delta.

People living in rural Myanmar have a large per capita consumption of rice—up to 154 kilograms per year. Rice provided 70% of their daily calorie intake in 2016. At the moment, most of the rice produced in Myanmar is used to feed the local people. In 2014 the population reached more than 52 million.

Increasing production will help Myanmar to be more competitive in the regional and global rice markets. As well as rice, MOALI is also looking at the production of pulses and other high-value crops, which are often grown immediately after the harvest of the monsoon rice.

The International Rice Research Institute (IRRI) is working closely with local partners to improve farm productivity and the profitability of smallholder farmers. The Department of Agriculture (DOA), the Department of Agricultural Research (DAR) and Yezin Agricultural University (YAU)—all under MOALI—are the main partners on the ACIAR MYRice project.

The MYRice project aims to diversify and intensify rice-based systems in lower Myanmar and

to assist smallholder farmers in the mid and upper Ayeyarwady Delta. These farmers grow rice in the monsoon season; in the dry season about one-third grow rice and two-thirds grow pulses.

## SOLUTIONS THROUGH FARMER PARTICIPATION

With partners from DAR and DOA, the MYRice project identified two target townships: Maubin in the Ayeyarwady Region and Daik Oo in the Bago Region. (Regions in Myanmar are equivalent to states.) Forty-four trials were undertaken from the 2012–13 dry season to the 2016 wet season. These were on-farm participatory adaptive research trials, implemented with 2,990 farmer-partners.

### This research with farmers focused on:

- short-duration and new high-yielding varieties of rice and pulses
- new best management practices
- community rodent management
- improved postharvest management.

A participatory varietal selection (PVS) approach was used to obtain immediate feedback from farmers—their reasons for their preferences and constraints to adoption. This close collaboration among farmers and national partners resulted in the release of two flood-tolerant varieties for wet season rice/rice systems, drought-tolerant varieties



**LEFT:** Learning Alliance members collectively assess technologies that will help improve their current postharvest systems.

PHOTO: CHRISTOPHER CABARDO; IRRI

## POSTHARVEST GAINS

An assessment conducted by IRRI in 2013 revealed that farmers in rice/pulse areas practice manual harvesting, and then pile up the harvested crops for as long as three weeks while they prepare their land for pulses. Farmers rely on outdated local threshers that are unable to thresh wet rice and are not mobile. This means that quality deteriorates and the harvest sells for a low price.

The MYRice team measured the losses from the traditional post-production process and compared these with the best management practices introduced by IRRI. Rice grain losses from traditional practices—piling, use of heavy threshers, sun drying and storing—can reach up to 13%. Rodents also cause significant damage and farmers lose about 100 kilograms of rice every six months. This is enough to feed a family for more than a month.

The farmers who adopted best management practices reduced their losses to 3–7%. The grains processed using best practice also had higher milling recovery than the grains processed through traditional farmers' methods.

### Best practice techniques include:

- threshing crops immediately after harvest using a lightweight thresher or a combine harvester
- systematic drying using a flatbed dryer
- storing the paddy and pulses in hermetic (air-tight) bags.

"I am mostly impressed with the combine harvester, which I used to harvest rice last summer," says U Shwe Toe, one of the cooperators. Women involved in farming activities reported that they had more social and community activities when they began renting combine harvesters.

Since 2013 the use of combine harvesters has significantly increased in the village. Farmers have also tried using hermetic bags and 1 or 5-tonne GrainSafes to store their pulses.

Daw Tin Yee, a rice farmer for 25 years, stored her pulse seeds for nine months in a hermetic IRRI Super Bag. "After storage in the Super Bag, I noticed that the colour of the seed is better, the germination rate is higher and there was no insect infestation," she recalls. →

for dry season rice/rice systems and one variety suited for both wet and dry seasons.

Deputy Director-General of DAR and MYRice collaborating scientist, Daw Tin Tin Myint says the PVS approach "helped Myanmar's agricultural technicians and farmers to obtain a variety that suits their tastes and preferences. It's a leading technique for all participants to be involved in making decisions."

U Maung Maung Aye, a 52-year-old farmer from Phaung Wae Village, Daik Oo township, joined the trials on varietal selection for new green gram varieties. In the 2015 monsoon season he also participated in the trial for best-management practices in rice.

"We were taught new ways of planting pulses, such as line sowing," U Maung Maung Aye says. "I preferred it over our traditional practice of broadcasting seeds, because seed rates are lower using line sowing." He used 8 kg/ha with broadcast seeding, compared with 3.2 kg with line sowing.

In the 2015 monsoon season, husband and wife U San Pwint and Daw Aye Maw participated in the best management practice trials for rice, using new rice varieties Pyi Taw Yin and Sin Thwe Lat.

"We were planting traditional varieties such as Sin Thu Kha that yielded 80 baskets per acre (4 tons per hectare) and sold for 4,500 kyats (A\$4.40) per basket as grain. We also incurred more losses in the field compared to when we tried growing Pyi

Taw Yin, which yielded 95 baskets per acre (4.75 t/ha) and sold for 7,500 kyats (A\$7.35) per basket as seed," U San Pwint says.

DOA assistant director and MYRice collaborating scientist Dr Aye Min says that new and improved crop varieties enable farmers to obtain a higher yield and income, and to cope with the effects of climate change. "Farmers feel more secure and are able to save on input costs."

Trials on drum seeding and integrated weed management in the rice/pulse system in Maubin township indicated a benefit of US\$15/ha (A\$20/ha) for the monsoon crop compared with the farmers' practice of transplanting. Row seeding using a drum seeder provided farmers with an extra US\$100/ha (A\$132/ha) for the summer crop.

During the 2014, 2015 and 2016 wet seasons, 8,148 kg of seed for monsoon rice varieties was distributed to 352 farmers in the Ayeyarwady and Bago regions. For the 2015, 2016 and 2017 dry seasons, 5,124 kg of summer rice varieties was distributed to 204 farmers.

For the first time in 20 years, pulse farmers in Myanmar have had access to new pulse varieties and more than 340 pulse farmers have adopted them. The combined benefit from new varieties and new best practice management (pre and postharvest) indicate that productivity benefits will be greater than 40%.



PHOTO: ACIAR

Daw Tin Yee, a farmer from Maubin, joined the MYRice on-farm research activities and benefited from her learning.

The following season, Daw Tin Yee planted the stored Yezin 2 seeds and harvested 12 baskets per acre. "The trader also preferred Yezin 2 so I was able to sell it at 48,000 kyat (A\$47) per basket. I used the profit to renovate my house," she says.

The MYRice group also introduced community-level rodent management and reduced rodent losses by 25%. Farmers benefited by up to US\$81 (A\$107) per household. Another benefit was reduced contamination by faeces, improving human health.

### BUILDING NETWORKS FOR CHANGE

The MYRice team established a multiple stakeholder platform called Learning Alliance (LA) to engage with different groups across the rice value chain. Farmers, traders, millers, DOA staff, and IRRI shared their knowledge and experience of technologies to optimise rice and pulse production.

The LA became an avenue for these groups to collectively assess their experiences from the best management practice trials and to identify opportunities to maximise the benefits. They visited the main wholesale market for rice, and the seed farms, where they learned about quality, different varieties and the process of selling in markets.

Alliance members also participated in a lightweight thresher demonstration on U Shwe Toe's farm to show how immediate threshing can reduce postharvest losses.

At the LA meetings, farmers from the best management practice trials also shared their experiences in using Sin Thwe Latt (rice) and Yezin (pulse) varieties with improved crop production management.

Recently, members organised farmer groups to develop postharvest services for the community in threshing, drying and storage. From the best management practice technologies used during the postharvest loss assessment trials, members chose the technologies they preferred to rent out and generate profit.

### EQUAL OPPORTUNITY AND INCREASED CAPACITY

Collecting data on gender is part of the MYRice project. Gender equality outcomes are measured via large household surveys at the beginning and end of a project, and seasonal farmer diaries.

Gender equity was examined at one of the project's townships using the framework of the Women's Empowerment in Agriculture Index (WEAI).

Participatory varietal selection trials recorded the preferences of male and female farmers based on agronomic characteristics, and cooking and eating qualities of rice varieties tested on-farm. Feedback identified the most preferred rice varieties and their seed multiplication and distribution in the community.

Female farmers such as Daw Aye Nyein not only became active cooperators, but also successful

seed growers. "I was able to pay off my loans because of the profit I earned," she says.

The MYRice project raised awareness among the project partners of the benefits of research and development on gender equality for agricultural smallholder communities.

MYRice is supporting two PhD students and Master of Science thesis grants for 17 DOA and DAR staff. The DOA partners who were mentored on farmer participatory research have gained project implementation skills and are now taking the lead during farmer meetings and field days.

### SUSTAINABLE ADOPTION PATHWAYS

The MYRice team is ramping up plans to further scale-out best management practices and high-yielding varieties of rice and pulses. The project is also collaborating with other ACIAR initiatives in the country, such as MYPulse (legumes), MYFish (fisheries), and MYLife (livelihoods).

"The support for, and appreciation of, the project's benefits to smallholder farmers from the Government of Myanmar has strengthened due to the impressive results of field demonstrations and the process of participatory engagement with farmer groups," says Dr Grant Singleton, IRRI scientist and MYRice program manager.

"We are very pleased with the results of our collaborative research in Daik Oo. It is now time to expand the project in 2017," says U Hla Myint, DOA regional director of Bago. He and his counterpart



**"FOR THE FIRST TIME IN 20 YEARS, PULSE FARMERS IN MYANMAR HAVE HAD ACCESS TO NEW PULSE VARIETIES AND MORE THAN 340 PULSE FARMERS HAVE ADOPTED THEM. THE COMBINED BENEFIT FROM NEW VARIETIES AND NEW BEST PRACTICE MANAGEMENT (PRE AND POSTHARVEST) INDICATE THAT PRODUCTIVITY BENEFITS WILL BE GREATER THAN 40%."**

in the Ayeyarwady Region, U Tun Aung Kyaw, met with their staff to identify outreach priorities for the next year.

During the MYRice project meeting in October 2016, U Hla Myint said: "In 2017, we will expand MYRice to 63 new villages from four districts. This will require a large investment of resources—my extension staff's time and operating funds. The regional government is willing to provide the main investment in this outreach."

A similar commitment was made by U Tun Aung Kyaw. Initiatives from the MYRice project are a great contribution to Myanmar's goal to regain its position as a significant contributor to regional and global food security through rice. Strong collaboration and engagement among MOALI, IRRI, non-government organisations and private-sector partners are also highly important.

Boosting competitiveness in the domestic and international rice markets is critical. Methods learned in the MYRice project and access to new rice varieties will assist and will help pave the way towards the sustainable development of the Myanmar agricultural sector. ■

**ACIAR PROJECT:** SMCN/2011/046

'Diversification and intensification of rice-based systems in Lower Myanmar'

**MORE INFORMATION:** Dr Grant Singleton, IRRI, g.singleton@irri.org



PHOTO: ACIAR

The MYRice project team captures consent of a farmer using the signature function in CommCare.

