Insights of Outstanding Farmers

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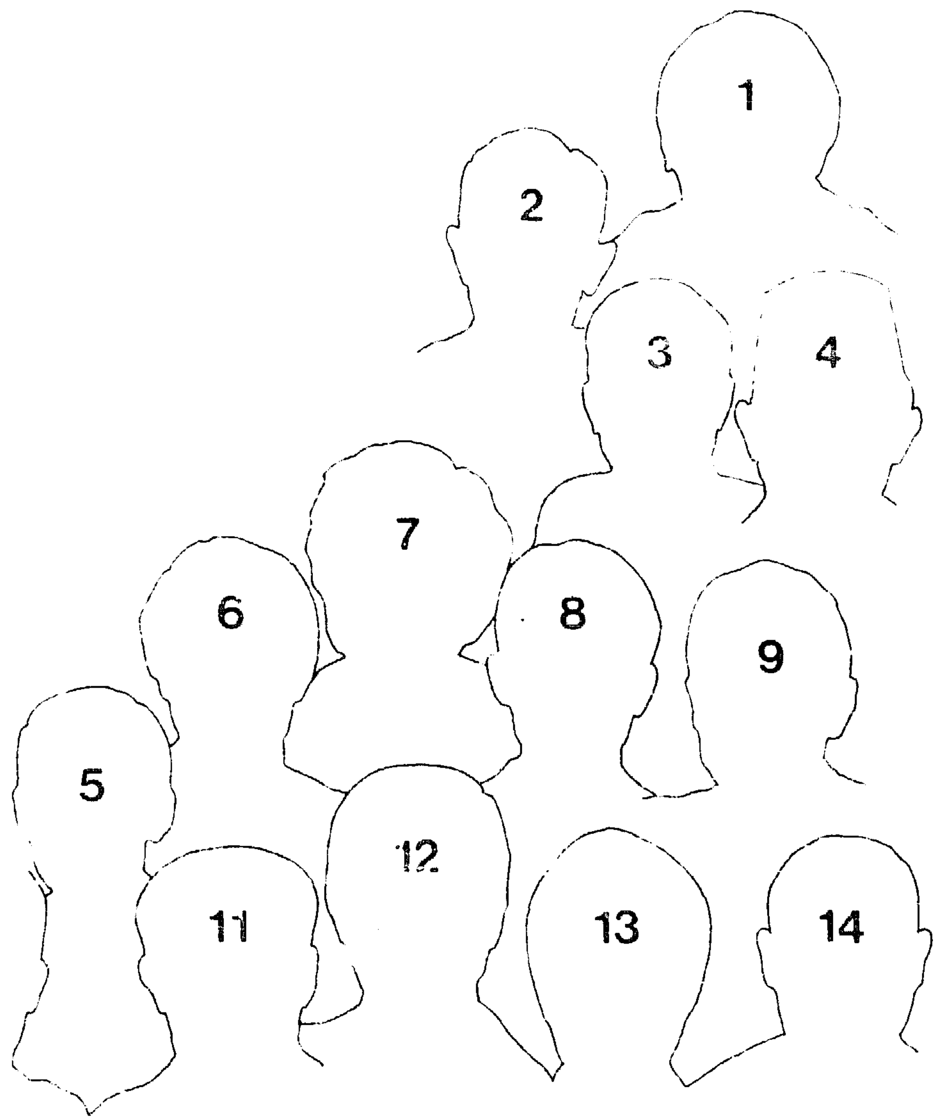


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# INSIGHTS OF OUTSTANDING FARMERS

1985
INTERNATIONAL RICE RESEARCH INSTITUTE
P.O. Box 933, Manila, Philippines

The International Rice Research Institute (IRRI) was established in 1960 by the Ford and Rockfeller Foundations with the help and approval of the Government of the Philippines. Today IRRI is one of the 13 nonprofit international research and training centers supported by the Consultative Group for International Agricultural Research (CGIAR). The CGIAR is sponsored by the Food and Agriculture Organization (FAO) of the United Nations, the International Bank for Reconstruction and Development (World Bank), and the United Nations Development Programme (UNDP). The CGIAR consists of 50 donor countries, international and regional organizations, and private foundations.

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The responsibility for this publication rests with the International Rice Research Institute.



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# FOREWORD

The following quotation from Chi-Wen Chang's *A strategy for agricultural and rural development in Asian countries* (1976) describes the spirit of self-reliance and self-respect of farmers:

*"From sunrise I work*
*Till sunset when I retire;*
*I drink the water from the well*
*That I have dug;*
*I eat the food from the field*
*That I have tilled;*
*Kings and emperors,*
*What have they to do with me?"*

We often forget that we live in this world as guests of green plants that tap sunlight and of farm families who convert plants into products for our consumption.

On the occasion of its 25th anniversary, IRRI organized a multilevel symposium that included participation of outstanding rice farmers, scientists, and political leaders.

Fourteen outstanding farmers from 10 nations were chosen to visit IRRI during the symposium, and they generously shared their experiences with IRRI scientists and scholars.

This book contains a narration of the experiences of these women and men. The program for the farmers was developed by a committee headed by D.L. Umali. The names of the scientists and scholars who helped with the interviews and discussions are on page 113.

We hope that the insights provided by these farmers will be useful not only to scientists and policy makers working on rice but also to all who are interested in increasing food production.

One message that all the farmers, irrespective of nationality, clearly conveyed is the need for additional opportunities for on-farm and off-farm employment and income in rural areas. This is the challenge we must face to sustain the interest of farmers in increasing the productivity of crops through the adoption of science-based technologies.

Responsibility for organizing the interviews, compiling the materials, and writing the introductory and concluding chapters was borne by M. B. Swaminathan. The book was edited by E. A. Tout, associate editor, and G. S. Argosino, assistant editor.

M. S. Swaminathan
Director General

# INTRODUCTION

"Before you teach the farmers," a Chinese peasant proverb advises, "listen to them." It is from such an attitude that this book was born. In writing it, we listened to successful rice producers who had developed packages of technology appropriate to their ecological environments and institutional settings. We hope the book will be a step forward in the ongoing dialogue between farmers and scientists, which is the source of meaning and purpose in agricultural research.

**Selection**

In 1984, IRRI decided to honor outstanding farmers on the occasion of its 25th anniversary. Nominations were invited from national research and extension agencies, the Food and Agriculture Organization (FAO) of the United Nations, and others. The nominations were examined by a committee headed by D.L. Umali, formerly assistant director general and regional representative of FAO for Asia and the Far East.

Criteria used to select the outstanding rice farmers were

- ability to adapt modern technology to local environmental and socioeconomic conditions;
- ability to develop simple, innovative, low-cost farm practices suited to local needs;
- willingness to share skills and knowledge with fellow farmers;
- dedication to community service; and
- promotion of self-reliance and ability to convert scientific knowledge into production gains.

## Methodology

Soon after their selection, a letter was addressed to all the farmers, asking them to record their experiences as successful rice farmers and community leaders. A questionnaire was attached as a guideline. Eleven of the 14 responded with a paper. The papers were very useful in gathering information about each farmer, especially in regard to their rice cultural practices.

The main data collection was a series of open-ended depth interviews. The main constraints were time and language. Because the 14 farmers came from 10 countries and spoke as many languages, it was evident from the outset that the major problem would be that of establishing rapport. It was therefore decided that each farmer would be interviewed by two persons, of whom one would be of the same country and/or language and would act as an interpreter as well as draw attention to less obvious cultural and social indicators.

Fortunately, the presence at IRRI of scholars from several countries made it relatively easy to recruit persons for this role. Each team consisted of an experienced researcher from the IRRI staff and a scholar from the same language background as the farmer. In two cases interviews were conducted by a single person, who shared the same culture as the farmer.

During several group sessions, a broad strategy was planned and a consensus reached about the interview process. A checklist of topics to be covered was prepared, to be used as a guideline for interaction rather than as a questionnaire to be filled out. The major emphasis was to be on the actual cultural practices followed by the farmers, the problems they identified, and their attempted solutions.

We also sought to elicit the expectations of farmers from science; their views on changing practices and issues; their expectations and attitudes toward government actions, and to the role of community or cooperative effort; and their attitudes toward the future of their families. Relevant personal and biographical data were, of course, necessary to complete the portrait. Because 2 of the 14 farmers were women, it was decided that the special problems, if any, of women farmers would also be probed and that the men would be questioned about the roles of their wives in farming.

During their 4-d visit to IRRI, the farmers were honored with a plaque and a citation summarizing their achievements. They also participated in discussions with scientists and scholars from several countries, visited IRRI experimental farms and laboratories, and met with many people, including the press. In the midst of a hectic schedule, time had also to be found for the interviews. Besides the farmers' natural

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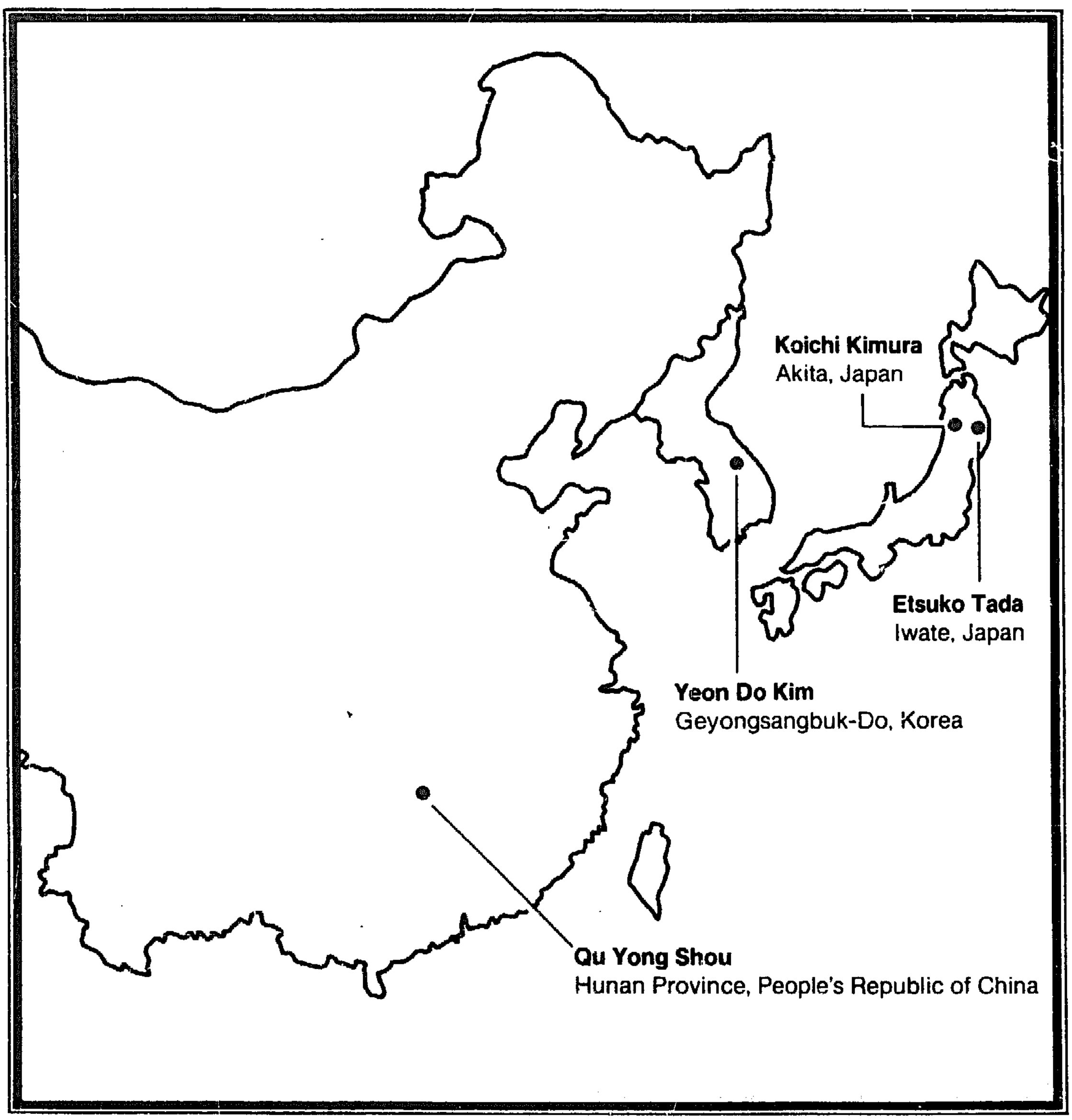
There is more to success than luck, hard work, and persistence. The last chapter examines what some of that "more" might be and draws the threads together. Now, here are the farmers, speaking about themselves.

# EAST ASIA



**Koichi Kimura**
Akita, Japan
**Etsuko Tada**
Iwate, Japan
**Yeon Do Kim**
Geyongsangbuk-Do, Korea
**Qu Yong Shou**
Hunan Province, People's Republic of China

*For introducing efficient and economical methods of mechanization of rice cultivation that helped women and the aged to practice high productivity rice farming; for her leadership in promoting cooperative farming; and for being a dependable consultant to farm families seeking information on rice farming and home life.*

# ETSUKO TADA

*Iwate, Japan*

"Being a woman farmer is not a handicap in successful rice farming," declares Etsuko Tada. Born in 1937 in the village where she lives, she became a full-time farmer 10 yr ago when her husband, a carpenter, died, leaving her with two school-going children to support. As a housewife, she had been active in the Home Life Improvement Circle and had learned something about farming by helping her parents, with whom she and her family lived. A junior high school graduate, she could have chosen to do something other than farm, but she felt challenged to prove herself in a field dominated by men. Besides, she is an only child and her parents' farm will be hers. Tada's early difficulties were cushioned by her father's technical advice and her own persistence and determination. Now, her innovative ideas have proved beneficial, not only to her family but to others.

**The farm**

Iwate prefecture is in northeastern Honshu Island. Tada's village of 1,000 households is near the center of the prefecture, about 30 min by car from the nearest city. Winter temperatures are below freezing, with a precipitation of 5-10 cm/mo. The ground is covered with 10-30 cm snow for 60-90 d periods. Although summers are warm, with 15-20 cm rain/mo, cold winds sometimes blow from May to July, which is the rice growing season. The area is fully irrigated by river water.

When Tada took over the farm, the rice fields were at several locations, and daily management was difficult and inefficient. Fortunately, the government recognized the problem, and with endorsement of the senior farmers and full cooperation of the farming community, the rice fields were consolidated. Distant parcels were sold or exchanged for nearer ones. Now her 1.37-ha rice field is in one parcel, 1 km from her house. Her field has been laid out for efficient water management and full mechanization.

**The agricultural calendar**

Tada's farming is mechanized from land preparation to postharvest handling of rice. She once used a small hand tractor to till her fields, but this was too time-consuming. It took her several days to prepare the land by herself, as hired labor is scarce. (Most small farmers have part-time jobs in nearby factories.) Now she shares a four-wheel tractor with another member of her agricultural cooperative. But she still finds use for the hand tractor on her upland fields.

May begins the planting season. With manual labor, it took 14 work days to transplant her 1.37 ha. In 1973, she bought a 2-row rice transplanter, the first in the village, which reduced transplanting time to only 3 d. She used it for nearly 10 yr before she got a 4-row transplanter, which halved transplanting time. Today, she shares a six-row transplanter with another family, and can plant her field in 1 d.

Harvest, in October, is the most gratifying moment in farming, Tada said. Then, all her efforts come to fruition. Harvest is the only time she asks help of other members of the cooperative. They use the cooperative's combine threshers. Immediately after harvest she takes her produce to the cooperative's small rice-processing center for drying and milling.

Farm mechanization makes life easier. Tada said that mechanization is not labor-displacing. In fact, it allows small farmers to augment their income with part-time jobs and to continue cultivating their land, which otherwise might have been left idle for lack of labor. She explained that were it not for mechanization, she could not farm as efficiently as she does. Tada's only complaint about farm machinery is of the seats — they were designed for men and are too cramped for comfort.

**The ingredients of success**

Tada's success in rice farming does not lie only in mechanization. In choosing the variety to plant, she considers its market price and susceptibility to lodging. She is inclined to plant varieties that command high market prices. Sasanishiki, a traditional Japanese rice variety with good eating quality, is susceptible to lodging, so she plants only 0.2 ha of it, mainly for home consumption. For commercial rice, she plants a slightly inferior variety, Kiyonishiki, on 0.6 ha. Kiyonishiki is early maturing and resists lodging. On a small portion of her field, 0.05 ha, she plants glutinous Sakakimochi. Yields average 6 t/ha.

The right amount of inputs such as fertilizers and pesticides can be applied only if the area is carefully measured, so Tada has meticulously measured and cleaned her fields. This helps avoid waste of inputs and minimizes production costs. Careful bookkeeping keeps track of the cash flows of various enterprises.

Commercial fertilizer is expensive. To lessen her dependence on it, Tada applies 10 t barnyard manure/ha. But she still uses 600 kg complete fertilizer/ha, soluble superphosphate with magnesium at 200 kg/ha, and calcium silicate at 800 kg/ha. Before land preparation, she applies manure collected from her two cows. It is a mixture of dung, decayed rice straw, and forage. She transports it to the fields in a self-powered trailer. This is the farm activity she hates, but she does it anyway to maintain soil fertility and minimize costs.

**A diversified farm**

Tada is not only a rice farmer. Her farm is highly diversified, integrating rice farming with livestock, upland crops, and forestry. On her 0.19-ha upland field, she grows soybean from May to September, followed by garlic in October. On an adjacent plot, she plants two crops of gladioli between April and September. These upland crops provide about 20% of her earnings. She does all upland crop operations herself, with some assistance from her mother, particularly during spraying. In the upland area, she practices organic farming.

About half of her forested area of 11.92 ha is planted with sugi, a timber species used in construction. The rest is natural forest. The sugi is not a reliable source of income, and Tada sells wood only when the price is high. The mushrooms that she grows in the woods are mainly for home consumption.

Tada keeps two breeder cows, which produce two calves every year. She sells them at 6 mo. She allocates 0.3 ha of land to forage grasses, which are harvested four times a year and stored dry. Her cows eat 50% dried forage, 30% rice straw, and 20% commercial feed concentrates. Sometimes she pastures them in the field. She spends about 1 h daily tending her cattle. Straw from the pens, leftover feed, and manure are her organic fertilizers.

## Sharing knowledge

Cold weather limits rice production in Iwate prefecture. *Yamase,* the cold northeast wind, often causes serious crop damage. Through the years Tada has tried different ways of combatting its harmful effects. She discovered that maintaining a certain level of water in the rice field raises the water temperature, so she raised the bunds on all her fields. She also removes the duckweed because she believes its presence lowers the water temperature. Each morning she irrigates her fields to maintain a water depth of 30 cm. Each practice has been helpful. For example, in 3 successive years, 1981-1983, cold weather affected the whole area; by her water level technique, Tada's yields were nearly twice those of other farmers.

The innovations that contribute to her success in rice farming are promptly disseminated to her fellow farmers and so is the new information Tada learns from experiment stations or agricultural journals. Tada is quick to say that she also learns from senior farmers in the area. In the village, she is almost the first to learn and adopt new rice farming techniques because of her willingness to collaborate and volunteer her field as a demonstration plot. Contact with technicians is frequent — three times a week. The flow of knowledge is not one-way, however. She learns much from the technicians, and they also learn from her. Although she is quick to adopt new ideas, she does so only after trying them on small plots.

## Unsolved problems

Pest control is a tough job for Tada. Every time she sprays she must carry a 19-litre knapsack sprayer on her back. Using a multiboom sprayer and with a little help from her mother, who holds the other end of the boom, makes the job faster. She said insect pests and diseases can seriously damage crops, and that weeds compete with crops for nutrients. Tada said the only readily available technology is chemical control, but using chemicals makes her uncomfortable because of potential health hazards to the farmer-user and the environment. She challenged scientists to develop safe, integrated pest controls.

She said that most problems in rice farming can be solved by developing appropriate varieties. For example, a cold-tolerant variety could minimize the damaging effect of cold weather and eliminate the burden of maintaining a high water level during cold months. A variety with high resistance to insect pests and diseases would reduce production costs and health hazards to farmers and the environment. Meanwhile, Tada makes the best of what is available.

**The cooperative**

Production costs in rice farming can be minimized by pooling resources with other farmers. The agricultural cooperative that Tada helped organize owns communal machinery with which the members can take advantage of the economies of scale. The eight-member cooperative owns large transplanters, two combines, and all the equipment in the small rice-processing plant (drying, milling, and packing) that Tada manages and operates.

Many village farmers have part-time jobs in nearby factories because their small farms cannot support their households. To make farming profitable for them, the cooperative introduced contract farming. The cooperative provides labor and power for all farm activities from land preparation through postharvest processing. Contract farming benefits both the farmer and the cooperative member, like Tada, who provides the services.

The cooperative receives government support. When it purchased heavy farm machinery, the government provided 60% of the cost as inexpensive credit. The remaining 40% was equally shared among the members. The government buys their produce through the cooperative. Tada said there are no private traders in their area. The cooperative also supplies the necessary farm inputs, charging slightly more to non-members.

Today Tada plays a dual role in the cooperative. Besides doing agricultural work, which still is dominated by male farmers, she is actively involved with the women's group by organizing home improvement activities. This group of 65 families processes soybean products and produces soybean paste and curd for home consumption and sale. This activity developed in 1970, when soybean became a major alternative crop following an overproduction of rice in Japan. In winter, when farm activity is minimal, Tada teaches ribbon flower making and knitting to women of the cooperative. For years, she has been involved with home life practices, labor-saving kitchen appliances, community cooking, vegetable and flower gardening, and care of the elderly.

**Recognition and rewards**

As a woman, Tada neither expects nor gets special treatment from fellow farmers, and modestly describes herself as "just an ordinary farmer." Yet her election as leader of the cooperative shows they recognize her abilities.

Her contributions to rice farming have not been unnoticed. In 1979 and 1984 Tada received an award for bookkeeping. During the 25th anniversary of the Home Life Improvement Project, she received a special prize.

As a group, the cooperative has received several awards for achievements ranging from agriculture to village life improvement. But Tada feels her greatest achievement is being able to support her family in comfort.

## Change

During the last two decades, Tada has observed many changes in her community. The most obvious, she said, are the rapid substitution of machines for animal power, and the changing role of women. Today, almost every farmer operates farm machinery, which has substantially reduced the demand for labor. Women's role in the farm has changed as a result. During harvest, women are responsible for cutting the rice near the bunds, which cannot be picked up by the combines. Women who can operate farm machines handle most farm operations, but such women still are very few.

With men increasingly seeking work in the towns, Tada observes that more and more women are becoming full-time farmers and she expects the trend to continue. Today, working hours are less than before, and life is more comfortable. But Tada, who acts as a go-between for marriages in the community, is disturbed by the increasing difficulty of finding brides for young farmers from rural areas. It seems, she says, almost as if city girls with a longing for nature are more willing to adjust to farm life.

Since her father's death in 1979, Tada has lived with her mother. Her daughter, who now has her own family, visits often, and her son, recently married, manages a restaurant in the city. She hopes he will one day become a farmer.

*For developing rice cultivation techniques that reduced by 60 to 70% the labor requirements for growing rice while harvesting more than 7 tons of rice per hectare; demonstrating a profitable rice farming system; and for being a selfless farm leader and adviser.*

# KOICHI KIMURA

*Akita, Japan*

Akita prefecture, known for its high rice yields, is located in northeastern Honshu, Japan's longest island. Koichi Kimura's hamlet in the Koyoshi River Valley has river-deposited sedimentary soil and is well-drained and fertile. This area receives less snow than some other parts of Akita, but crops suffer from some cold damage. Winter begins in November and lasts until February, with frosts sometimes even in May. In summer, as in the rest of Japan, typhoons cause much damage. Farm life is busiest from May to October. Farmers preserve their crops for winter. In spring, they collect ferns and bamboo shoots to preserve for home use.

Kimura's hamlet has 32 households, 12 of which share his surname. The hamlet is 20 min by car from the closest town of 5,000 people. Of the 1000 households in the town, 700 engage in agriculture but only 1% are full-time farmers.

**The daily routine**

Kimura, 37, is a hard working, full-time farmer. From spring to autumn, he and his wife go to the field before breakfast, as early as 4:30 a.m. Although it is only a few minutes from home, he drives his car because he expects a load to transport. At about 7:30 a.m., they go home for breakfast and return to the fields at 8:30 and work until lunch. During busy seasons, transplanting and harvesting, Kimura starts again at 1:00 p.m. Otherwise, he rests until 3:00 and works until 6:30. Free time is spent at meetings and lectures, with extension workers, or enjoying recreation sponsored by agricultural cooperatives.

Kimura also travels with members of the farmers' association to other farms to learn new methods of farming. Kimura enjoys working in the field and loves his farm very much. "Plants are living beings," he said. "If you take good care of them, they will never betray you."

**Family**

The Kimura farm belonged to his mother's family. His grandparents had no sons. They asked a young man to marry their only daughter, succeed to their surname and the land, and to care for them in their old age. The young man was Kimura's father.

The Kimura household contains an extended family, including his parents, and a younger brother, his wife, a son, and two daughters. Kimura's 35-yr-old wife, a high school graduate and a nutritionist at a local public school when she was single, has helped on the farm since they married, but he makes the farm decisions.

Kimura does not expect help from his children on the farm, but he wishes his son would succeed him, which is traditional in Japan. His son is in the 5th grade and has little time to spare from school activities. Kimura's parents are in their 60s. They help feed and groom the cattle, tend the vegetable gardens, and help ship mushrooms. The younger brother is a salesman and does not help on the farm.

**Crops**

The Kimura farm has 8.3 ha of rice fields, 0.2 ha of upland, and 20 ha of forest. One rice crop per year is grown on 7.3 ha, 0.2 ha is planted to asparagus, 0.4 has alfalfa forage, 0.5 ha is for vegetables, and 0.1 is in soybean. Kimura grows Sasanishiki, a traditional rice with excellent eating quality. However, it tends to lodge. Since 1984, 40% of the riceland has been planted to Kiyonishiki, which is early-maturing, high yielding, and less likely to lodge than Sasanishiki. His yields average 6 t/ha, with a maximum 7.5 t/ha.

Rice is soaked in April, transplanted in May, and harvested in October. Asparagus is planted in June, grows for 3 yr, and spears are harvested as they appear. Alfalfa is continuously grown and harvested, and soybean and vegetables are planted in April.

The forest is planted with sugi (Japanese cedar). The wood is used for making the best kitchen utensils and chopsticks. However, Kimura said the income from the forest is not yet worth the expense if he sells the wood for logs. In his grandchildren's time it may be valuable. To make the area profitable, he grows mushrooms in the forest, cultivating them on 36,000 bed logs. Each log produces 250 g of mushrooms. The mushroom income is almost half that from rice. Kimura's 1982 net income from farming was $57,200.

**Cultural practices**

Kimura said that local farmland once was in small, odd-shaped fields. Through land readjustment, patches of land were traded among individuals so that fields could be reshaped in a more uniform pattern. Larger, uniform fields have encouraged mechanization. Following the local practice, Kimura plows his fields once with a rototiller, then harrows them.

Fields are irrigated from ditches that were recently concreted. To pay for the construction, farmers agreed to contribute 3000 yen ($12)/yr for each 0.1 ha of farmland they irrigate. Payment will be complete in 25 yr, but Kimura expects that repairs will be needed long before then.

Kimura said that insects and diseases cause serious crop damage. The most common insects are stem borer, believed to migrate from China with the winds; stink bugs that damage rice at the milk stage; and water weevil which, Kimura said, was introduced by imported cattle feed. Other important insects are leaf beetle and leafminer. Kimura has not yet found the ideal controls and believes the insects return because he does not use the strongest chemicals.

Rat control is a community activity. Chemicals are mixed with mashed potato and thrown into rat holes in the dikes. Each household sends a representative to participate in rat killing three times a year. Kimura also keeps his fields clean to discourage rats.

Birds, particularly wild ducks, are a bother. Kimura said they are a serious problem because they eat the rice when it ripens. Farmers use various ways to scare them away, such as nets and noisemakers. Recently farmers tried putting up white plastic balls with red circles painted on them.

Weeds are controlled mostly by herbicides because labor for weeding is scarce.

Kimura applies organic fertilizer composed of rice straw and cattle manure. He said it is important for high yields because the nutrients the manure contains are necessary to keep the soil rich. He feels inorganic fertilizers are less effective in a cold environment and said organic compost disintegrates well in cold places.

Kimura raises cattle mainly for organic fertilizer and sells only one calf a year. It takes him half an hour a day to cut fodder from his farm.

The insurance company pays for veterinary services, including artificial insemination.

He applies an average 10 t organic fertilizer/ha. He would add more but it is all he gets from three cattle. He cannot keep more cattle because there is no labor to care for them. Although Kimura has more than enough rice straw to exchange for manure with other farmers who own livestock, the supply of organic matter is still not sufficient.

Kimura practices row sidedressing of inorganic fertilizer during transplanting. A device is attached to the transplanter that applies fertilizer near the seedlings at 4-cm depth. This encourages efficient fertilizer use and prevents chemical pollution of the nearby lake.

Fertilizer, insecticide, and seeds are usually purchased at the cooperative for cash. Kimura does not use credit to buy his inputs.

**Agricultural cooperatives**

The local agricultural cooperative, called the Nokyo, is a farmers' organization with representatives from each hamlet. It is supervised by the prefecture cooperative, and linked to the Japanese Farmers' Association, which has immense political influence.

Rice is marketed by the Nokyo at prices set by the government. Mushrooms also are marketed by the cooperative. Most of Kimura's mushrooms which are *Shiitake*, a much appreciated delicacy, are sold fresh. The price fluctuates widely, ranging from 5 to 50 *yen*/mushroom.

**Labor and machinery**

Rice farming, Kimura said, is a husband-and-wife affair. He handles land preparation but sometimes Mrs. Kimura operates the tractor. During transplanting, they ask relatives to help. From harvesting to drying, everything is mechanized. Kimura seldom employs laborers. He owns a tractor, a 6-row transplanter, a combine, 2 dryers, and a truck and trailer. Kimura tends the mushrooms and his family manages the vegetables and livestock. He willingly adopts new technology and often contacts extension workers. He also visits farmers of other districts, when time allows. Kimura regularly listens to the radio for weather forecasts, which he said are quite accurate, and reads the local newspaper, which provides good agricultural news. The major dailies don't have much about agriculture except in June when stories predict or discuss prices. The Nokyo library has agricultural magazines, which he regularly reads.

Extension workers from the agricultural extension office conduct about 150 seminars or classes on crop and livestock production each year. Farmers choose the sessions they attend. Attendance is optional, but encouraged. Kimura said he feels very close to extension and experiment station officers, saying "We are like a big family."

### Science, education, and farming

Kimura graduated from the junior agricultural college attached to the local agricultural experiment research institute. His teachers at college provided great spiritual influence. Kimura intended to become an extension worker but in school he was constantly taught the value of being a farmer. He does not consider his education or his degree an important factor in his success in farming. He attributes his success to what he learned from senior farmers, whom he describes as excellent full-time farmers, although they have had little formal education.

When asked what made him stick to farming in such an industrialized country, Kimura said he is happy as a farmer because he has the freedom to make his own decisions. He is successful because he concentrates full-time on his farm and so gets high yields, unlike other farmers who work at other jobs such as construction. Kimura is leader of the mushroom research circle in his town and an active member of Nokyo, where he heads the production section and formerly was president of the youth group.

### The future

Kimura feels scientists should develop rice varieties suited for direct seeding in cold climates, and should work to develop ways to prevent bird damage. He also thinks communication should be improved so that new information about farming will be more rapidly disseminated. Kimura said he will continue to encourage young people to adopt farming as a way of life.

*For performing practical field experiments that largely reduced rice flower sterility caused by cold weather, thus enabling rice farmers to surmount the cold injury problem and achieve yields of 17 tons of rice per hectare for 2 crops; and for converting his riceland into a demonstration farm where other farmers could learn better management techniques.*

# QU YONG SHOU

*Hunan Province, People's Republic of China*

China produces one-third of the world's rice to feed its more than 1 billion people. Its ability to feed its huge population depends on the millions of Chinese farmers who are willing to learn and try new things in agriculture. One of them is Qu Yong Shou.

Qu was born in 1931 in Kiangten township, Liling county, Hunan Province, where he completed elementary education. Today he lives in another village in the same county. His six-member family includes his mother, wife, son, daughter-in-law, and a grandchild. A married daughter lives in another county.

In 1965, Qu was elected team leader of the local agricultural production team, which includes 128 individuals from 24 families. His position enables him to interact with extension workers and gain access to technical information. He has been honored three times as a model worker at the provincial level, four times at the county level, and recently at the national level. He said he is successful in rice farming because of the leadership structure of the party, which supports farmers; access to information; and his own willingness to try what he learns from extension workers.

**Village, setting, and team**

Hunan Province is in central China. It has hot summers and cold winters. Qu's village, population 20,000, is 120 km from the county center, and well-connected by road. The village has one store, where all farm inputs are available. The rice farms, located in the hills surrounding the village, are irrigated by reservoirs that serve two counties. Water is not a constraint, although cold weather is. Only one rice crop is harvested each year.

In China, all arable land is owned by the State through its production teams. Before the present leadership, all members of Qu's production team worked together on the 6.8 ha of land and were paid according to their labor contribution. In the last 5 yr, however, as an incentive to farmers, lands can be operated more or less permanently by families, who try to produce more because they can enjoy the added profits. The Qu family is now entitled to the produce from 0.3 ha.

In addition to rice fields, Qu's production team manages a fishpond, fruit trees, a small forest for fuel sources, and a hand tractor. The land and machinery are rented for 5-yr periods to the highest bidders. The rental receipts are used for maintaining irrigation canals and farm roads and for welfare of the elderly.

Qu's production team is organized like similar teams throughout China. The 128 members are headed by a team leader who coordinates the economic activities of individual members and is more or less responsible for their socioeconomic upliftment. The team accountant records the business transactions and takes care of the property. The members are able-bodied working individuals older than 13.

## Farm capital and income

Although all land is State-owned, Chinese farmers can own production capital individually. Qu owns a 3.5-hp threshing machine and one carabao for family use. He also has an orange orchard, rears pigs and chickens, and grows vegetables around his house. Qu's annual income from all sources is about $5500 (Table 1).

**Table 1. Qu's annual income by source.**

| Source of income | | Amount (US$) | |
|---|---|---|---|
| Farming | | | |
| Rice[a] | 400 | | |
| Oranges | 2600 | | |
| Swine[a] | 600 | | 3600 |
| Representation | | 400 | |
| Salary as production team leader | | 16 | |
| Others (son and daughter-in-law) | | 1440 | |
| Total[b] | | | 5456 |

[a]Excluding rice (2 t/yr) and hogs (2/yr) for family consumption. [b]Excluding vegetables and seed oil for family consumption.

Table 2. Annual yields of the Qu farm, 1969-1984.

| Year | Annual yield for two crops (t/ha) | Growth (%) |
|---|---|---|
| 1969 | 7.2 | — |
| 1972 | 12.7 | 76 |
| 1976 | 14.9 | 17 |
| 1980 | 15.5 | 4 |
| 1984 | 17.0 | 10 |

Qu sells rice to the government after deducting the annual rice consumption quota of 2 t for a family of 6. A well-known farmer in his area, his expertise is acknowledged by the government. Many farmers visit his farm, and as part of government incentive to him, he receives $400 as a yearly representation allowance to cover the cost of food and drinks for visitors. His salary as leader of his production team is $16 per year. His son, a truck driver, contributes $1200 and his daughter-in-law, a saleswoman in town, $160.

Because his family is small, Qu hires, at a little less than $1 a day, members of the production team to augment his family labor force. His wife helps only during transplanting and harvesting. Most of her time is devoted to household chores, feeding the chickens and pigs and, more recently, entertaining their many visitors.

## Rice production trends

The cropping pattern is basically rice-rice, the first crop being from April to the first week of July. Land preparation begins right after harvesting. Stubble is incorporated into the soil as an organic fertilizer. Twenty days before the second crop is harvested in mid-October, seeds of red clover are broadcast on the rice fields. In the last week of May the clover is plowed under as green manure.

Table 2 shows yield trends. On Qu's personal portion of the farm, he has harvested annual yields as high as 17 t/ha. This marked increase in rice production was due to the introduction in 1969 of semidwarf, early-maturing varieties that respond well to high levels of fertilizer and have strong lodging resistance. Before 1976, keng was the major rice variety planted, but since then, hybrids that yield 20% more than keng have been introduced.

## Philosophy

Qu said he believes in "optimum yield with optimum input," a rational approach aiming at high productivity with limited cash inputs.

Fertilizer and water must be applied in the right amounts at the right time. His main indicator when to apply or not to apply fertilizer and water is leaf color.

The leaf color of high-yielding rice varieties follows the pattern "dark green — yellowish green — dark green." Taking as his starting point hints from many scientists and extension workers, Qu has devoted many years to closely observing the rice plant. It is his comprehensive knowledge of plant growth stages that underlies his management approach, and this is how he describes it.

From transplanting to late tillering, vegetative growth dominates. There is a rapid increase of leaves, roots, and tillers. Chlorophyll fills the leaves and they turn dark green. Healthy plants tiller early and rapidly and bear more productive spikelets. From young panicle differentiation to early heading, vegetative and reproductive growth are simultaneous and the growth of roots, leaves, and stems is accompanied by the formation of young panicles. Because most of the nutrients go to the development of young panicles, leaves become yellowish green.

Now, the plants have strong stems and thick erect leaves, which let light in. Healthy plants are resistant to lodging and pests. From heading onward, reproductive growth dominates. Leaf and stem growth stops. Leaves turn dark green again with increased chlorophyll to manufacture more food for the seeds.

## Cultural practices

Using leaf color as a guide, Qu cites four factors important to high productivity. They are strong seedlings, dense transplanting in small hills, rational irrigation and drainage, and effective fertilizer application.

Healthy seedlings are the first step to obtaining high yield. Seeds should be carefully selected, seedbeds intensively prepared, and seeds evenly and thinly sowed at a rate of not more than 1.1 t/ha. Appropriate nitrogen and high phosphorus and potassium fertilization is important.

Dense planting in small hills is important to regulate the relationship between individual plants and the group, between leading panicles and tiller panicles, and between panicles and grains. A good basic practice is to increase the number of hills and reduce the number of seedlings per hill. Normally, there are 4-6 seedlings per hill and about 25,000-30,000 hills/ha. Qu recommends planting 1-2 seedlings/hill at 13- × 17-cm spacing instead of the regular 13- × 20-cm. If transplanting is later than 15 July, there is potential for cold damage at heading in September. Planting fewer plants in a hill at closer spacing ensures a balanced relationship between the group and individual plants for light and fertilizers, the number of seedlings and panicles per hectare, and the development of individual plants for bigger and more panicles.

Qu relates water management to leaf color changes. Optimum water depth is 2.5 cm for turning plants green and about 2 cm during tillering. He suns fields at the proper time and maintains alternating dry and wet soil during seed filling. Standing water is necessary to discourage the growth of unproductive secondary tillers. In the middle of crop growth, mid-season drainage is necessary to improve soil aeration, encourage root growth, enhance nitrogen absorption, and accumulate more carbon dioxide in the stems and sheaths, thus increasing their vigor.

The rule for fertilizer use is "quick and heavy at early stage; additional food in the middle, and light and skillful application at the late stage." Early application is to ensure a desirable number of shoots, middle is for a desirable number of panicles, and the last is to fill the grains. Using this fertilization practice, Qu has reduced the rate of unfilled grains from 30% to 7%.

For the first 1984 crop, Qu spent $33 for 150 kg urea/ha, $20 for 150 kg potassium/ha, and $19 for 375 kg superphosphate/ha. Local insecticides were used to control stem borer ($10), leaffolders, and leafhoppers ($14). Qu does not apply herbicide to control weeds because it is too expensive, but said he may begin to this coming season because an inexpensive, locally produced herbicide will be available. The second crop received $29 of $(NH_4)HCO_3$ (375 kg/ha), $33 of urea (150 kg/ha), $20 of potassium chloride (150 kg/ha), and $27 of superphosphate (2.5 kg/ha), and the same amount of insecticide as for the first crop.

Qu has tested techniques to overcome sterility caused by low temperatures. When temperatures are low during heading, sterility percentage is greatly increased. In Hunan, the temperature sometimes drops below 15°C in late September. Qu suggests that topdressing fertilizer should be avoided when temperatures are low and that rice should be planted early to avoid heading during cold spells. Heading can be advanced by early transplanting or applying gibberellic acid ($GA_3$), or delayed by mid-season drainage.

**From farmer to trainer**

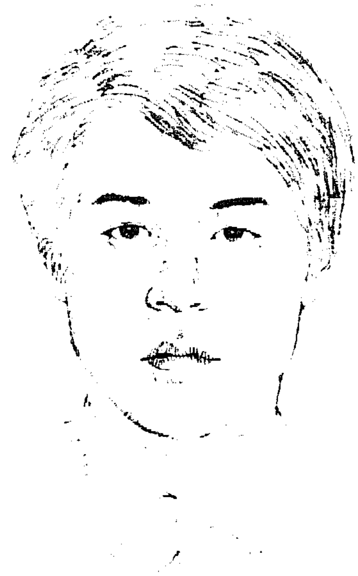
Rice management practices developed by Qu are receiving support from government and scientific research institutes in China. Booklets, photographs, and models have been produced to popularize them. From 1970 to 1981, 48 people whom he trained demonstrated his techniques in other places and harvested yields as high as 7.8 t/ha in a season. In 1975, Qu helped 200 farmers raise their annual yields for two crops from 10.1 to 16.3 t/ha. Scientists from the Hunan Agricultural College have studied his farming methods closely, and he taught students there by demonstration for 2 yr. Two students are living and training with him now.

Qu's goals are to increase the working efficiency of his group and to select those whom he is going to train. He feels they must have the patience and motivation to work with farmers. From scientists, he looks for the development of cold-tolerant varieties and hybrids suitable for the early season. With the support of scientists and government, he is confident that Chinese farmers will never let China go hungry.

*For harvesting more than 13 tons of rice per hectare, the highest ever in the Republic of Korea, using high yielding varieties and advanced farming technology; and for unselfishly sharing with others his successful farming experience.*

# YEON DO KIM

*Geyongsangbuk-Do, Republic of Korea*



Yeon Do Kim was born in 1960, the third son of a farmer with four children. After graduating in engineering from a vocational high school, he worked in the city for a year. Soon, however, he realized that he was not suited to engineering nor to city life. In 1980, he decided to dedicate himself to scientific farming.

At first, everyone — fellow villagers, relatives, and even his parents — laughed at his decision. His parents, especially, were disappointed, because they had expected him to find a better job in the city. Farming, they felt, was not an attractive job for young people. But Kim overcame those difficulties because he believed that rice farming could be profitable if scientific farming practices were adopted.

**Steps to success**

Realizing that technical knowledge was essential, Kim began to study new practices and characteristics of varieties through the farmers' training program and the technical services offered by the dissemination offices of the Rural Development Administration (RDA). The first year, his yields were good, but the second year his crop was damaged by cold. In 1982, Kim harvested 9 t/ha, which is 49% higher than the national average. In 1983, a farmer from his own county won the title *King of Rice Production* for harvesting 11.0 t/ha.

Encouraged and challenged by the potential of earning such an honor, Kim, with the help of the county rural guidance officer, developed a detailed plan to obtain the highest yield. He sought to improve the fertility of his land, achieve balanced fertilizer use, and efficiently manage irrigation water.

After thorough study, he selected a variety. At a demonstration field set up by the County Rural Guidance Office, he became very interested in Samgangbyeo. It yielded more than 10 other demonstration varieties and had resistance to blast, bacterial leaf blight, stripe virus, black-streaked virus, and brown planthopper. It also had good eating quality.

With this basic knowledge, he listened for more information about Samgangbyeo on radio and television and read about it in farming publications. Finally, he decided to grow it, and in 1984 bought 20 kg of seeds from the National Seed Supply Office. In that year, he harvested a record 14.0 t/ha from his 0.6 ha rice field, and earned the title *King of Rice Production.*

Kim joined the Saemaul (New Village) Rural Youth Club in 1975 and has served as chairman of the crop committee since 1980. He has also served as a contact farmer for the branch Rural Guidance office. He organizes his own workshops to help young people improve their farming skills and to increase their farming income. Kim has visited several research institutes to learn of progressive farming technology. Every year, demonstration plots are set up by the County Rural Guidance Office where they can easily be seen. Because he believes in the value of such demonstrations, Kim volunteered to have one in his field.

After he won the rice production championship, many farmers in the villages began seeking his advice about new farming methods. "That," he said, "makes me feel very proud." His wife, whom he married in January 1985, is active in off-farm activities of the Youth Club.

**Background**

Kim's village is 10 km west of the county capital, in southeast Korea. Nearby are a highway and a market. About 40 families, 200 people, live in the village. About 95% have the family name Kim and the rest are Lee.

The village is 50 m above sea level, with mountains on the northern side. Summers are hot and winters cold, and there is a large day-night temperature difference. Annual average rainfall is 1000 mm. All the village rice fields are irrigated with water from a reservoir 3 km away.

The irrigation facilities are well maintained and operated by the municipal land improvement cooperative. Farmers pay about $11/yr to use the irrigation system. Soil in the village is sandy and well-drained.

### The farm

Kim plants 0.6 ha of rice and 0.1 ha of upland vegetables, and tends 200 peach trees on 0.4 ha of hilly land. The farm belongs to his father.

Kim owns an 8-hp rototiller and a 5-hp multiple cultivator. He borrows a transplanter from his uncle, who lives in the same village. He also uses a power sprayer. Mechanization is essential, he said, because there are severe labor shortages in rural Korea.

Although Kim's major farm income is from rice, the peach orchard currently is more economically attractive than rice. Kim plants a rice-barley rotation. Rice is grown from June to early October and barley from mid-October to June. He also plants tomato, cucumber, watermelon, and honey melon in early spring in vinyl-covered hothouses, and keeps 3–4 beef cattle.

### Soil fertility

When he began farming, Kim found that the soil fertility of his field was low. He consulted detailed soil maps at the county agricultural office to decide how to improve the fertility of his land. He applied 1,040 t heavy clay soil/ha from a nearby hill, to his field in November 1982. The soil was readily available because of road construction and land clearing in the hills. Transportation and leveling were provided by small-scale contractors, who charged $5.50/5 t truckload, including leveling.

Beginning in 1982, Kim applied 20 t compost annually and 40 t in 1984. He also arranged for a detailed soil survey through the County Rural Guidance Office, which helped determine proper fertilizer rates and management. Recommendations for optimum fertilizer use were prepared by the Provincial Office of Rural Development, based on the soil analysis. Zeolite is used to prevent rapid loss of fertilizer. A large amount of compost is prepared during the year. Whenever time permits, Kim collects grasses and leaves from the forest for composting. Rice straw, night soil, and animal waste are added to the compost.

### Cultivation

Kim believes that 50% of the success of rice farming depends on seedling quality. He has developed a double-layered, vinyl-covered upland seedbed that protects the seedlings from cold and keeps them uniformly wet. The seedbed is properly ventilated and the vinyl cover is removed when temperatures are higher than 20° C. From screening and soaking the seeds to water management and pest control, Kim adheres strictly to scientific practices recommended by extension experts from the Rural Guidance Office.

Kim plows his field to a depth of 25 cm 3 times before transplanting. To achieve his record rice yield in 1984, Kim applied 280 kg N/ha, 290 kg P/ha, and 192 kg K/ha. His fertilizer application schedule is shown in Table 1. Hand weeding and herbicides were used to control weeds. On the recommendation of the County Rural Guidance Office, chemicals were applied nine times during the crop year to control brown planthopper, stem borer, armyworm, and blast, sheath blight, and bacterial leaf blight diseases.

Kim uses intermittent irrigation to promote root development and to reduce the number of tillers that do not bear panicles. He drains the field 40 d after flowering.

Kim checks his field at least twice daily and says this is how he came to understand the nature of the rice plant. He does all the farm work, with some help from his family and members of the Saemaul Youth Club. His parents are not very active on the farm. At transplanting, Kim must hire up to 45 workers. Informal labor groups are usually made up of local youth who transplant the farms by rotation.

Kim has had no difficulty with credit, marketing, or input supplies and he appreciates government efforts to help farmers through fertilizer subsidies and rice support prices.

But he is concerned about the high cost of insect pest and disease control, and hopes that scientists can develop varieties with stable performance and multiple insect and disease resistance. Because compost-making requires much time and labor, Kim would like to know about chemical fertilizers that can replace compost but retain high soil fertility.

## The future

In the future, Kim said he plans to gain more farming experience and to break his own rice production record. He spent more than 250 d last year in farming, and said he firmly believes that farming will regain

**Table 1. Fertilizer application schedule for rice crop in 1984.**

| Fertilizer | Total (kg/ha) | Basal (kg/ha) | Topdressing (kg/ha) | | |
|---|---|---|---|---|---|
| | | | Tillering | Panicle initiation | At 80% flowering |
| N | 280 | 134 | 78 | 58 | 10 |
| P | 290 | 290 | — | — | — |
| K | 192 | 134 | — | 58 | — |

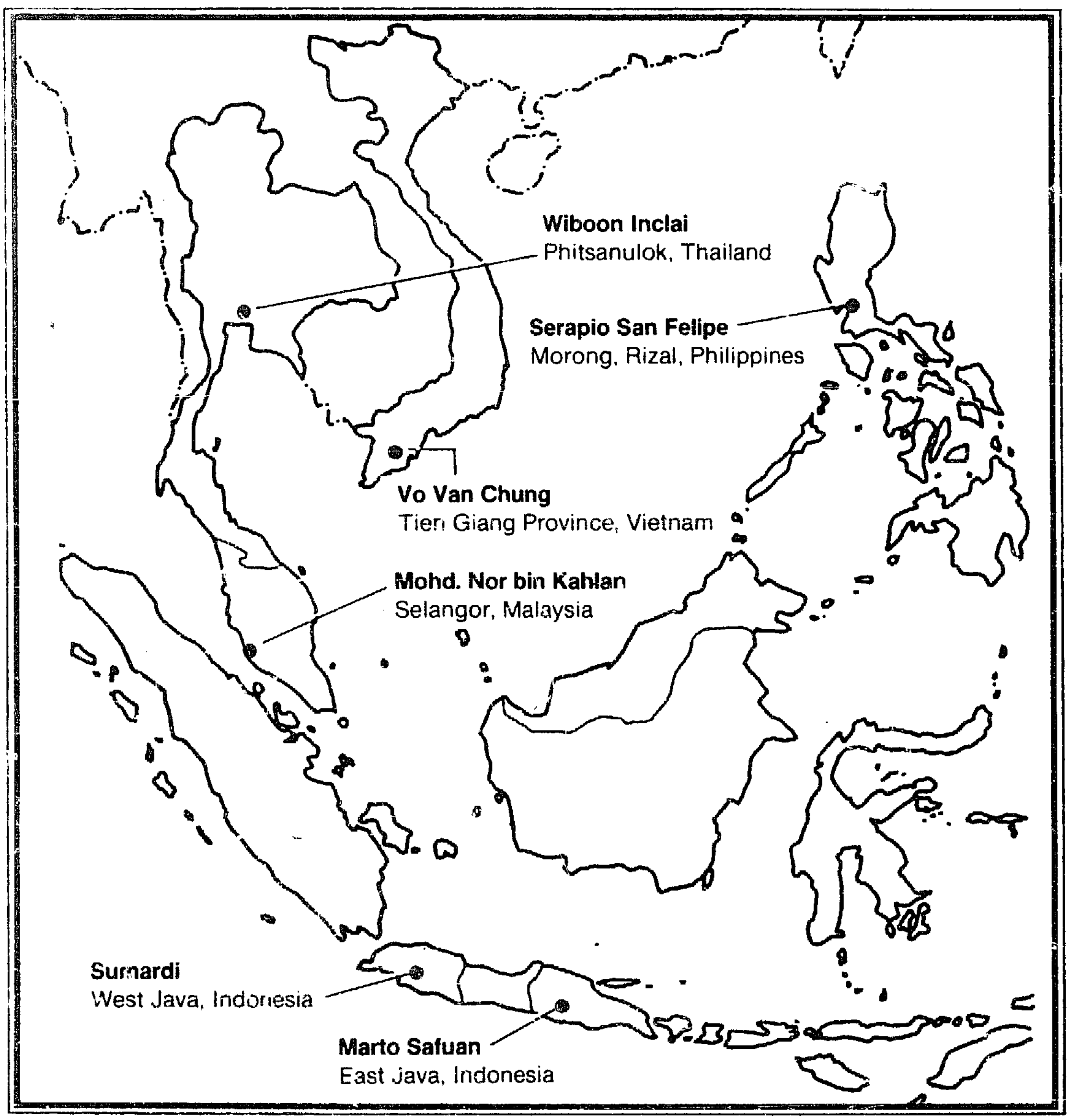
popularity among Korean youth, although many today are seeking their future in the city.

Kim said that the dedication of individual farmers, scientific farm practices, cooperation among farmers, excellent extension efforts from the Rural Guidance Office, and strong government incentives are behind his success and will continue to be important factors in the prosperity of farming in Korea.

Kim said he plans to form a small contract farming group, an enterprise which is becoming popular in Korea, as it is in Japan and Taiwan, China. Because of severe rural labor shortages, many elderly farmers are no longer able to farm their land. For a fee, contract farmers manage these farms from seeding through harvest. The contractors have farming expertise and furnish machinery such as cultivators, transplanters, harvesters, and combines.

Kim said he will continue to persuade his friends and neighbors to return to farming, where he believes they can find a better future and a happier life than in the city.

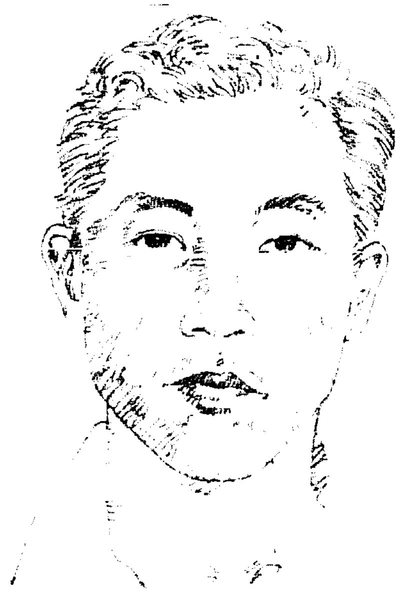
# SOUTHEAST ASIA



*For developing an economically and socially viable village cooperative that collectively prepared group production plans, carried out essential farm operations, and secured production inputs, credit, and services to increase rice production and promote nonfarm activities, which increased family income and savings; and for encouraging among members self-reliance and the awareness that personal interest is secondary to the interest of the community and that the basic element of leadership is good example.*

# MARTO SAFUAN

*representing*
*SUMBER KARYA TANI FARMERS GROUP*
*East Java, Indonesia*



Marto Safuan lives in his ancestral village of Sendanghaji, in Tuban district in east Java. The village is 2.5 km by dirt road from the nearest town of Merakurak and 8 km from the nearest city, Tuban. Both have markets. Topography is relatively flat.

Sendanghaji has about 1,075 residents, mostly Javanese and Moslem, most of whom work in agriculture, either as farm owner-operators, hired labor, or a combination thereof. Family farms dominate, but some large farms hire nonfamily labor.

There are two seasons — wet (November to May) and dry (June to October). Average annual rainfall is 146 mm, most of which falls in the wet season. Two creeks are the main source of irrigation water, which is carried by a canal system. The soil is clay loam.

### Family and farm

Safuan was born in 1949 and completed 6 yr of elementary school in 1962. He started helping his parents on the farm at age seven. His wife, 34, completed secondary school. They were married in 1965 and have three daughters aged 16, 14, and 12. The first is in the second year of high school, the second has finished the third year of secondary school, and the youngest has graduated from elementary school. Safuan's mother and mother-in-law live with them, as does a male laborer who works with him on a long-term stay-in contract. Additional labor for peak farm operations is hired.

Safuan inherited from his parents 1 ha of lowland rice field and 0.2 ha of house and garden. He has bought 0.5 ha more lowland rice fields, a little at a time. Most of his time is spent farming, and rice farming contributes most to the family income. Other activities include raising 3 cows, 5 sheep, 40 chickens; managing a fishpond; growing vegetables and fruit; buying and selling sheep; and participating in village life. His income from animal production in 1984 was about $112 from cows, $36 from sheep, and $34 from chickens. He earned about $16 from vegetables and $161 from buying and selling sheep. Net income from his 1 ha rice field was $1,229.

Safuan said only his wife helps him in farming, especially transplanting, weeding, and harvesting. Their three daughters help in household chores. He hopes that one daughter will follow him as a good farmer, and that the others will continue to study and then get good jobs. Planting improved rice varieties has increased the Safuan family income significantly, so he can easily finance his children's education.

### *Sumber Karya Tani* farmers group

The *Sumber Karya Tani* farmers group was established in November 1981 with Safuan as its chosen leader. The group has 76 farmer members with an organized land area of 42.77 ha. For yield and management competition, however, the group decided to include only 30 farmers and 25.6 ha in 1981-82 wet season and 40 farmers with 28.5 ha in 1982 dry season. The other members were excluded from competition because their rice fields have deep water and are unsuitable for modern rice varieties.

The group has nine divisions: 1) land preparation, 2) irrigation, 3) seedling, 4) farm inputs supply, 5) product marketing, 6) insect and disease control, 7) credit supply, 8) library, and 9) rural broadcasting. The head of each division is responsible for collective needs of the group in the respective activity area.

The group meets every 35 d, but the leader may call special emergency meetings. Before land preparation, the group usually schedules transplanting. This is the most important agreement in the group, because key reasons for forming the group were to encourage synchronous planting and to develop cooperative land preparation.

Based on an agreed-upon transplanting schedule, each subgroup decides when to start land preparation. Cooperative land preparation is mainly for plowing and harrowing among farmers within a subgroup. If Farmer A plows 1 d for Farmer B, then farmer B will plow 1 d for

Farmer A without pay, but with food. If B needs more help than A, the excess working hours are considered as hired labor and reimbursed in cash and food.

The group leases a car to transport farm products and for other purposes, and has organized a kindergarten with other farmers' groups. Some members have become tutors in literacy classes. The group also offers sewing machine training.

The Sumber Karya Tani farmers group won the district rice competition in 1981-82 wet season, the provincial competition in 1982 dry season, the national competition in 1982-83 wet season, and was third in the provincial competition for village greening.

Among many prizes won have been a car, 2 tape recorders, 2 mist blowers, 3 television sets, 5 sewing machines, 6 pedal threshers, 15 hand sprayers, 20 rotary weeders, 20 cows, 100 plates, 200 kg rice seed, 300 kg urea, and $4,492 in cash.

## Changes in rice farming

The lowland rice fields of the village are in two different areas. One is high and has manageable water through irrigation and the other has deep water. Before the introduction of modern rice varieties, cultivation practices in both areas were similar. The crop rotation was rice - secondary crops, but some farmers harvested a rice ratoon crop.

After modern rices were introduced in 1978, the crop rotation changed to rice - rice - secondary crops on the upper fields, but remained unchanged in the deep water area where modern varieties will not grow. On the upper fields, the cropping pattern is first rice, November-March; second rice, March-July; and secondary crops, July-October. Secondary crops are usually an intercropping of soybean and maize.

Changes in the crop rotation have significantly increased the use of both family and hired labor. Not only do the farmers grow two rice crops, but the new varieties generally need more management. Hired labor still is plentiful, however. Farmers check the rice fields almost every day for insects and diseases, but insecticides are applied only if there is an indication of an insect attack. The extension worker visits the field every 2 wk.

The average yield of IR36 is about 7.5 t/ha (dry grain ready for milling). Traditional varieties yielded 1.5-2 t/ha. Soybean yields 800 kg and maize 900 kg/ha. Because of the short-duration varieties, farmers have time for proper harvesting, threshing, and drying of second rice before planting secondary crops.

## Learning

Safuan first learned farming from his parents as a child. He said there is no need for a college education for rice farming; grade school is enough. Practice and experience, however, are all important. Since 1978, he has learned about new practices from extension workers, radio and television, and agricultural magazines.

In 1978, he received C4-63 seed from the extension worker, grew it, and harvested 4.2 t/ha. In 1979, he grew IR20, IR30, and IR34, but was not satisfied with the yields. In 1980, he began planting IR36, which yielded 8 t/ha. He has planted it ever since.

Because Safuan is a contact farmer, field extension workers talk with him about introducing new rice varieties and use his farm as a demonstration plot. Other farmers in the group usually wait and see, and then plant the varieties that performed best. The group grows the same variety at the same time to achieve almost homogenous production levels.

## Problems in science and technology

Rats are a major pest and were particularly bad in 1977, when it took tremendous community effort to control them. Although recent attacks have not been bad, Safuan still fears another attack. Brown planthopper was a major problem in 1978-79 wet season, but it has been partly overcome by synchronous planting of resistant varieties and by applying some insecticides. A persistent problem with no present solution is the lack of suitable deep water varieties. He hopes that science will find an answer soon.

Safuan said he likes IR36 very much because it is resistant to insects and needs little insecticide. However, he notes that only with high inputs do modern rice varieties yield higher than traditional rices. On Safuan's deep water rice fields, he grows traditional varieties with good eating quality. On higher fields he plants modern varieties, which he sells. He would like scientists to develop rice varieties with very high yields, good eating quality, short duration, long dormancy, and resistance to all insect pests and diseases, so no insecticides are needed. He frequently says that insecticides are dangerous to humans.

Although he said that he is willing, Safuan has had no chance to try machinery for land preparation because there is no shortage of animal power. Moreover, he said it is important to keep draft animals because they, especially cows, provide manure, give power for land preparation, produce calves to be sold, and are an income buffer during crop failure. Animal manure is particularly important because the intensive cropping pattern does not allow time for a green manure crop.

### Government support

Safuan appreciates the Indonesian Government's tremendous support to rice farmers, which has helped introduce technology to increase rice production. The government provided extension services and mass communication media, fertilizer and insecticide subsidies, seeds of new varieties, input and cash credits, rice marketing assistance, and assistance to village cooperatives.

Before the new rices were introduced, there were few agricultural credit institutions. When the new varieties were introduced, farmers received credit as a package of seed, fertilizer, insecticide, and some cash to finance land preparation. Today, Safuan said, if farmers can achieve high production, they prefer to finance their own farming rather than depend on credit.

Once, rice was marketed by the village community and by middlemen. The introduction of new rice varieties was complemented by *Cooperative Village Units (KUD)*, initiated and fully assisted by the government. The cooperative supplies inputs to farmers and markets their rice. Farmers sell most of their rice to the Cooperative Village Unit, Safuan said, but last year the cooperative did not have enough money to buy rice. The farmers had to sell to middlemen at relatively lower prices. Safuan said he hopes the government will now pay more attention to marketing.

### The group leader

As leader of the Sumber Karya Tani farmers group, Safuan is responsible for its success. He said his best year was 1983, when his group won the national rice/special rice intensification program competition and he was invited to the presidential palace to receive their prizes.

As leader of the farmers' group, he spends much time working for it. There are many meetings and many visitors, he said. "I am happy to do this work, it is a challenge to build a better life for my village." The reasons for their success, he said, are "cooperation, diligence, and patience in following the instructions of the field extension worker; solidarity; good planning; and discussion among group members."

*For his success in semimechanized rice farming of transplanted, broadcast, and drilled rice; and for being a dynamic model farmer in demonstrating new rice production technology to others and thereby becoming a leader in technology transfer.*

# MOHD. NOR BIN KAHLAN

*Selangor, Malaysia*

Mohamad Nor bin Kahlan was in the arrival area of Manila airport for quite a while after his plane landed before he was noticed. He had changed some money and waited quietly in a corner until Zaney, the Malaysian scholar from IRRI who was his interpreter, came up and asked if he was Mohd. Nor bin Kahlan.

The day that followed, he said, was the crowning glory of his 20 yr as a full-time farmer. Never in his wildest dreams had he expected to travel to another country to receive an award for being an Outstanding Rice Farmer of the World.

**Wak**

Wak, as Zaney and other Malaysian scholars politely address Kahlan, is a native of Sabak Bernam, Selangor, in central west Malaysia. He cannot tell the day of his birth, but he knows from his parents that 48 yr ago, a coconut tree was planted near their home to mark his birth. His village of about 300 families is on a coastal plain where rice and coconut are grown. Selangor has marked dry and wet months. June and July are the driest months, and October to December are the wettest. The main rice growing season is October to March.

Wak has two daughters, one of whom is married and lives in her own home. He owns 3.6 ha of riceland, 1.2 ha inherited from his father, and the rest of which he bought. He learned to farm from his parents when he was a boy. By age 25, he began to seek out other sources of knowledge, such as other farmers, government extension workers, and scientists.

Today, he is a prosperous farmer and owns a two-wheel tractor — one of many things he has been able to buy since modern rice farming methods have provided him stable high yields and income. Wak grows 2 rice crops a year, and harvests an average of 6.5 t/ha each season. He earns about $880 from each crop.

Wak said his high yields do not depend on a magic formula. He plants high-yielding rices such as MR1 and MR48, developed by the Malaysian Agricultural Research and Development Institute (MARDI), and those recommended by the Department of Agriculture. And he integrates into his farming operation new technology that he learns from extension agents, other farmers, and farmer associations. He feels sorry, he said, for those farmers who do not take advantage of the new technologies. Wak said he is fortunate to have been the first MARDI farmer cooperator to test improved varieties in his area. His long association with MARDI has given him easy access to new varieties and improved technology.

## The Farmers' Association

Wak is not one who keeps technology to himself. In the field, at home, or in group meetings, he is quick to share his knowledge with fellow farmers. This has made him popular, and when the government needed someone to represent the farmers of his village in an association, he was chosen. His experience eventually made him head of the local Farmers' Association.

Wak's Farmers' Association was established in 1973 and serves its members by providing credit. Before the Association, there was no nearby credit institution and farmers found it hard to obtain credit. To be an Association member, a farmer pays a membership fee and buys at least $10 in shares. In addition to providing credit, the association rents 2- and 4-wheel tractors and a seeder and combine harvester-thresher. Initial rototilling by the 2-wheel tractor would cost $64, and succeeding rototillings would entail $24 per operation. Using the combine costs $2.40/80 kg sack of grain. Association members may rent the machinery.

## Rice farming practices

The 3.6 ha of rice that Wak cultivates is in 4 parcels among other fields in the irrigated area near his house. He both transplants and direct seeds by broadcasting or drilling. Many poorly leveled fields in his area are unsuitable for direct seeding. Although Wak prefers direct seeding because it requires less labor, most of his fields are transplanted. Government zoning requires some areas to be direct-seeded and others to be transplanted.

Wak prepares his fields for transplanting by cutting and burning the rice stubble. He then rototills the dry fields twice, followed by harrowing to break up the clods. When direct seeding, he begins irrigating the field 20 d after seeding, and applies herbicide and the first of 2 splits of urea fertilizer 5-10 d later. If necessary, he supplements herbicide application with hand weeding.

Whether direct seeding or transplanting, Wak generally plants a 135-d rice variety. For his transplanted fields, Wak soaks 35 kg seed/ha for 2 d and then incubates them for 2 d before planting on a nursery bed in a corner of the main field. The bed is raised a few centimetres above the soil, spread with rice straw and then coconut leaves, and covered with a thin layer of soil. The seeds are broadcast and then mulched with rice straw. After a week, seedlings are transferred to hills in a field nursery and after 25 d are transplanted.

After transplanting, Wak topdresses urea and granular insecticide and herbicide. He applies a second equal split of urea at panicle initiation. Each farmer in his area receives from the government enough fertilizer and pesticide for a 2-ha field. Herbicides needed at land preparation are always available. Insecticides are available on a need basis.

Although his fields are irrigated, Wak sometimes has difficulties because they are not level. To minimize possible drought, he impounds 8-10 cm of water in his transplanted field 20 d before sowing the nursery. If irrigation water is available, he maintains 15-20 cm in his fields until 20 d before harvest.

Transplanting, weeding, and sometimes harvesting are strongly hand-labor-dependent and usually done by women. Transplanting, in particular, is women's work. In the last 20 yr, labor requirements have significantly increased and womanpower has been more important than ever. In addition to the labor that Wak, his wife, and daughter provide, he hires one permanent laborer for machine operations and has contracts with about eight workers for specific tasks. He pays about $96/ha for transplanting. On the role of women in agriculture, he said in a gentle voice, "I don't mind my wife and daughters or other women working on the farm. They are specialists in some farm activities. For example, women farmers are better transplanters than men."

## Production constraints

Besides recurring irrigation problems, Wak complains of pest problems and the shortage of labor and machinery in his village. "Sometimes," he said, "a farmer loses his entire crop when insects attack." Rats are the worst pests. He uses 83 g zinc phosphide/ha on bait to kill rats, but laments that, "For every bait only one rat dies." Although the farmers work hard to keep their fields clean, and occasionally conduct rat killing drives, rats migrate from coconut plantations and other areas. On the question of pests in general, Wak said, "If I were a scientist I would concentrate on finding better ways to control pests."

Today, because young people no longer like to work on the farm, labor is scarce during peak demand. Wak is interested in mechanizing as much as he can. Marketing and transport are no problem because he sells to the National Rice Authority.

## Government support

Wak said the Malaysian government has always been attentive to farmers' needs. He appreciates input subsidies, the rice support prices ($6.60/100 kg), and the technical advice given by the extension service. He believes support should continue, especially for developing better pest-resistant varieties and providing farmers technical assistance. He said the government should not only take measures to increase rice production but also encourage people to stick to rice farming as a way of life.

When asked what changes he would make if he were Minister of Agriculture, Wak said, "I would make sure that extension workers really do their job in transferring practical technology. They should see to it that farmers understand and follow their advice." However, he considers being a Minister a remote possibility, because he lacks the necessary education. He reached only sixth grade in school. But this does not keep him from social and political activity. In addition to being a farmer leader, he belongs to the Village Development and Security Committee, the Government Mini-Estate Rice Farming Project, and the United Malay National Organization, the majority political party.

## Other crops

In addition to rice, Wak and his wife tend 1 ha of coconut-cacao plantation in 3 parcels around the village. Most of this area belonged to Wak's father. Wak said the plantation is his wife's domain. She spends most of her time in it weeding, applying fertilizer, and supervising its harvest by hired laborers.

The plantation produces 7,000 coconut/ha. They planted cacao under the coconut trees in 1969, started harvesting 4 yr later, and harvest stable monthly yields of 200 kg/ha of unprocessed cacao seeds. Cacao yields declined by 50% in 1980, which was attributed to lowering of the water table caused by frequent diggings and drainage development in the area. The family also keeps 30-40 native chickens for home consumption.

**Rewards from farming**

Wak spends about 60% of his time farming, which is his total livelihood. He said farming has provided his family with many amenities. They own a refrigerator, a television set, and even a telephone. Wak also has a motorcycle, which he drives to the National Rice Authority or the Federal Marketing Agency in the town about 1.6 km away, to sell small amounts of his farm produce.

Once, Wak and his family ate mostly vegetables and fish. Their hard work and innovative management now allow them to enjoy a more balanced diet that includes chicken and meat. Wak said he will allow his 15-yr-old daughter to decide what educational degree to take. But he would be happiest if it were in agriculture. Actually, he said, he doesn't really mind if his daughter completes a degree or not because, "When she gets married, her husband will take care of her anyway. In fact, my older daughter, now married and with two children, completed only the fifth grade."

*For attaining steady production of more than 10 tons of rice per hectare by planting high yielding varieties and following good soil fertility management involving compost composed of animal manure and crop residues and the application of chemical fertilizers; and for being the earliest effective barefoot technician deputized by the Ministry of Agriculture and Food to help rice farmers in nearby communities.*

# SERAPIO SAN FELIPE

*Morong, Rizal, Philippines*

Filipino Serapio San Felipe, 50, began farming 33 yr ago, when he was 17 and newly married. San Felipe, who has six children and three grandchildren, does not own the land he tills, but farms under a rice sharing arrangement. After deducting the harvesting and threshing shares, 25% of the net produce goes to the landowner and 75% to San Felipe. He pays all expenses. San Felipe's only inheritance from his parents was a 100-$m^2$ residential lot, where he built a 2-storey house.

**The family**

San Felipe chose to invest in education rather than in land for his children. His five boys and one girl were raised and schooled out of his farm earnings. Three of his children have college degrees, and another is about to graduate. The eldest son, 31, is a high school graduate and will most likely follow in his father's footsteps. The son is married and has two children. He tills 0.5 ha of the farm for his own family and helps his father operate the rest. San Felipe's daughter is a commerce graduate and works as a clerk in the Ministry of Agriculture. The second boy is a radio-TV mechanic and the third manages 1000 $m^2$ of fishponds and fish cages along Laguna de Bay. The two youngest are students. San Felipe said his sons are very helpful on the farm. They work in the fields before going to school or work, and fill in for him when he goes fishing.

His wife Melba, 52, helps on the farm but she spends most of her time marketing their produce — vegetables, fish, and rice. A typical housewife, she manages the house and sees to the needs of the whole family. Once, she operated a small general store in front of their house, but gave it up because customers did not pay their debts.

### The farm

San Felipe's farm is in Rizal Province in southern Luzon. The town of Morong is 40 km from Manila and easily accessible by road. The 3.8-ha farm is on the shore of Laguna de Bay, the largest lake in the Philippines. Part of his fields are flooded during heavy rains or typhoons. There are two distinct seasons — 5-6 dry months and 5-6 wet months. The heaviest rains are from June to September.

The farm has six fields. It is generally flat, with loamy, fertile soils. San Felipe's oldest son cultivates one field. Of the 5 remaining fields, one 0.75-ha parcel is rainfed and planted to rice only in wet season. The remaining four fields are pump irrigated. Two of them (1.3 ha) are planted to rice in wet and dry season, a 1-ha field is planted to rice, vegetables, and fruit trees, and 0.3 ha produces a combination of rice and fish. The farm is 4 km from town and about 200 m from the San Felipe house.

Aside from farming, Mang Serapio, as he is popularly known, goes fishing once or twice a week for home consumption and additional income. He sells about $2.25 of fish a week.

### Rice production

In wet season, Mang Serapio plants about 1.0 ha of irrigated rice and 0.75 ha of rainfed rice. In dry season, he plants about 2.0 ha of irrigated rice.

During the early fifties, when Mang Serapio planted traditional rices, his yields were just under 2 t/ha. When he adopted modern varieties, his yield jumped to 6-9 t/ha. His highest yield was 11-12 t/ha.

Mang Serapio uses a hand tractor and buffalo to plow his fields, then harrows them by buffalo 3 times at 1-wk intervals. Two tonnes of chicken manure are spread on the fields just before plowing, so it decomposes and can be easily incorporated in the soil. Chicken manure is less expensive than commercial fertilizer and conserves soil fertility. Herbicides are applied to control weeds and fields are hand weeded when necessary.

Thirty-five days after transplanting, fields are drained and dry until the soil cracks. On the 45th day, urea is applied and the fields are irrigated. San Felipe said the fertilizer enters the cracks and when water is applied the nutrients are easily absorbed.

The fields are irrigated through a pump system owned by the local cooperative. Members buy the diesel fuel and pay 10% of net production in dry season and 5% in wet.

San Felipe harvests his fields by hand, with a sickle, and he uses a small thresher, which he owns, to thresh the crop. Harvesters and threshers receive one-seventh of the grain, but pay Mang Serapio one person's share for the use of the thresher. The rice is cleaned and hauled by the harvesters, but the family spreads it along the concrete road to dry. Grain is stored in the house and in a small warehouse at the back.

Mang Serapio used to sell his produce to the National Food Authority, but because of red tape, delay, and low prices, he now sells to private dealers who offer better prices and good service. He does not sell immediately after harvest, but waits until prices rise.

San Felipe estimates that excluding his own efforts, 80 labor days/ha are needed to manage the farm. Laborers are hired only for transplanting (10 labor days) and harvesting and threshing (36 labor days). All other labor is provided by the family.

## Profitability of rice farming

For the last 5 yr, Mang Serapio has consistently harvested an average 9 t/ha from his irrigated riceland. Recent average production costs have been $277/ha. After deducting 14% of production gross as harvester and thresher share, 10% of net for irrigation fees, and 25% as the landlord's share, his net earnings are $722/ha. In addition his wet season crop, which yields 6.8 t/ha nets him $494.

Mang Serapio has few problems in rice farming, except for typhoons and flooding, and a weed locally known as *apulid* which is impossible to control by herbicides. It can only be controlled by pulling or, if there is stubble in the field, burning. Mang Serapio has no trouble obtaining credit because he promptly repays loans. Some of his neighbors, who are delinquent payers, have difficulties, he said.

## Other farm operations

Combined rice and fish culture occupies 3,000 $m^2$ of San Felipe's farm. A small, 1,000-$m^2$ fishpond is used for tilapia fingerling production. The rest is planted to rice. Vegetables such as string beans and yam are planted along the dikes.

Last year, the San Felipes sold $278 of fingerlings and used the rest of their production in the fish cages. Fingerling production expenses are minimal. The fish are fed rice bran left from the milling process and a few kilos of leftover complete fertilizer. Mang Serapio has also raised fish in the ricefields in wet season — a technology from Central Luzon State University.

Vegetables and fruits such as string beans, eggplant, okra, gourd, banana, guava, and guyabano are grown in 0.3 ha. Some produce is used for home consumption and the remainder is sold in the nearby market or around the neighborhood. If the season is favorable and the market good, Mang Serapio earns an estimated $500/yr from this land.

Mang Serapio also keeps five buffalo as work animals, two pigs for home consumption, and five cows. He started with one cow, which he won as a prize for his National Farmer of the Year award in 1981. Animal feed is rice straw and grass gathered from the farm. He has not needed purchased feeds or veterinary services, and has sold two cows for $361.

### Success

Before 1966, San Felipe was just an ordinary rice farmer who harvested less than 2 t/ha from traditional varieties. He depended on his landlord and private persons for credit. Life was hard and farm earnings were barely enough for his family's needs.

In 1966, his farm practices changed. The Agricultural Development Council for Rizal (ADCR) was launched to bring technology and financial assistance to the local farmers. Mang Serapio was one of the first to attend seminars to learn how to improve productivity, and was an early recipient of the supervised credit program of the Agricultural Credit Administration (ACA). ADCR became the nationwide Masagana 99 program for increased rice production. With ADCR help, Mang Serapio began to adopt the improved farming methods that were to more than double his production and income.

San Felipe was the first farmer in his area to follow ADCR recommendations and to plant IR8. He recalls that his neighbors laughed at him, saying that he was being fooled by the extension men. When his fields yielded 6.8 t/ha, he returned their jokes, saying that IR8 was indeed a miracle rice, for the piles of paddy went on increasing as you harvested them. Thereafter, other farmers bought seed from him.

San Felipe said he was successful not only because of his hard work but because of the technologies he learned from seminars. He was, and is willing to take risks and have faith in government programs for small farmers. "I have learned a lot from training," he said, "and from visits to scientific institutions like IRRI and the University of the Philippines at Los Baños."

San Felipe was selected as an outstanding farmer in the region in 1977 and for the Philippines in 1981. He has also been very active in disseminating information as a speaker in seminars and training courses, and he said he never hesitates to help other farmers. As a model farmer, he has been an effective "barefoot technician."

## Thoughts on farming

When asked about the most important problems faced by farmers, San Felipe immediately complained of the increasing prices of inputs and the low prices of output. He said the government should address this problem but he does not advocate handouts to farmers. Credit also is a problem for farmers with few resources.

He would like scientists to develop varieties that are tolerant of saline water and iron toxicity — common problems along Laguna de Bay.

Land preparation, he said, is easier and faster with machines, and as wages increase, land preparation by tractors may even be slightly cheaper than by hand. Today, however, it is better to use buffalo because of the high cost of gasoline. As vice-president of the Wawa San Pedro Farmers' Cooperative Association, which owns the pump irrigation system that irrigates his field, San Felipe is fully aware of the benefits of cooperatives to the farmer.

"Once, I did not like being a farmer because of the hard and dirty work, and being rooted to the field, rain or shine," San Felipe said. "But now, I am proud of being a farmer and like being my own boss. Even though input prices are high now, so too are yields. As a result, net income is much higher than it was 20 yr ago."

"A farmer," he said, "will never incur losses (provided the weather is good, of course) if he devotes the necessary care and attention to his crop."

*For developing an economically and socially viable village cooperative that collectively prepared group production plans, carried out essential farm operations, and secured production inputs, credit, and services to increase rice production and promote nonfarm activities, which increased family income and savings; and for encouraging among members self-reliance and the awareness that personal interest is secondary to the interest of the community and that the basic element of leadership is good example.*

# SUMARDI

*representing*
*RAHAYU FARMERS' GROUP,*
*West Java, Indonesia*

Sumardi's father was an Indonesian government school teacher and farmer. Sumardi, 47, began helping his father as a teenager and continued until he had a family of his own. He has 17 yr of farming experience and 3 yr of secondary school education.

Sumardi is leader of the *Rahayu farmers' group* and the *Aneka Karya Village Cooperative* unit. Sumardi is a dynamic farmer. He tests technology introduced by extension workers on his farm before passing them on to the members of the cooperative. Sumardi also attends seminars on rice production and visits experiment stations to acquire information for the cooperative.

Sumardi's wife is 39 and completed elementary school. She buys and sells rice, mung, and soybean. She transacts the business and Sumardi tells her where to locate products. She buys rice from other villages and sells in their own. The mung and soybean she buys in their village and sells at different markets.

Sumardi's village is near the sea in Cirebon, western Java. The land is flat, 5 m above sea level, and has clay loam soils. In wet season (November-April), rainfall is 1,200-3,500 mm. In dry season (May-October), it is 50-1,000 mm.

Sumardi owns a hectare of land in another village which he rents to another farmer at $450/yr. For $630, he leases 1 ha of riceland in his own village. Additionally, he owns a 0.3-ha home lot that is planted to fruit trees and vegetables. He earns about $1,800 from this land. He also raises chickens, sheep, and edible birds for home consumption. Sumardi's farm income is usually more than his income from other sources. About 60% of his time is spent farming, and the rest goes to the village cooperative activities.

### Family

Sumardi has 6 sons and 3 daughters from age 4 to 21. Two of his children have finished school and share their income with the family. The eldest son is a commerce graduate, one daughter is a teacher, and another is in nursing school. The rest are in high school and elementary school. None are married yet.

### Farm work

Although Sumardi has nine children, none help on the farm. He does not ask them to help nor teach them to farm because he does not want them to be farmers. He said, "Farming is hard work. I would pity my children if I were to see them working in the heat of the sun. I want them to study, enter good careers, and be good workers." He means honest office or government workers.

Only Sumardi and his wife work on the farm. His wife helps in weeding and fertilizer application, and brings food to her husband. Sumardi tills the land with a hand tractor, repairs the dikes, and buys seed. He hires labor for planting and weeding and sometimes, if he is too busy with the cooperative, he also hires labor for land preparation. His wife usually keeps records.

Once, they used buffalo for land preparation. In 1979, mechanization made the task easier and faster. Machines take less maintenance than caring for and protecting buffalo, and till the land faster. Mechanization has allowed Sumardi more time for the cooperative's needs because land preparation that formerly took 3 wk now takes only 1.

### