

Leading Edge, supported by the Society for Engineering in Agriculture and the Australian Centre for Precision Agriculture, provides a local and worldwide window on engineering and PA research.

## Water, crops, prices, pests and policies — a universal language

By Gary Alcorn

**F**armers around the world share the same concerns — water, crops, prices, pests and policies. After 10 years advising primary producers in every Asian country from North Korea to Pakistan, agricultural engineer Joe Rickman is convinced they all speak a universal language.

“The extension skills I learnt working with farmers on the Darling Downs were the most important attribute I could have taken to Cambodia.

“After all, it doesn’t matter how clever your new technologies might be — if farmers don’t embrace them as their own then you are wasting your time and money,” he said.

Joe is currently head of the agricultural engineering and experimental station at



Joe Rickman.

the International Rice Research Institute (IRRI), Laguna, Philippines.

Post-Pol Pot Cambodia was his first

assignment, a country where most professional people were either killed or banished.

### INTEGRATED ENGINEERING

His task was to integrate ag engineering and proven farming systems working with other engineers and agronomists. The list included land preparation, plant establishment, on-farm water management, then post-harvest techniques such as drying, processing, storage.

“One of the agricultural colleges in Cambodia had just four out of 40 teachers left when we arrived. It was IRRI’s brief to help restore the nation’s rice industry through capacity building.”

Mechanisation and advanced agronomic practices tested and modified by IRRI were introduced and demonstrated to village farmers.

What came out of the Cambodian work was the importance of water use efficiency. IRRI developed land-levelling techniques suited to animals and small tractors — including laser levelling.

“In 1995 only 12 per cent of Cambodian cultivation was ploughed by tractor. By 2000 that had risen to 25 per cent, all done by contractors using Belarus tractors.

“Rice production in 1989 was 1.1–1.2 tonnes per hectare. This year it’s over two tonnes per hectare, so we helped growers pick up almost one per hectare in 15 years across the country.

“It’s mostly rainfed country, so it has the same problems as the Darling Downs with rainfed crops. Relying on rain, catching it the best way you can and making the most efficient use of it — using resources such as fertiliser, seed, chemicals in the most efficient manner you can,” he said.

The old adage that good farmers make their own luck applied just as much in

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### THE MAIN POINTS

Australian rice growers are the most efficient in the world with yields around 11–13 tonnes per hectare while US growers average eight to 10 tonnes per hectare.

Local cotton and sugar producers can learn from the Asian experience by comparing systems using energy balance modelling. According to Joe Rickman, recording all inputs and outputs in energy units is a good way to compare the efficiency of different cropping systems.

“Our better managed rice growing systems are achieving a 2:1 return on inputs while our poorer systems are as low as 1.2–1.3 to 1. By analysing the whole system it is much easier to highlight interventions that will have an impact on the whole system.”

the puddled rice paddies of Cambodia as on the black soil plans around Dalby and Brookstead. Repeatedly Joe saw the better farmers in Asia making their own luck by having fields ready to plant straight after a rain event, controlling weeds, and timely harvesting and threshing.

He also had to gear back mentally from researching axle wind-up in high horse-power 4WD tractors to introducing low-tech aids to villagers.

"Throughout Asia irrespective of the cropping system you need about 7.5 kW per hectare of power — animal, human, walking tractor or 4WD — and then how long does it take to do the job?"

"A man using an animal to plough, walks 50 km for one hectare at one to two kms per hour. If he uses a small two wheel tractor he still trudges 20 km. It takes eight to 10 days to plough a hectare using animals, one day per hectare using a walking tractor, three to four hectares per day using a 4WD tractor. When you do the sums it's the same power per area."

The other major challenge is a rural labour shortage as families insist their children have better education which means a one-way flow to cities and towns.

So what happens during the peak labour periods? Plant establishment requires 40 person days per hectare and harvesting 30–40 person days per year. Mechanisation is filling this gap because rice production and prices must be stabilised to feed the two billion plus people who eat rice two or three times every day.

Of the 600 million tonnes of rice produced each year, just 40 Mt (approx seven per cent) is traded on the world market, Joe said.

Thailand now produces an excellent combine harvester for US\$50,000, as does India.

IRRI has introduced other applied research technologies as well as land levelling, stubble incorporation and strategic weed control to protect crop yields.

### POPULAR ITEMS

Two of the most popular items are a cheap (\$30) and readily available analogue 10–16 per cent range moisture meter to ensure grain is stored at the optimum 12 per cent. Local manufacturers in three countries now market this device.

As well reliable, insect-free low moisture storage is assured by introducing hermetic low-permeability plastic liners for the standard 50 kg rice sack.

"Growers are an independent lot and you know your technology has been

accepted when they refer to IRRI practices as their own. It takes about seven to 10 years to gain acceptance after you put in demonstration plots and technologies on selected farms in different villages.

"In one part of Vietnam the government wanted farmers to grow pineapples but the locals preferred sugar cane so we provided toolbar rigs which would suit both. Today that region is a major sugar cane producer and the growers are very proud of their home-modified rigs," Joe said.

The secret to new technology uptake was involving local manufacturers in every project. Without their active participation, widespread adoption by growers was impossible, he said.

At IRRI they practice what they preach. Chemical use in crop has been reduced from 18 litres per hectare of active ingredient in the 1990s to less than 0.5 litres per hectare per year with no insect problems as beneficial predator species return.

In August Joe Rickman will accept a new challenge by heading up the IRRI campaign in east Africa.

"Asia is running out of land and water for rice production and Africa is adopting rice as its staple food so we will be introducing IRRI technologies there to help

meet the extra 200 million tonnes of rice that will be needed within 10 years," he said.

## Australian Society for Engineering in Agriculture

The society contributes to the development of a strong engineering involvement in agriculture to aid economic growth and environmental sustainability for the entire Australian community.

### WHO CAN JOIN SEAG?

Membership is open to anyone interested in the application of engineering to agriculture and related industries. This includes scientists, farmers, surveyors, technical officers, engineers, manufacturers, distributors and processors.

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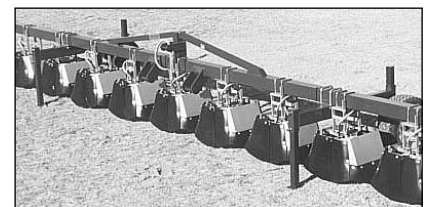
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