## MAD IN MYANMAR

The age-old method of collecting paper-based data in the field is all too familiar to researchers around the world. There are many inefficiencies with paper-based methods, including the time it takes to get the data into a usable form and the increased chances of introducing errors during transcription from paper to digital format. One of the greatest deficiencies in a paper survey system is the inability to provide real-time feedback to the farmers who give up their time to complete the questionnaires.

Since June 2015, ACIAR has funded the mobile acquired data (MAD) evaluation, which seeks to understand how digital data-collection apps affect ACIAR projects.

The first piece of MAD research, led by the R&D support company AgImpact, was a desktop review of the vast array of 'off-the-shelf' mobile data-collection apps. The most suitable apps were short-listed and trialled in a field pilot in Indonesia. The pilot not only identified the most suitable app for ACIAR-type projects (CommCare) but also demonstrated that apps have the ability to improve the relationships between stakeholders in the data-collection process. The use of apps had a positive influence on how farmers, field researchers and project leaders shared data. The ability to share research findings with farmers in near-real time was a very positive experience for farmers.

Following the field pilot, the MAD research team partnered with nine ACIAR projects to better understand the issues of adopting apps at scale. AgImpact provided CommCare adoption support and, in return for the support provided, the projects agreed to share information on the time and resources necessary to adopt apps and whether they believe the adoption of apps adds value to research projects. These findings will be important for future ACIAR projects looking to adopt apps.

The MYRice project in Myanmar is participating in the MAD series. The project is looking at sustainable methods to diversify and intensify rice production in the Ayeyarwady Delta. The MyRice team, led by the International Rice Research Institute, has adopted the open-source mobile application CommCare to monitor changes in farm productivity and share findings with farmers in near-real time. Some of the app features the MyRice team are using include GPS capture, auto-calculations and the freehand drawing function. ■

**MORE INFORMATION:** Information and videos on the ACIAR MAD evaluation series can be found at [www.agimpact.org/resources](http://www.agimpact.org/resources) or by contacting project leader Stuart Higgins, AgImpact, [stuart@agimpact.org](mailto:stuart@agimpact.org)

Floating or 'deepwater' rice cultivation in Myanmar.

AS MYANMAR OPENS TO THE WORLD, THE COUNTRY HAS AN OPPORTUNITY TO DECIDE WHETHER TO INTENSIFY RICE PRODUCTION OR ENHANCE THE MORE DIVERSE, TRADITIONAL FOOD-PRODUCTION SYSTEM.

## THE ROLE OF TRADITIONAL FLOATING RICE SYSTEMS

BY ASSOCIATE PROFESSOR JAMIE PITTOCK AND DR KIEN VAN NGUYEN

Australian National University

**G**overnments across South-East Asia have programs to intensify rice production but researchers from the Australian National University (ANU), the Research Association for Development, Cooperative University (Myanmar) and An Giang University (Vietnam) are arguing for the conservation of the traditional, once-per-year crop of floating (or 'deep-water') rice in Myanmar.

When wet-season floods inundate the plains the floating rice plants grow very fast, up to 4 metres high in the water column, and form good habitat for fish. When the floods recede the rice is harvested, leaving the land with a thick mulch of rice straw suitable for supporting vegetable production, such as black gram beans.

This project is assessing the benefits and costs of conserving floating rice in Vietnam, where little remains, and extending the lessons to Cambodia and Myanmar—countries that have not yet undertaken widespread intensification of rice production.

Over the past two decades, governments in Vietnam, with support from international donors, have built extensive networks of dykes to control the annual floodwaters and enable production of two or three crops of rice per year. Now Vietnamese governments are setting targets for restoration of floating rice fields from the 200 hectares remaining. The research has found that although Myanmar has lost 42% of its floating rice fields, about 745,000 ha remains. As Myanmar opens to the world, the country has an opportunity to decide whether to intensify rice production or enhance the more diverse, traditional food-production system.

The Government of Myanmar has a policy of tripling rice exports to 4 million tonnes per year by 2020. A workshop in 2016 with farmers, researchers and government officials agreed on three priorities to improve the benefits for farmers from floating rice production:

1. Improve understanding of the range of floating rice varieties to enable farmers to select the genetic qualities needed to better adapt to changing flood regimes.

2. Increase farmers' knowledge on how they can better integrate dryland vegetable crops into their floating rice farming system.
3. Develop better markets based on the low farm chemical and more nutritious qualities of floating rice.

Key to conserving the red floating rice varieties as a low-volume but high-value crop is the development of markets. Floating rice has high protein, vitamin E and anthocyanin compared with high-yield white rice, but has a different texture and flavour. Identification of domestic and international markets for floating rice as a healthier choice is an objective for the next stage of this research. ■

**The project is supported by the Mitsui & Co. Environment Fund and the Luc Hoffmann Institute for conservation research. Associate Professor Pittock has worked on several ACIAR projects.**

**MORE INFORMATION:** Associate Professor Jamie Pittock, jamie.pittock@anu.edu.au



PHOTO: ANGUS CAMPBELL

# LIVESTOCK PAVE PATHS TO PROSPERITY

**Livestock can be of central importance to smallholder farmers' livelihoods and welfare, but in the central dry zone of Myanmar research was needed to help farmers find solutions to key production constraints**

**BY JENNY HANKS, DR KAREN HARPER, DR JOERG HENNING, DR ANGUS CAMPBELL, NEAL DALGLIESH, PROFESSOR AUNG AUNG, DR KYAW NAING OO AND PROFESSOR DENNIS POPPI**

**T**he central dry zone (CDZ) of Myanmar is an important livestock production area with a high density of small ruminants and cattle; it is also one of the poorest regions in Myanmar. It covers 14% of the total land area of the country and supports a population of 10 million people whose livelihoods depend mostly on dryland agriculture. Rainfall in the CDZ is concentrated in the summer months from May to October with little rain during the remainder of the year. It is highly variable and there is a high risk of crop failure.

Most farms in the CDZ are smaller than two hectares and there are many landless people whose livelihoods depend on supplying farm labour.

Farming systems are highly diversified and livestock play an important role for food, cash income and livelihood security. Most households, including the landless, keep village chickens. Small ruminants are raised by landless people and smallholder farmers; cattle are raised by most farmers.

A significant impact on the livelihoods of poor rural households of the CDZ can be made by improving animal productivity, animal value, production sustainability and reducing animal loss. To that end, an ACIAR project led by the University of Queensland is underway to conduct on-farm research at two sites in the CDZ that are representative of small-scale livestock production systems.

## **PARTNERSHIP IS KEY**

A collaborative partnership between Australia and Myanmar was established to improve the livelihoods of small-scale livestock producers in the CDZ by enhancing management, nutrition

and health of small ruminants, cattle and village poultry. This partnership is called Dahat Pan.

Taking part from Australia are the University of Queensland and the University of Melbourne. Joining them in Myanmar are the Livestock Breeding and Veterinary Department and the University of Veterinary Science, Yezin (UVS).

In addition to conducting research for development, the project team is using the opportunity to build capacity. This important aspect of the project has supported 20 postgraduate students and more than 20 short-term training and/or international opportunities. These students have been involved with various aspects of the research on village chicken, ruminants and forages in the CDZ.

## **VILLAGE CHICKEN ACTIVITIES**

The objectives of the village chicken research are to identify constraints to village chicken production and to develop sustainable and affordable interventions to overcome these constraints. →

Additionally the project aims to explore farmers' perceptions, attitudes and behaviours towards disease prevention and biosecurity in raising village chickens, and to train village chicken farmers in methods of best production.

High chick mortality and deaths from Newcastle disease were identified as the two main constraints to village chicken production. A 12-month study showed that conducting one to two Newcastle disease vaccinations, protecting chicks from predation using bamboo coops and providing supplementary feed to chicks in creep feeders were able to reduce mortality rates significantly. This resulted in a substantial increase in the number of birds sold by farmers.

The Myanmar Livestock Federation (MLF)—the chicken project's private-industry partner—developed a chick starter diet from local ingredients. MLF also supported the development of a sustainable retail system to make the feed available in villages.

Improvements in village chicken production are dependent on farmers' uptake of new technologies and skills. To facilitate adoption, the project used innovative approaches to communicate research findings in an understandable manner to village farmers. Included were unique extension methods, such as incorporating messages to improve village chicken production into traditional puppet plays and by developing a series of movies advising on improving village chicken health and biosecurity.

Rural chicken farmers were the central focus of this extension work and they were trained in simple and sustainable methods to improve the health and production of scavenging chicken flocks. Training in village chicken production has been provided to almost 1,000 villagers across 70 villages of the CDZ.

## RUMINANT ACTIVITIES

The small ruminant and cattle components of the Dahat Pan project have operated alongside each other. The project team has been detailing patterns of production and animal health to obtain a greater understanding of cattle, goat and sheep rearing in Myanmar, as well as identifying opportunities for improvement.

Initial activities included meetings with farmer groups to understand their issues. The interested farmers then participated in a program of regular monitoring of liveweight and body-condition scoring to increase understanding of the nutritional challenges and more clearly describe seasonal patterns of production, such as births.

The project regularly provides 'farmer report cards' to participants and updates billboards in the villages summarising recent production and health challenges.

To gain an understanding of the impact of



U Tháun Myint, community animal health worker from Ya Thar village, helps vets administer anti-parasite treatments and to determine the best timing of treatments.

PHOTO: ANGIS CAMPBELL

parasitism on ruminant health, one of the master's students, Thiri Zaw, monitored internal parasite infections in goats, sheep and cattle. Anti-parasite treatments are available in Myanmar, but there is little information guiding farmers on the best timing for treatments.

The results of this work will be integrated into management recommendations to guide farmers and animal health staff on the best use of anti-parasite treatments to maximise their efficacy while managing the risk of drug resistance development and avoiding chemical residues. The local village community animal health workers (CAHWs) and government veterinarians have been important supporters of this work, helping guide UVS students to use drenches and collect samples.

A novel 'syndromic health monitoring' scheme was initiated to collect animal health information. Broad, descriptive information collected by junior project staff from their own observations and observations by farmers, CAHWs and local veterinarians was collated. The monthly monitoring revealed that young goats and sheep often suffer from 'ill thrift'—a syndrome of poor growth and health caused by a combination of poor nutrition and disease challenge.

In an effort to efficiently combat this problem, the project trialled a 'creep' feeding system, which lets only kids and lambs access a high-quality, locally sourced feed supplement. From an initial 12 trial participants, creep feeding systems have

been extended to all small ruminant farmers in two villages. Other villagers were only too keen to use this creep feeding system. One farmer enthusiastically reported that livestock traders had begun to specifically seek out her animals to buy because of the effect the creep feeding had on them.

Similarly in cattle, creep feeding of calves has been viewed favourably by farmers, with increasing numbers of farmers wanting to participate. For their master's degree research, Shwe Sin Win and Aung Thet Myat worked with farmers to monitor the effects that supplementary feed had on the growth of calves. Improved weight gains were observed compared with calves that did not receive the creep feed.

The Dahat Pan project is now partnering with other organisations to provide best practice management recommendations to extend to farmers throughout the CDZ. Hopefully this knowledge will now spread more widely to smallholder goat, sheep and cattle farmers in Myanmar.

## THE FEED CHALLENGE

A major challenge for the CDZ's smallholder farmers is to source year-round feed supplies for their cattle and small ruminants. The cattle, in particular, are critical to the success of farmer livelihoods, supplying draught power for both agricultural production and local transport.

While the residues of traditional pulse crops,



PHOTO: ACIAR

As a result of research activities, chicks eat supplementary feed inside the 'creep feeder' and are protected from predators by the bamboo coop.

along with forage sorghum and native grasses, traditionally form the basis of wet-season diets (from July to October), production becomes more difficult from March through to June during the dry season, with animal feed shortages common. Farmers dry and try to store as much pulse and sorghum forage as possible for dry-season use; however, supply does not always meet demand.

On average, farmers are using 44% of their annual crop production land area to grow forages to support livestock, with the vast majority of this being fed to draught animals. A reduction in draught requirements allows this resource to be used in other ways to either grow animals for other uses or increase crop production.

In other countries in which ACIAR has worked, the shift from draught animals to beef production has markedly increased income. Myanmar has the largest cattle population of South-East Asia and this potential will be realised as cropping becomes more mechanised and the current feed resource is redirected from draught to cow-calf and fattening beef systems.

Forage research has focused on the selection of plants that are adapted to local climatic conditions, are nutritional and fit with the needs of the farmer. Three grasses—*Panicum maximum* (Mombasa), *Brachiaria* spp. (Cayman) and *Brachiaria* spp. (Mulato II)—and three browse legumes—*Leucaena leucocephala*, *Gliricidia sepium* and *Sesbania grandiflora*—were found to be most suitable. →

## FUTURE WORK

BY DR KAREN HARPER (UNIVERSITY OF QUEENSLAND), DR DI MAYBERRY (CSIRO), DR ANGUS CAMPBELL (UNIVERSITY OF MELBOURNE), DR JOERG HENNING (UNIVERSITY OF QUEENSLAND), PROFESSOR AUNG AUNG (UNIVERSITY OF VETERINARY SCIENCE, YEZIN), DR KYAW NAING OO (LIVESTOCK BREEDING AND VETERINARY DEPARTMENT) AND PROFESSOR DENNIS POPPI (UNIVERSITY OF QUEENSLAND)

Several future projects are emerging from the Dahat Pan project that capitalise on important findings. The Dahat Pan project has built the capacity of partners for on-farm research and research management, leading to new information for central dry zone (CDZ) smallholder farmers. The findings have identified the production systems' constraints and opportunities, thereby pointing to the direction of future research planned in this area. Two ACIAR-funded projects are being developed: one on cattle and forages, and one on small ruminants.

### FUTURE DIRECTIONS FOR CATTLE RESEARCH IN MYANMAR

**ACIAR PROJECT:** AH/2016/132 'Improving cattle health and production in Myanmar'

Most cattle in Myanmar are kept to provide traction and transport, but as mechanisation occurs, the importance of draught cattle will decline. If farmers in the CDZ follow the development path of farmers in rainfed areas of other South-East Asian countries, such as Cambodia, many will replace their male draught cattle with cows and produce calves.

Cattle productivity and reproduction are limited by nutrition, management and health care. Cattle diets are based on poor-quality crop residues and by-products. The best feed is usually kept for draught cattle, but these animals still occasionally suffer from illness related to inadequate nutrition and exhaustion, especially during the dry season. Cows and calves are usually left to graze with minimal supplementation and under-nutrition is reflected in long inter-calving intervals and low growth rates, as found during the current Dahat Pan project. Inadequate nutrition and poor husbandry also predispose cattle to, and exacerbate, animal diseases, which may further limit production.

This future project will conduct research to integrate high-quality forages into the cropping system and improve cattle health and

management. The aim will be to improve the productivity and resilience of village-based cattle production systems through improved forage-based feeding systems, animal health and animal management.

Better management of cattle health and nutrition will create more productive and resilient cattle production systems, irrespective of whether cattle are kept for draught or to produce calves to be sold into a beef value chain. In the short term, improved cattle management and access to a year-round supply of homegrown forages will contribute to reduced feeding costs and work days lost for draught cattle. In the longer term, cattle farmers will be well positioned to respond to emerging market challenges (such as reduced demand for draught cattle) and opportunities (increased demand for beef and relaxation of policies relating to slaughter and export of cattle).

**KEY PARTNERS:** CSIRO, University of Melbourne, University of Veterinary Science, Yezin, Yezin Agricultural University

### FUTURE DIRECTIONS FOR SMALL RUMINANT RESEARCH IN MYANMAR

**ACIAR PROJECT:** AH/2014/056 'Profitable goat and sheep production to support smallholder livelihoods in the central dry zone of Myanmar and regional biosecurity in South-East Asia'

Further research in small ruminants will ensure that smallholder goat and sheep farmers will benefit from Myanmar's rapid economic development. A future research project is planned to continue after Dahat Pan that concentrates on small ruminants and is closely allied to a new cattle-focused project.

The new project will research small ruminant issues at several different scales within Myanmar and South-East Asia. It intends to further the work with smallholder farmers to improve the efficiency and sustainability of production, by continuing to test improved management procedures with goats and sheep and analysing the associated financial and social effects.

The project also plans to work 'up the value chain' to better understand trade networks and animal movements. This will reveal market opportunities available for farmers selling goats and sheep. The movement and trade of small ruminants are potential pathways for the spread of diseases that reduce on-farm productivity and are detrimental to regional biosecurity. This future research will aim to improve regional disease control by gaining a better understanding of the small ruminant trading networks on a national scale.

**KEY PARTNERS:** University of Melbourne, University of Veterinary Science, Yezin, Livestock Breeding and Veterinary Department →

## FUTURE DIRECTIONS FOR POULTRY RESEARCH IN MYANMAR

### Proposed: New business opportunities for women and improved nutrition for families through a value chain analysis of semi-intensive village chicken production

Over the past few years, consumer demand for poultry meat in Myanmar has increased dramatically. Rises in urbanisation, incomes and population size are significant factors in this trend. Although more than 80% of chickens are still produced under free-ranging conditions in Myanmar, there is an opportunity for small-scale farmers to move into semi-intensive production.

Previous research activities have focused on increasing survival rates of birds by providing Newcastle disease vaccinations and introducing methods for improved chick rearing. Future research will provide an opportunity to develop a semi-intensive family poultry production system that can be adopted by a significant proportion of small-scale farmers with limited resources.

In particular, this future work will benefit women who usually own, manage and sell village poultry. Keeping village chickens semi-intensively does mean additional challenges for breeding, supply of feed and vaccines, disease management and marketing that need to be considered. Research into the development of sustainable semi-intensive village chicken production would provide unique business opportunities for female farmers to increase income from sale of eggs and birds, as well as improving quality nutrient intake from poultry and poultry products. This would improve nutritional outcomes for the women and their families, particularly for their children.

Semi-intensive village chicken production can provide entrepreneurial business opportunities for women and offers a unique opportunity as a first step out of poverty. It also aligns with the ACIAR animal health strategy of helping smallholder farmers to move from keeping livestock solely as an asset, to managing them in a production system for income generation, with clear pathways for adoption by smallholders. ■

**MORE INFORMATION:** Professor Dennis Poppi, University of Queensland, [d.poppi@uq.edu.au](mailto:d.poppi@uq.edu.au)

They have been cultivated through on-farm demonstration areas in two villages in the CDZ. Word of mouth and pre-season training workshops have led to 75 farmers establishing more than 1,000 browse legume seedlings in 2016. Many of the farmers were landless, small ruminant producers who saw an opportunity to increase forage supply by establishing trees around their own homes. Farmers involved in project research have made the link between better forages and improved animal productivity. More browse legumes were also established along the road verges leading into the two villages, providing a community fodder resource for the future.

Farmer training and prior demonstration also resulted in 14 farmers from the two villages growing a total of 1.5 ha of the three selected grass species, with production used to feed cattle and small ruminants. These farmers indicated that grasses are now an integral component of their system, buffering feed supply in times of shortage. While researchers had always considered grass production to be a wet-season activity with material stored for later use, participating farmers indicated they would be investing in irrigation to enable them to feed green forage late into the dry season.

Immediate project activities aim to extend forage use in the CDZ. It is critical that seed or vegetative planting material is available to support future expansion without the continuing reliance on imported material.

An ACIAR short-term collaborative research grant has enabled researchers from the University of Queensland, the University of Melbourne, UVS and Yezin Agricultural University to form linkages with semi-commercial farmers and MLF to develop Myanmar seed production capability.

Training of staff from both universities and the developing experience of the researchers and farmers augurs well for the future.

## CONCLUSIONS

The most significant contribution of this work is the generation of sound information and data on current livestock management, animal productivity and disease status. This information is crucial as a basis for designing successful interventions and will be used by scientists, development projects, government planners and policymakers.

The introduction of interventions designed to improve livestock productivity has directly benefited both landless and smallholder livestock producers by improving their knowledge and skills, leading to more animal products available for home consumption (such as chickens) and sale (more calves, sheep and goats, higher liveweight of animals sold, and excess chickens).

Through linking with government, non-government and the private sector, the Dahat Pan project has created pathways to extend key messages to other farmers throughout the CDZ. A focus on strengthening the capacity of project partners ensures they have the knowledge and skills to further improve small-scale livestock systems after the completion of the project. ■

**ACIAR PROJECT:** AH/2011/054 'Improving livelihoods of small-scale livestock producers in the central dry zone through research on animal production and health in Myanmar'

**MORE INFORMATION:** Professor Dennis Poppi, University of Queensland, [d.poppi@uq.edu.au](mailto:d.poppi@uq.edu.au); Dr Mike Nunn, ACIAR research program manager for animal health, [mike.nunn@aciarc.gov.au](mailto:mike.nunn@aciarc.gov.au)



Shepherds take goat herds and cattle for grazing outside of Ya Thar village.

PHOTO: ACIAR



LEFT: U Win Myint and Daw Tin Nyunt, Kyauk Aoe village, Meiktila township.

PHOTO: ACDI/AR

## FACES OF THE DAHAT PAN PROJECT

### TU TU ZAW WIN

Tu Tu Zaw Win is undertaking a PhD at the University of Queensland School of Veterinary Science, where she is also president of the Veterinary Science Postgraduate Association. She received her Bachelor of Veterinary Science in 2010 and her master's in 2013 at the University of Veterinary Science, Yezin, in Myanmar. Before starting this PhD course, Tu Tu Zaw Win was a research officer at the Livestock Breeding and Veterinary Department, Ministry of Agriculture, Livestock and Irrigation, and was appointed a focal person for the Dahat Pan project 'Improving livelihoods of small-scale livestock producers in the central dry zone of Myanmar'. In 2014, she was awarded a John Allwright Fellowship to undertake a PhD at UQ.

The principal supervisor of her PhD study is Dr Joerg Henning and her research focuses on the identification of constraints and opportunities for trade and marketing by small-scale livestock producers in the central dry zone (CDZ) of Myanmar.

"This epidemiological study is designed to identify the current livestock production environment of cattle, small ruminants (sheep and goats) and village chickens," she says. "It aims to improve the understanding on livelihoods of farmers, current livestock husbandry practice, livestock health management practice and health

problems, livestock trade and marketing network, and related public health concerns." The findings from this study will help to enhance the financial return of the small-scale producers, human nutrition, health under one-health paradigm and the livelihood of the farmers in the CDZ.

### U WIN MYINT AND DAW TIN NYUNT

U Win Myint and Daw Tin Nyunt farm at Kyauk Aoe village in the central dry zone of Myanmar. By local standards their farm is bigger than most, with about 22 acres (8.9 hectares) under crop and forage production. Their farming operation is quite complex, growing intercropped pigeon pea, sesame and maize and sole crops of butter bean, sunflowers and tomatoes. While the sesame, pigeon pea, butterbean and tomatoes are sold in the market, the rest are used for family consumption. In addition, 9 acres (3.6 ha) of forage sorghum is grown to feed the five cattle that are used for draught power and as future replacement draught animals. They also own four pigs and run a flock of chickens and a herd of goats.

U Win Myint and Daw Tin Nyunt were initially keen to be involved in the Dahat Pan project to improve the health and management of their cattle and goats. They are now actively engaged with project researchers in all areas of the project: forage production, village chicken rearing, and cattle and goat rearing.

Previously, during dry-season feed gaps, crop residues and chopped sorghum were often bought from outside the village. In 2015, the family trialled growing three grasses in a small rainfed area, which was expanded to 2,000 square metres in 2016.

This resource has now become an important part of their dry-season cattle feeding strategy. While there was no history of irrigation on the farm, there are now plans to invest in both irrigation infrastructure and fertiliser to further increase productivity.

Not content to just grow a well-managed area of grass and wanting to improve feed security for their 42-head goat herd, U Win Myint and Daw Tin Nyunt planted browse legume seedlings around their house in July 2016, after the experience of feeding leucaena as a night-time goat supplement. When the project offered more seedlings to interested farmers, they jumped at the chance and have established a separate area of seedlings, investing in animal-exclusion cages to ensure a successful start.

This couple have become important and excited advocates for the project in Kyauk Aoe and the surrounding areas, mentoring and encouraging their neighbours to take up the opportunities that Dahat Pan offers to improve animal productivity and therefore farmer livelihoods.





PHOTO: ACAR

U Myint Win Gyi and Daw Yi Myint, Kyauk Aoe village, Meiktila township.



PHOTO: ACAR

Nang Khan Hline outside the Department of Biochemistry and Physiology, University of Veterinary Science (UVS).

### U MYINT WIN GYI AND DAW YI MYINT

U Myint Win Gyi and Daw Yi Myint farm 5 acres (2 hectares) on the outskirts of Kyauk Aoe village. Their main farm income is generated from the intercropping of pigeon pea and sesame, with sunflower grown for the production of cooking oil for home consumption. They run two draught cattle and have a flock of chickens that are important to the household, with regular monthly bird sales paying their daughter's school fees.

Forage sorghum is the main feed supply for the draught cattle with 39% of the farm being used in its production. The sorghum plants are fed green during the wet season and dried and chopped for dry-season feeding when it is supplemented with groundnut cake. Returns from the sale of sorghum seed also contribute to family income with the seed being used for chicken feeding and as a traditional snack food.

Regular dry-season animal feed gaps occur about every second year on this small farm. In the past, this required the cost of sourcing forage from many kilometres away.

Engagement with Dahat Pan has allowed the family to not only improve its chicken husbandry skills, but also to grow grasses and browse legumes to feed the cattle. In 2016, these farmers grew 1,000 square metres of grass for the first time and planted browse legumes in their compound. The improved earnings from the first year have now given them confidence to invest in a small

irrigation pump, which enables them to produce grass to supplement sorghum supplies in the dry season. Browse legumes will also play their part in dry feeding over the coming months.

Unbeknown to U Myint Win Gyi and Daw Yi Myint, they already had mature leucaena trees growing in their compound, but until the project came along did not know of their value.

### DAW WIN THEIN

Daw Win Thein is a female village chicken farmer in Hpat Yin village, Myingyan township. She has been part of the Dahat Pan village chicken interest group since the beginning of 2013 and was involved in the intervention study between December 2014 and November 2015. She now plays an important role within the project training other village chicken farmers.

Before this project, Daw Win Thein had about 10 chickens and now runs 31 village chickens. This improvement in numbers was due to project interventions supplying creep feed to chickens and regular vaccinations against Newcastle disease.

These interventions have made vast improvements to the participants in the village.

"Before the interventions, the mortality rate of chickens within the flock was high due to diseases," Daw Win Thein says. "With the intervention practices by the project, which included feeding with the starter feed and introducing vaccination, we lost fewer and fewer chickens. With the supply

of the starter feed, our chicks were growing faster than before so we could sell the chickens earlier because they grew so much better. We do not eat these chickens, but being able to sell more chickens is important for us."

Even though Daw Win Thein would like more chickens, the current practices do not allow for any more expansion. She would consider other approaches to raise more village chickens, such as confining some of the village chickens and supplying them with additional feed.

"If the project can provide advice and show us how to do this, this would be very good for us," she says. "We have to learn how to fence our chickens and how to feed them. We are very interested in this. We just don't want our chickens to go to the neighbouring houses where they raise cattle or disrupt their agricultural production. We just don't have experience in this production method of raising village chickens, but we want to learn how to do this."

### NANG KHAN HLINE

Nang Khan Hline was the first student from the University of Veterinary Science, Yezin (UVS) to receive a scholarship from the Dahat Pan project to undertake research for her master's degree. Nang Khan Hline completed her research in 2015 on selection of suitable varieties of grasses for Myanmar from the introduced grasses. She presented this research at the 2015 International





PHOTO: ACIAR

Jenny Hanks administers anthelmintic to a goat in Kyauk Aoe village, with the assistance of U Kyaw Kyaw (community animal health worker) and Phyu Phyu Aung (deputy township veterinary officer).



PHOTO: ACIAR

Jenny Hanks with postgraduate students from the University of Veterinary Science and Elsa Glanville from the University of Melbourne during the poster session at the Dahat Pan annual meeting. From left to right: Jenny Hanks, Aung Thet Myat, Elsa Glanville, Thiri Zaw, Shwe Sin Win, Ya Min, Jue Jue, Ei Mon Nyein, Wai Wai Min, Hnin Yu Wei and Soe Min Thein.

**"WE HAVE COME SO FAR IN THREE YEARS. AT THE START IT TOOK MORE THAN SIX MONTHS TO SET UP BANK ACCOUNTS AND THERE WERE MANY LOGISTICAL CHALLENGES THAT SLOWED OUR PROGRESS. HOWEVER, NOW WE CAN SEE THAT THE HARD WORK OF THE TEAM DURING THE PAST THREE YEARS IS PAYING OFF."**

– Jenny Hanks

Grassland Congress, New Delhi, alongside colleagues from the Department of Physiology and Biochemistry, UVS. This department and university, in collaboration with international researchers from the Dahat Pan project, are leading the way on forage research in Myanmar. Dezin Soe Lwin, another young woman from the department, will soon start a PhD in forage research at the University of Queensland. She is a John Allwright Fellowship recipient.

Following the successful model in which Nang Khan Hline received scientific guidance from her supervisors at UVS, as well as from Australian and Thai forage researchers, more students have followed. In 2016, seven women and one man completed their Master of Veterinary Science with the support of the ACIAR Dahat Pan project. In 2016, a further seven women and one man started their research, which will be completed in 2017.

Nang Khan Hline now continues her work as a demonstrator in the Department of Physiology and Biochemistry at UVS. She is also an important part of the Dahat Pan team, contributing to ongoing forage research in villages within Myanmar's central dry zone and at UVS.

#### JENNY HANKS

Jenny Hanks has been managing the Dahat Pan project funded by ACIAR and the Australian Department of Foreign Affairs and Trade, for the past three years. She lived in Myanmar for the first two years to assist with the task of getting the project started. Before she moved to Myanmar she worked for the ACIAR in Canberra, and before that in a mixed veterinary practice in Victoria. She received her Bachelor of Veterinary Science in 2011 from Charles Sturt University and will receive a Master of Veterinary Public Health Management in 2017 from the University

of Sydney. Her role is to coordinate the team in activities across the different livestock groups and different organisations. She has studied her master's part-time during this time, using a novel approach to research the health of goats and sheep in the CDZ.

"My role on the project has been a steep learning curve but a truly rewarding one," she says. "We have come so far in three years. At the start it took more than six months to set up bank accounts and there were many logistical challenges that slowed our progress. Now we can see that the hard work of the team during the past three years is paying off. Simple, cost-effective ideas are being taken up by farmers to help improve production of their animals; young Myanmar veterinarians have gained new skills and international experience. What was previously unknown regarding health and production problems for livestock in the CDZ is being described."

Jenny Hanks enthusiastically supports other young Australians to have similar opportunities as she has. This led to her involvement in the creation of Researchers in Agriculture for International Development (RAID). RAID is a network of early and mid-career researchers seeking to make positive contributions to agriculture in places such as Myanmar. She is the Victorian state representative and secretary. ■

# MAKING INSTITUTIONAL IMPACT

PHOTO: E. BARAN

With support from ACIAR, new mechanisms and processes to facilitate research and development are changing the Myanmar Government's understanding of fishery management and the importance of small-scale aquaculture as an instrument for poverty alleviation

Seine fishing along the Ayeyarwady River.

## BY DR GARETH JOHNSTONE

WorldFish Center

**'Improving research and development of Myanmar's inland and coastal fisheries' is the full name for MYFish, a four-year project developed and implemented by WorldFish and Myanmar's Department of Fisheries (DoF) that ran from 2012 to 2016. The project is part of ACIAR's program of investment in agricultural R&D in Myanmar and, according to DoF's director-general, Khin Maung Maw, "has become an important force for change in fisheries and we are pleased that a second phase of funding has been approved until 2020".**

The Myanmar Government estimated fish production at 5.3 million tonnes and exports at 338,000 t, valued at US\$482 million (A\$638 million), in 2014–15. Although Myanmar's fisheries are

vital to national food security, income generation and export earnings, the sector's ability to inform policy and foment development is limited by a lack of accurate and reliable data. The sector lacked a comprehensive information base and MYFish project leader Dr Gareth Johnstone says the challenge for the project was to design an intervention that improved the quality of data to increase knowledge of the fisheries while at the same time strengthening the capacity of DoF to carry out effective R&D activities.

"The project has focused on developing mechanisms and processes within DoF to facilitate R&D that is changing DoF's understanding of fishery management issues and highlighting the importance of small-scale aquaculture. The outcome being poverty alleviation," Dr Johnstone says. "These institutional impacts have been made possible through several contributing

factors, not least the Australian Government's readiness to work with the previous reformist government of President Thein Sein (2011–16) and for ACIAR to provide direct funding support to DoF, which signalled the intent to partner directly with government.

"Equally as important was to embed WorldFish within the institution of DoF and to attach project staff to the R&D department, which helped to strengthen DoF's research capacity. These factors have provided DoF with the credibility to manage R&D projects and the skills to improve understanding, knowledge, technologies and practices needed for sustaining the development of aquaculture and fisheries in Myanmar."

## FISHERIES DEVELOPMENT AND RURAL REFORMS

ACIAR's research work on fisheries and aquaculture



Ayeyarwady Delta fish market.

“The approach taken by the preparation team created a positive sense of ownership and confidence that the research focus of MYFish would deliver both on the institutional needs of DoF and also the rural reform process in fisheries,” Dr Soe says. Two research modalities were developed to engage staff and researchers, both within DoF and across the sector, which capitalised on the changing, more open institutional environment within DoF.

First, the project was embedded within DoF both in terms of physical presence and personnel. The MYFish office was housed within the DoF offices in Yangon and several DoF researchers formally attached to the project to conduct research and implement pilot projects with guidance and support from WorldFish scientists. Winko Ko, who led DoF’s capture fishery research for MYFish, explains: “This approach has been very effective not only in building the capacity of researchers within the DoF but also increasing our ownership of the research.”

The second modality introduced by the project was the Fisheries Research and Development Network (FRDN), established as an informal network that brought together DoF and other sector partners to share knowledge and research priorities. MYFish increased the research capacity of FRDN members representing the private sector, academia and civil society through a series of mini-research grant projects. Members submitted proposals for funding and received assistance in methodology formulation, research implementation and quality control.

The objectives of MYFish were designed to characterise the fisheries sector in the Ayeyarwady Delta and the central dry zone (CDZ) and then to identify, test and demonstrate new approaches that increased productivity and sustainability of fisheries and aquaculture. A third objective aimed to strengthen research capacities of the government, private sector, universities and NGOs across all project activities. The objectives were sufficiently flexible for the project to adapt and change as new political and institutional realities emerged. Following the visit of then US President Barack Obama in 2011, which included a speech made at the University of Yangon, the Government allowed foreigners to enter the university campus freely and meet with staff and students. The change enabled MYFish to engage directly with the University of Yangon, which was particularly significant for fisheries as the sector does not have a university for graduate training. →

in Myanmar was initiated in 2002 under a joint mission with the Food and Agriculture Organization of the United Nations and the Network of Aquaculture Centres in Asia-Pacific. It was not until almost a decade later, when military rule was replaced by a military-backed civilian government in 2010, that the concepts and ideas identified in the mission could be operationalised. Many previous findings remained relevant to the MYFish project design, with fisheries development constrained by a lack of a comprehensive information base, a lack of proven management approaches and technologies, and limited technical capacity to implement fisheries projects. In addition, centralised government control continued to set targets aimed at maximising fish production, with little consideration for equity and sustainable development.

In 2010, the new civilian government initiated reforms of the rural sector. One target was poverty reduction, to be addressed by increasing production and incomes for rural producers and households. In conjunction, administrative changes to the 2008 constitution decentralised responsibility for the rural sector to regional and state governments. Regional governments could make their own laws for several commodities, including fisheries, and this provided additional opportunities to reduce poverty. The ACIAR agricultural investment was well timed to contribute to the reform process and discussions with senior government officials were candid and honest about how new investments and projects, such as MYFish, could help deliver reforms in the fishery sector.

In describing the first preparation meeting in Yangon, Dr Johnstone noted that a key message,

conveyed by the then director-general of DoF, Khin Ko Lay, was the urgency to tackle the reforms as laid out by the president, despite limited guidance on how these reforms should be implemented. During this meeting, the director-general described a sector that was willing to adapt fishery management practices and introduce co-management. He recognised the need to diversify fishery products and markets so commercial aquaculture could continue to grow. He also promoted inclusive aquaculture so poorer households could develop an alternative source of fish.

Discussions were shaped by the way investments had been made after Cyclone Nargis, which caused catastrophic destruction to the Ayeyarwady Delta and resulted in more than 130,000 fatalities in May 2008.

DoF had observed that some post-Nargis rehabilitation and development investments were made in non-government organisations (NGOs) with limited experience and technical capacity in fisheries and aquaculture. This led to some tensions between DoF and the NGO community. MYFish was to be designed to position DoF at the centre of the sector while working with NGOs and other sector partners.

### PROJECT DESIGN AND APPROACH

During the design phase, the director-general of DoF gave full backing and access to the institution. Dr Khin Maung Soe, a retired director-general of the R&D Department, was attached to the preparation team and provided invaluable technical support as well as historical and political insights that helped shape the project and develop new institutional modalities for research.



The fisheries statistics generated by Myanmar estimate fish production at 5.3 million tonnes and exports at 338,000 tonnes, valued at USD\$482 million in 2014–15.

research for development and management, which is stimulating new policy directions in rural aquaculture and fisheries management.

Important factors in achieving institutional impacts include: the ability for the project to partner with and fund DoF directly; embedding the project within the DoF; engaging senior staff in the design and implementation of the project; and having sufficiently flexibility in project design to adapt to change.

The project also benefited from external factors including the reforms of the 2008 constitution that decentralised responsibility for inland fisheries to regional and state governments, as well as the funding of civil society after Cyclone Nargis that contributed to engaging civil society in the reform process.

The new government in 2016 brings new opportunities and challenges to the fishery sector. Trust in the sector will need to be developed. Many fisheries still represent the old order that has historically rewarded cronyism and rent seeking. Partnerships will play an important role in building this trust and stimulating change, particularly as the number of investors grows and the demands on the sector increase.

Fisheries R&D will need to be dynamic to deliver and inform policies. Projects such as MYFish that strengthen research capabilities from within the government institution can support DoF to play a full and active role in identifying research priorities and implementing projects to meet national needs. The challenge will be to build sufficient institutional capacity and skills within DoF so it can lead the R&D process and fulfil its mandate to manage Myanmar's fisheries development. ■

**ACIAR PROJECT:** FIS/2011/052 'Improving research and development of Myanmar's inland and coastal fisheries'

**MORE INFORMATION:** Dr Gareth Johnstone, project leader, WorldFish Center, g.johnstone@cgiar.org; Fishery Information Centre, dof.myanmar.fic@gmail.com

### MYFISH INFLUENCE AND IMPACTS

MYFish has made considerable headway in achieving its objectives, with increases in aquaculture production and improved research capabilities. The project has benefited from the partnership with WorldFish, and the Ministry of Agriculture, Livestock and Irrigation (MOALI) has endorsed rural, small-scale aquaculture as an instrument for poverty alleviation.

Embedding the project within the institution has facilitated research directly with DoF and across the sector via the FRDN; DoF is increasingly willing to support research for development and management. The modality has provided opportunities for promoting institutional and group practice changes by broadening the research focus and making it more relevant to livelihood development. The project is changing DoF's discourse on research and the perspective of fisheries is shifting from productivity and revenue raising to include social elements and how research can be applied to benefit stakeholders.

The FRDN has helped place DoF at the centre of the learning process in fisheries and encouraged research collaborations with universities, the private sector and NGOs. The FRDN has funded more than 20 research projects and promoted interactions between members within the FRDN by hosting an annual symposium. DoF has established a publishing portfolio that is linked to an online digital library called the Fishery Information Centre (FIC). Launched in December 2016, the FIC is cataloguing fishery science in Myanmar and publishing FRDN studies and DoF reports. The publication quality is maintained through a committee chaired by DoF's director of R&D and the library is linked to a network of

national and international libraries. The FIC is now the largest repository of Myanmar-specific information on fisheries and is providing access to previously unseen data, including PhD theses, books and reports.

The demand from MOALI and DoF for continued interaction with MYFish has created the basis for a long-term program of support for fisheries research. WorldFish has invested in developing a country program office and a 10-year agreement was signed with the MOALI in 2015. This formalised many of the modalities developed under MYFish. Policy support is maintained through regular communications and meetings with DoF and MOALI. This has helped to facilitate access to DoF hatcheries for research on indigenous species and to hold technical and policy discussions including, more recently, a workshop to produce policy advisories for the new Government. The scaling of proven technologies has been an important development goal for the project that WorldFish is pursuing through funding from the Livelihoods and Food Security Trust Fund.

In 2016 the project MYCulture applied MYFish technologies and techniques to small-scale aquaculture farmers in more than 70 villages in the Ayeyarwady Delta and CDZ, providing benefits to more than 600 households and about 2,500 people. The aim is to extend aquaculture to 10,000 rural households by 2019 and to benefit more than 40,000 people.

### CONCLUSIONS AND OUTLOOK

MYFish has been a timely project for DoF, coinciding with the political and rural reform processes. It has promoted new understandings of the sector and DoF is increasingly applying

Aquaculture in Myanmar.

# SECURING COASTAL FISHERIES

Coastal fisheries are critical to the food security and development of millions of Myanmar people

BY **RICK GREGORY** (PYOE PIN), **KEN MACKAY** (NETWORK ACTIVITIES GROUP), **DR NEIL ANDREW** (WORLD FISH CENTER), **YIN NYEIN** (NETWORK ACTIVITIES GROUP), **AUNG NAING OO** (DEPARTMENT OF FISHERIES, MYANMAR), AND **DR RUDOLPH HERMES** (FOOD AND AGRICULTURE ORGANIZATION)

Nearly half of Myanmar's people live in coastal states and regions. Coastal areas include a wide range of habitats such as coral reefs, seagrass beds, mangroves, mudflats and rocky shores. These provide important environments for Myanmar's impressive marine biodiversity, which includes endangered species such as dugongs, marine turtles and migratory shore birds. Importantly, Myanmar's coastal fisheries also support the livelihood of millions of Myanmar citizens who are among the most marginalised, poor and vulnerable people in Myanmar society. This includes some of the distinct ethnic minorities, such as the Salone people of the Tanintharyi Region.

Coastal fishers typically use small-scale gear (seines and stow nets, longlines, gill nets and traps) and target a wide range of species (fish, molluscs and crustaceans). Women play a vital role in this economy, particularly in connection with fish processing. Locally processed coastal fishery products are an important nutritional component of the Myanmar diet and particularly important in the dry zone and upland areas.

In recent years, however, the capacity of these fishery areas to support viable livelihoods and contribute significantly to the local economy has come under threat from several sources. These include reductions in fish stocks, damage to critical habitats, environmental pollution and disasters.

Five priority areas have been identified. These need immediate attention to enable coastal resources to recover to more productive levels and allow fisher communities to continue to benefit from them. These actions must be aligned with key development principles such as working through partnerships, promoting co-management and striving for greater gender equality.

The five priority areas for action are as follows.

1. Strengthening coastal communities and safeguarding fishery-based livelihoods
2. Harmonising laws and policies affecting coastal fisheries
3. Closer alignment of national and state/regional-level agencies and institutions to improve coastal fisheries management and law enforcement
4. Improving the management of coastal fisheries resources
5. Improving information and statistics for coastal fisheries management.

## THE POLICY FRAMEWORK

Sustaining and increasing the contribution of coastal fisheries to poverty reduction and food security faces three interrelated problems. First, the overharvesting of stocks combined with insecure tenure and competition with other users has degraded the resource base. Second, the sustainability of coastal fisheries is threatened by changes in the broader landscape. Third, even where local innovations address some of these →

threats, there is inadequate policy recognition of the importance of coastal fisheries and poor alignment of national, regional and local institutions.

The challenge is to put in place governance and management frameworks that will secure a productive future for coastal fisheries and the communities that depend upon them. These frameworks must achieve a balance between meeting human wellbeing needs and sustaining the wellbeing of coastal resources.

Meeting this challenge requires coordinated action from national and regional/state institutions working with coastal communities to re-imagine ways coastal resources can be governed effectively. Many of the building blocks to do this are already in place and, while stock and natural resource recovery is a long-term challenge, much progress can be made in the short term through timely and strategic action.

Five key opportunities for action are highlighted that will allow coastal fisheries and fishery communities to play a productive and significant role in Myanmar's immediate and long-term future.

### Action 1

#### Strengthening coastal communities and safeguarding fishery-based livelihoods

Empowering and strengthening of coastal communities will be fundamental to Myanmar's social and economic progress. Empowerment can occur through giving coastal communities a louder voice and greater participation in rule-making and fisheries co-management responsibility. Such an approach has proved successful in many countries in the region.

Community awareness of laws, rules and regulations relating to natural resource use will be improved through fishery co-management arrangements. Management mechanisms can be localised by recognising and valuing traditional customary fishing practices and the indigenous knowledge of communities.

In many coastal communities, most, if not all, families depend on fishing for their livelihood. New livelihood options such as small-scale aquaculture and eco-tourism, technical support for improving traditional women-led practices, including fish processing and value addition, need to be promoted to reduce dependency on a single activity in coastal communities.

Improved infrastructure for efficient landing, postharvest processing and marketing of fish products is critical. Rural finance schemes that support livelihood diversification are seen as essential. The potential for women to benefit from new livelihood activities must be fully explored.

The working conditions of the fishers and fish



The mixing of the offshore and inshore fishing fleets in Myeik.

workers are often harsh and dangerous. Health and safety at work can be improved through the strength of cohesive community groups and the implementation of co-management arrangements. Improving fisher safety at sea and local emergency responses are also required.

### Action 2

#### Harmonising laws and policies affecting coastal fisheries

There is some confusion and conflict among national, regional and state-based legislation and regulations, which constrain coastal fisheries legal reform. Coherence among these laws is the foundation for effective decentralised governance and the improved management of fisheries. A strong legal foundation for co-management arrangements is the basis for empowering communities.

A comprehensive review of Myanmar's natural resource-related laws and policies is recommended to enable more effective policy and regulation in support of the reform of coastal fisheries governance. Greater participation by communities and local institutions, as well as the integration of traditional and customary laws, will result in greater acceptance of and compliance

with laws and policies. An important component of this legal policy and law reform will be a reduced emphasis on revenue collection and more focus on the sustainable development of coastal fisheries and communities. Harmonised national and state/region laws and policies will provide a solid foundation for securing the contribution of coastal fisheries for future food security and development.

### Action 3

#### Closer alignment of national and state/regional-level agencies and institutions to improve coastal fisheries management and law enforcement

The Constitution of Myanmar supports the decentralisation of coastal fisheries authority to states and regions. A review of this decentralisation process is required so states and regions can be guided on ways to harmonise approaches to the governance of coastal fisheries.

Collaboration between different national and state/regional-level organisations is essential for improving management of coastal fisheries. For example, coastal communities frequently complain about the number of offshore vessels fishing illegally in shallow coastal areas.



**"TEN YEARS AGO, ONE TRAMMEL NET SET IN THE SITTAUNG RIVER CAUGHT 10 HILSA (NGA THA LAUK), NOW A WHOLE DAY FISHING ONLY CATCHES ONE AND IT IS HARD TO SUPPORT OUR FAMILIES."**

– coastal fisher Sut Pa Nut,  
Kyaikhto township, Mon State

national reporting. There are many inconsistencies in the statistics and they provide a weak basis for effective fisheries management. There is no species-specific data collected on catch and effort in Myanmar coastal fisheries.

Priority investment in the design and implementation of a national fisheries statistics system that includes coastal fisheries is recommended. Effective implementation of this system will require the integration of township, district and regional/state agencies as well as the training and resourcing of DoF officers in collecting, managing and analysing this data.

Information gathered should be explicitly linked to the improved sustainability of fisheries rather than solely for use in national production planning and reporting. More broadly, there is an urgent need to build Myanmar's fisheries research capacity through establishing research partnerships between DoF, universities, NGOs, central statistical offices (CSOs) and communities and through strengthening the Fisheries Research and Development Network.

## CONCLUSIONS

These five actions are required urgently if Myanmar's coastal fisheries are to be secured for the benefit of future generations. Progress towards implementing these five proposed actions can only be made through the establishment of partnerships involving government, CSOs, NGOs, the private sector and communities. These partnerships would begin to turn the tide on the damaging practices that are degrading these resources and threatening the viability of coastal community livelihoods. ■

**ACIAR PROJECT:** FIS/2011/052 'Improving research and development of Myanmar's inland and coastal fisheries'

**MORE INFORMATION:** Dr Gareth Johnstone, project leader, WorldFish Center, g.johnstone@cgiar.org

Surveillance of illegal fishing and enforcement of fisheries laws require close cooperation between and coordination by several different bodies, including the Department of Fisheries (DoF), the Navy, the coastguard and communities. In another example, the protection of coastal conservation areas is regarded as a major strategy to achieve fisheries sustainability. Clarification of responsibilities and improved cooperation between environment agencies and DoF is also required. Additionally, in many of Myanmar's coastal areas, tourism is growing fast. Cooperation between tourism-related agencies and DoF is essential so that responsible tourism (or eco-tourism) is promoted and coastal resources, including fish stocks, are not damaged as a result of poorly planned infrastructure development and waste management.

### **Action 4** **Improving the management of coastal fisheries resources**

Critical to managing Myanmar's inshore fishery resources is the need to strengthen existing fisheries management systems and develop new approaches. To begin with, poorly defined coastal fisheries boundaries, which vary across states and

regions, need to be standardised and delineated. This should be followed by an institutional review of DoF's management functions, structures, working practices including revenue collection and allocation, and the development of new fishing-gear licence collection arrangements that are transparent and not overly burdensome to fishing communities.

Given the widespread threat to coastal fisheries from illegal fishing, there is a critical need to develop and implement strategies, involving all co-management partners—DoF, non-government organisations (NGOs), the private sector and communities—to eradicate illegal fishing. Capacity building of all partners in fisheries co-management will be critical. Special protection measures are required to protect and conserve Myanmar's most critical coastal habitats (coral reefs, mangroves and seagrass meadows) and their extraordinary biodiversity.

### **Action 5** **Improving information and statistics for coastal fishery management**

Information collection from coastal communities and fisheries focuses on licensing and fish production statistics for regional/state and

MYFish is helping to improve the productivity of small-scale fish producers in Myanmar.

# SUPPORTING SMALL-SCALE FISH FARMS

With support from ACIAR, the Government of Myanmar is improving its understanding of local communities and promoting fish-farming technologies adapted to smallholders

BY XAVIER TEZZO

WorldFish Center

**“Fish plays a predominant role in the diet of the people of Burma.”**

This quote from the book *Fisheries in Burma*, written in 1948 by U Khin, still has resonance. Fish is second only to rice in terms of food expenditure nationwide. And with an overall production estimated at 5.31 million tonnes, Myanmar is in the top 10 global fish-producing nations.

Historically, fish have been sourced from the wide network of rivers and flood plains and there is a strong preference by local Myanmar consumers for freshwater (mostly carp) species. But the country's natural water bodies have suffered immensely from the combined effect of economic and demographic growth. There is growing evidence of a rapid reduction in the catch. Following a global trend, aquaculture, the farming of aquatic organisms, is growing faster and is now playing a significant role in supplying fish for local consumers.

Aquaculture operations in Myanmar are dominated by large farms located around Yangon. Compared with other countries in the region, there appears to be a very limited adoption of this promising and potentially lucrative business by smallholders. Concurrently, smallholder farmers from the Ayeyarwady Delta—once called the ‘rice bowl’ of Asia—have suffered from the decades of political turmoil and now have one of the lowest levels of land productivity in the region.

This situation led Dr Nilar Shein and her team from the Department of Fisheries (DoF) to two key questions: To what extent are communities of the Ayeyarwady Delta practising fish farming? How can we ensure they, too, can claim their share of the so-called ‘blue revolution’? Dr Shein and her team have been exploring these questions with the financial support of ACIAR and the technical assistance of WorldFish under the MYFish project.

**IDENTIFYING AND UNDERSTANDING SMALLHOLDER FARMERS**

“When our project started in 2012, it was very difficult to approach the subject of small-scale aquaculture in the Ayeyarwady Delta because of the scarcity of data, even for DoF,” Dr Shein says. “Fish ponds smaller than 120 square metres are not taxed and, as a consequence, they are not accounted for in the government database.”

Dr Jharendu Pant from WorldFish supported the project team in designing a survey to address these data gaps. The process involved extensive consultation with central and regional government offices, non-government organisations and local village leaders. “After Cyclone Nargis devastated a large portion of the Ayeyarwady Delta in 2008, small-scale aquaculture started to be promoted by various organisations as a livelihood-diversification option,” Dr Pant says. “Unfortunately most of these experiences have remained undocumented and there is very little evidence of what worked



and what did not. Our study had to start by a comprehensive review of these experiences.”

These preliminary discussions identified small-scale fish farmers throughout the Ayeyarwady Delta and allowed the team to design a tailored questionnaire to help understand the major challenges and opportunities small-scale fish farmers face. A representative sample of 136 households was interviewed with questions covering demographics, livelihoods, production, and legal and social aspects. The interviews were facilitated by trained officers from DoF under the technical supervision of WorldFish and were complemented by group discussions in most of the villages visited.

Dr Shein says: “It was the first exercise of this kind for most of my colleagues from DoF. The survey ended up being very valuable as it helped us to identify some key challenges and encouraged us to consider new approaches to support the development of the aquaculture sector.”

Overall, the contribution of fish farming to household food production, nutrition security and income generation was found to be significant. Nevertheless, the study indicated the productivity of small-scale fish farms was extremely low.

This makes the adoption of this business unattractive. The lack of technical support and the unfavourable policy environment were identified as additional factors stalling adoption. Yet the interpretation of the results indicated a great potential for expansion, intensification and commercialisation of the aquaculture sector in the Ayeyarwady Delta.

### PROMOTING TAILORED TECHNOLOGIES

“Probably one of the most encouraging outcomes from our survey was the realisation that productivity of these small farms could be significantly improved with very limited technical improvements,” Dr Pant says. “In fact, very often small-scale producers were trying to rely on technologies that did not suit their technical and financial capacity. They had no information on alternative low-cost options.”

Largely inspired by small-scale fish farming practices in the region and carefully building on prevailing technologies encountered in the Ayeyarwady Delta, DoF and WorldFish spent the following three years developing, testing and piloting a wide range of low-cost technologies. This started with the selection and breeding of new indigenous species in three different government fish hatcheries. The team relied on successive cycles of on-station experiments, from which successful technologies were then piloted directly with communities through farmer field-school approaches.

Overall more than eight different technologies—ranging from carp polyculture to



PHOTO: E. BARAN



PHOTO: ACIAR



PHOTO: BEN BELTON

eel farming and rice–fish farming—were tested by 300 households. Among the beneficiaries, U Win Zaw Ko from Mawbisu village in Dedaye township, recounts: “I only have 100 square metres that I used to stock with a mix of available species without considering their compatibility. Through the project, it was explained that some species can perform well together while others cannot. We did not have access to these recommendations before. The MYFish project also helped me to provide day-to-day extension services by training and mentoring one of my neighbours as a community-based facilitator.”

The hundreds of farmers involved with MYFish have seen an average productivity increase from 10–40%, but the impact goes beyond the project. Modalities and technologies developed under MYFish have been recently replicated through other development interventions in Myanmar, notably the MYCulture project that aims to scale these technologies to 10,000 households by 2019 and boost incomes, food and nutrition to 40,000 people. ■

1. Leasable fishery in the Ayeyarwady Delta.
2. Community-based facilitator samples a fish pond.
3. Workers packing harvested fish in ice for delivery to market.

**ACIAR PROJECT:** FIS/2011/052 ‘Improving research and development of Myanmar’s inland and coastal fisheries’

**MORE INFORMATION:** Xavier Tezzo, WorldFish Center, [x.tezzo@cgiar.org](mailto:x.tezzo@cgiar.org)



# THE ROLE OF LEGUMES IN FOOD SECURITY

Improved varieties of legumes promoted under the MyPulses project are benefiting farmers in the central dry zone of Myanmar

**BY DR TUN SHWE AND DAW KHIN LAY KYU (DEPARTMENT OF AGRICULTURAL RESEARCH) AND DR POORAN GAUR (ICRISAT)**

**T**he central dry zone (CDZ) of Myanmar has established itself as a key agricultural production area. The three regions of the CDZ—Sagaing, Mandalay and Magway—account for 34% of the country's population, or 18 million people. It is the main region for rainfed agriculture in the country. Many of the smallholder farming systems are based on legumes—pigeonpeas, chickpeas and groundnuts—and feature rice, mungbeans (green gram), maize, millet, sesame and sunflowers grown in rotation or as intercrops. The production share of oilseed and pulse crops for the CDZ is higher than in the Ayeyarwady Delta: 70–90% in the case of oilseed crops and about 40% to more than 90% for pulses, except

urdbean (black gram bean). Despite the high production share, yields remain low, principally because of the lack of nutrient inputs and management, an absence of improved high-yielding varieties, and limited options for pest and disease management. As a result, the CDZ is one of the most food-insecure regions in Myanmar.

Climate change poses a particular threat to the CDZ, which has suffered consecutive years of drought. Agricultural production has stagnated due to extreme water shortages and an unevenly distributed rainfall pattern, which is a constant threat to the viability of rural livelihoods. As a result, the farmers from the CDZ are poor and highly vulnerable to both present and future effects of climate change.

The ACIAR-funded MyPulses project is playing an important role in achieving a sustainable increase in crop productivity and improving

farmers' incomes and livelihoods in legume-based farming systems in the CDZ.

## PREFERRED VARIETIES

Farmer participatory varietal selection trials were used to identify farmers' preferred varieties of groundnut, pigeonpea, chickpea and mungbean. Promising breeding lines from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India, and the Department of Agricultural Research (DAR) from Myanmar were subjected to the trial process. A total of 54 mother trials (managed by researchers) and 378 baby trials (using farmer-managed cultural practices) were conducted across the CDZ during 2014–16 under the MyPulses project.

## GROUNDNUT

Eleven groundnut mother trials and 63 baby

PHOTO: IAN WILLETT



## “MYPULSES IS ADDRESSING THE IMMEDIATE NEEDS OF THE VULNERABLE PEOPLE OF MYANMAR THROUGH RESEARCH, DEVELOPMENT AND EXTENSION. IT HAS A STRONG FOCUS ON CAPACITY BUILDING FOR BOTH PEOPLE AND INSTITUTIONS.”

Foliar spraying of nutrients on black gram rice, near Tatkon township.

via DOA, non-government organisations and directly; and an unknown quantity of Nyaungoo Shwedinga via the Japan International Cooperation Agency Nyaung Oo project. Seed multiplication is continuing. Yezin 9 will be formally released in 2018.

### CHICKPEA

A total of 19 mother trials and 78 baby trials were conducted to identify farmer-preferred chickpea lines. The desi chickpea line ICCV 00108 out-yielded Yezin 4 (the check variety used for comparisons in the trials) by an average of 23% in mother trials and 10% in baby trials. Line ICCV 07118 out-yielded Yezin 4 by an average 44% in mother trials and 13% in baby trials.

In kabuli chickpeas, line ICCV 07308 out-yielded Yezin 3 (the check variety) by an average 7% in mother trials and 33% in baby trials. Check varieties Yezin 3 and Yezin 4 account for about 65% of the current chickpea-growing area in Myanmar. All three new varieties were preferred by farmers. The lines ICCV 00108 and ICCV 07308 are due for commercial release in 2016–17. There were eight field days conducted during 2015–16 with 550 farmers (30% women) in attendance.

### MUNGBEAN

For mungbeans, 14 mother and seven baby trials were conducted. The varieties Yezin 11 and Yezin 14 out-yielded the check by an average of 14% and 18%, respectively. Seed of Yezin 14 is currently being increased for distribution to farmers—sufficient seed for planting 60,000 hectares. For urdbears, 22 new lines received from the World Vegetable Center (India) in 2014 were evaluated for yield and other traits at DAR in Yezin during the 2015–16 post-monsoon season. The grain yield of these lines ranged from 1.4 to 4.2 t/ha.

### VILLAGE SEEDBANKS AND DISTRIBUTION

Village seedbanks were established to enhance the availability of high-quality seed to farmers at a local level. During 2015–16, there were 74 pigeonpea seedbanks covering 160 ha, 13 groundnut seedbanks covering 10 ha, 31 chickpea seedbanks covering 50 ha and 22 urdbean seedbanks covering 35 ha. Four training

workshops on seed production and distribution (village seedbank model) were organised involving 270 participants. There were five field days for pigeonpeas, eight field days for groundnuts and 12 field days for chickpeas with total involvement of 360 DOA staff and 1,200 farmers (860 male and 340 female).

### ACHIEVEMENTS SO FAR

The MYPulses project has helped to identify farmer-preferred varieties in pigeonpeas, groundnuts, chickpeas and mungbeans. The seed availability of these farmer-preferred varieties was enhanced by establishing village seedbanks. These improved lines are being rapidly adopted by farmers as they see the benefit of increased productivity and income.

The CDZ is prone to drought stresses, particularly because of changes in the climate as reflected by erratic rainfalls and fluctuations in temperature. These new varieties are not only high yielding, they also have higher levels of resistance to stress and increased resilience to climate change. Through all these advances, the MYPulses project is contributing to improved food security and rural incomes for smallholders in the CDZ and the Ayeyarwady Delta. Farmers have also benefited by having better access to domestic and international markets.

MYPulses is addressing the immediate needs of the vulnerable people of Myanmar through research, development and extension. The program has a strong focus on capacity building for both people and institutions.

The MYPulses project is showing a passage to prosperity for farmers in the CDZ through an extraordinary partnership of local communities DAR, DOA and the technical experts of ICRISAT and ACIAR. ■

**ACIAR PROJECT:** SMCN/2011/047 ‘Increasing productivity of legume-based farming systems in the central dry zone of Myanmar’

**MORE INFORMATION:** Professor David Herridge, University of New England, david.herridge@industry.nsw.gov.au

trials were conducted during 2014–16. The best-performing line (Sinpadetha-11) out-yielded the check line by an average of 38% in the mother trials and 40% in the baby trials. Farmers preferred Sinpadetha-11 and YZG-98017 due to their high yield and moderate tolerance to drought. A total of 17 tonnes of Sinpadetha-11 pure seed was distributed to 120 farmers for the 2015 monsoon season.

### PIGEONPEA

Ten pigeonpea mother trials and 230 baby trials were conducted in 2014–16. Overall, the lines Nyaungoo Shwedinga, Monywa Shwedinga and Yezin 9 out-yielded check varieties by 17%, 15% and 12%, respectively. High-quality pure seed of these three lines was distributed to farmers: 500 kilograms of Yezin 9 via the Department of Agriculture (DOA); 3,300 kg of Monywa Shwedinga

# GROUNDNUTS: PRODUCING THE GOOD OIL FOR MYANMAR

Participatory varietal selection has helped to identify groundnut varieties that improve yield and drought tolerance



**BY DR TUN SHWE  
AND DAW KHIN LAY KYU**

Department of Agricultural Research

**U** Sein Htay is one of the volunteer farmers who routinely conducts demonstration trials and elite yield trials of new groundnut varieties developed by the Myanmar Department of Agricultural Research (DAR) and the Department of Agriculture (DOA). In the 2014 monsoon season, he participated in the ACIAR-funded MYPulses project by running a groundnut baby trial on his farm (a baby trial is a self-managed trial). According to the results, he realised the new groundnut variety, Sinpadetha-11, produced a greater number of pods and significantly higher yield than all the others and also had good-quality kernels.

"We got a threefold higher yield by adopting the Sinpadetha-11 groundnut variety from DAR," U Sein Htay says. "Sinpadetha-11 could produce up to 115 baskets per acre of groundnuts in shell

whereas local variety produced only 35 baskets. This is much higher than the local variety that we have always used and we are happy to adopt the new variety."

U Sein Htay normally grows groundnuts twice each year. He grows them first in April, before the onset of the monsoon, using irrigation water so he can harvest in July. The land is then replanted in August under rainfed conditions. He is an innovative farmer and follows agricultural practices recommended by DAR. He usually applies triple superphosphate and gypsum to increase yield and kernel quality. He applies gypsum twice—a basal application and a side-dressing—and his groundnut fields are always free from diseases, insect infestations and display no symptoms of nutrient deficiency.

Following the trial, U Sein Htay requested more high-quality seed of Sinpadetha-11 from DAR. He multiplied the seed, which he then shared with his relatives and neighbouring farmers. He

makes a profit by selling his high-quality seeds to the farmers around his village tract. He usually grows 3.5 acres (1.4 hectares) of groundnuts and produces more than 300 baskets of seeds. If he sells them as high-quality seed, he gets double the price. With the profits of this enterprise he installed solar energy in his house, purchased a motorcycle, and bought 2 acres (0.8 ha) of land. Moreover, he organised his relatives to produce high-quality seed to sell as certified seed to other parts of Myanmar's central dry zone (CDZ), such as Myingyan township. He has distributed more than 10,000 baskets of Sinpadetha-11 groundnuts to other farmers.

Daw Sein Yee is an active and innovative farmer in her village. She always participates in the training programs, which are conducted by DOA, DAR or other non-government organisations (NGOs), such as the farmers' field program and organic training. She received the new groundnut variety Sinpadetha-11 from her nephew and



PHOTOS: DAW KHIN MAR MAR NWE

Myanmar farmers who have adopted the new groundnut variety, Sinpadathar-11; Daw Hla Yee, U Sein Htay, and Daw Sein Yee, who is producing pure, certified seed to distribute to other farmers.

produced pure, certified seeds to distribute to others.

Daw Hla Yee is a neighbour of U Sein Htay. She participated in the groundnut varietal selection program and found Sinpadetha-11 to be the best. The variety produced 90 baskets per acre of groundnuts on her land, a significantly higher yield than the local cultivar. She sells Sinpadetha-11 variety groundnuts as food for local customers for domestic consumption.

### THE IMPORTANCE OF GROUNDNUTS

In Myanmar, groundnuts (*Arachis hypogaea* L.) are mainly grown in the CDZ as both a monsoon and late-monsoon season crop. It is important as an edible oil and food crop in the country. Thousands of smallholder farmers in Myanmar grow groundnuts for household food and as a cash crop. In Myanmar, the groundnut is classified as an oilseed because of the high oil content of the grain. Sesame and groundnuts are widely grown as

climate-resilient crops in the CDZ because they are moderately resistant to drought. About 16% of the cultivated area (3 million ha) is occupied by oilseed crops. This is the third most important crop group in Myanmar agriculture after cereals and pulses.

Groundnuts are grown on about 0.7 million ha in Myanmar, mainly in the CDZ. Research and breeding programs aim to increase yields with the adoption of improved short-duration and drought-tolerant varieties. ACIAR works to that end in collaboration with DAR and DOA by using the farmer participatory varietal selection (FPVS) approach to identify farmers' preferred varieties.

The next step following the FPVS is to formally release the new varieties, followed by DAR and DOA multiplication of seed for dissemination to farmers. The other important partner in this selection and breeding program is the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), located in India. Groundnuts are one of ICRISAT's mandate crops.



Above: Daw Myint Myint Maw is a skilled technician working for the Department of Agricultural Research. Her parents are farmers at Laytha village, near Yezin in the central dry zone. She is holding groundnuts produced by the improved variety Sinpadetha-11.

Myanmar people add roasted and pounded groundnuts to salads of blanched spinach, pennywort leaves and tomatoes. They sprinkle groundnuts on top of noodles and add them to soups. Groundnuts are also eaten toasted and served as a snack and, most often, the groundnut is pressed into oil. People usually use a lot of groundnut oil and it is said that the oilier a curry, the better. People also eat groundnuts boiled in the husk, which has a very sweet taste.

As popular as groundnut oil is in Myanmar, its price has been undercut by palm oil. Oil crops play an important role in the rural economy of Myanmar, second only to rice in terms of overall relevance. But despite its importance, the sector has been facing a series of challenges that have constrained its performance. These include a lack of productivity growth, reduced oil extraction levels and quality, increased net foreign exchange costs, limited efficiency of current oil crop processing operations and the lack of national standards for edible oils. Added to these challenges is the importation of cheap palm oil. In recent years, Myanmar has begun importing more and more palm oil from Malaysia and Indonesia. The cheap price of palm oil has boosted its popularity, even though the traditional preference is still groundnut oil. ■

**ACIAR PROJECT:** SMCN/2011/047 'Increasing productivity of legume-based farming systems in the central dry zone of Myanmar'

**MORE INFORMATION:** Professor David Herridge, University of New England, Australia, david.herridge@industry.nsw.gov.au

# RURAL CHANGES

Changes in agricultural productivity are sweeping through Myanmar and care is needed to manage the effects on social structures and labour practices

PHOTOS: CLEMENS M. GRÜNBÜHEL



A salt farm on the southern tip of the Ayeyarwady Delta, Labutta township. What might have been rice paddies previously is now land used to produce salt as a form of extreme specialisation. Predominantly only absentee landlords with sufficient investment capital can afford to convert land into such an operation.

## BY CLEMENS GRÜNBÜHEL

Asian Institute of Technology

**S**ince the start of the project, Myanmar has experienced drastic social, economic and political change. In no other sphere have these changes been more visible than in rural areas, specifically, the areas in which we are working in the Ayeyarwady Delta and the central dry zone (CDZ).

Myanmar is deeply reliant on agriculture: 70% of the population lives in rural areas. The majority of rural people engage in some form of agriculture, whether it is crop production, livestock husbandry or fisheries. Surveys found two basic types of livelihoods: landholders (56%) and landless (44%).

The first group is titled 'landholders'—not landowners—because there is an ongoing land titling process in Myanmar and a large number of farming households currently do not hold formal title to their land.

### FARMERS' PERSPECTIVES

As the central agricultural regions of the country, both the CDZ and the Ayeyarwady Delta have been going through a process of agricultural intensification, whether by mechanisation, access to irrigation, input or labour intensification. Among those surveyed, about 60% of landholding households have access to irrigation for their crop production and about 40% of the

total sown area is irrigated across both regions.

Cropping intensity is at nearly 150%. Farmers from irrigated areas say that with the introduction of short-duration rice varieties several crops per year became possible. This, in turn, has increased the demand for labour.

### FARM LABOUR

"We can now grow more than one crop per year by using high-yield varieties, which have a short growing season. This should lead to more farm job opportunities for landless labour."—survey respondent

While demand for labour has been progressively increasing, farmers pointed out they



**"WE CAN NOW GROW MORE THAN ONE CROP PER YEAR BY USING HIGH-YIELD VARIETIES, WHICH HAVE A SHORT LIFE SPAN. THIS SHOULD LEAD TO MORE FARM JOB OPPORTUNITIES FOR LANDLESS LABOUR."**

– survey respondent

have been facing increasing farm labour scarcity over the past 10 years. Contributing to labour scarcity is migration away from rural areas in search of work. Most of the migration is temporary and within the country.

Young people migrate to urban areas seeking better job opportunities. Landless people are the first to seek non-farm jobs. Consequently, labour for agriculture becomes scarce and farmers have trouble getting basic agricultural tasks done, such as planting, weeding and harvesting, when demand for manual labour is high.

Farmers report they have started to shift to farming practices that require less labour. For example, farmers have replaced transplanting rice with broadcasting seed in their paddies. They initially resorted to hiring workers from other villages, and fall back on traditional family exchange labour; eventually, however, they have to adapt their farming practices, even if it means a reduction in yields.

Farm machinery, such as two-wheel tractors, threshers and rice harvesters, are increasingly used in order to save time and labour. In the survey, 32% of landholders owned tractors for ploughing and harrowing. Other machinery such as rice harvesters were hired. Small and medium

scale farmers still face difficulties accessing this sort of labour-saving machinery. Retailers do not reach the remote rural areas, and spare parts are expensive and hard to find. Many machinery companies will not hire machinery out if the land area is small and expected returns are low. Therefore, most farmers see labour scarcity as their number-one challenge and cost factor in crop production.

### LANDLESS PERSPECTIVES

Contrast this with the perspective of landless labourers. "Last summer there were no jobs for women in the village. [There are] only a few opportunities for women in years with lower rainfall. Meanwhile, the use of farm machinery in cropping is gradually increasing and it results in declining demand for female hired labourers, especially during harvest."—survey respondent

While in many areas labour scarcity due to migration is causing problems, in other areas where farm mechanisation is increasing, labour demand is actually decreasing. Thus in these areas a livelihood from agricultural labour is becoming less achievable. In particular, the automation of rice harvesting and threshing has reduced work demand in the agricultural production process.

Group meeting, Hnar Khaung Pauk village, Labutta township. In this picture, we gathered the village to report our survey results and engage the participants in a discussion on the challenges and opportunities of landholding/landless household types. The group meeting was followed by individual interviews.

This leads landless people to look elsewhere for work, and in Myanmar's booming economy (about 8% GDP growth per year) non-farm jobs abound, particularly in industrial production, food processing, services and building construction.

Traditionally, female labourers have been paid considerably less than men. This trend extends to non-farm work. Men find more opportunities for jobs and they are more mobile and able to spend time away from home. Men can adapt to various jobs in casual labour, while women often face family restrictions in terms of mobility and the nature of work. Several female respondents noted they were held back from joining the urban workforce by their parents.

There are observations of different types of migration in traditional agricultural areas with high levels of landlessness. While some people remain rooted in their villages and commute seasonally, increasingly landless labourers are staying away longer, regardless of the agricultural season.

As the fabric of rural villages changes, farmers and landless people become more disconnected. This will affect the social structure and may create issues in both the source and target areas of migration.

The big question is whether the agricultural intensification process can keep up with the rate of migration out of the villages. In the past, landless people have been integral in the production process. Now, farmers in Myanmar are presented with additional challenges and an added urgency to modernise agriculture. Mechanisation requires infrastructure (roads, power and markets) as well as private sector (retailers and mechanics). ■

**ACIAR PROJECT:** ASEM/2011/043 'Strengthening institutional capacity, extension services and rural livelihoods in the central dry zone and Ayeyarwady Delta regions of Myanmar'

**MORE INFORMATION:** Clemens Grünbühel, [clemens@grunbuhel.com](mailto:clemens@grunbuhel.com); Julian Prior, [jprior2@une.edu.au](mailto:jprior2@une.edu.au)



## ACIAR'S VISION

ACIAR looks to a world where poverty has been reduced and the livelihoods of many improved through more productive and sustainable agriculture emerging from collaborative international research.

The Australian Centre for International Agricultural Research (ACIAR) operates as part of Australia's international development cooperation program, with a mission to achieve more productive and sustainable agricultural systems for the benefit of developing countries and Australia. ACIAR commissions collaborative research between Australian and developing-country researchers in areas where Australia has special research competence. We also administer Australia's contribution to the International Agricultural Research Centres.



**ACIAR**  
aciar.gov.au

**Australian  
Aid** 

Back cover:  
Smallholder farmers in Myanmar are partners in projects to improve the country's agricultural profitability and productivity through adaptive research trials on cropping, livestock and fishery farming systems.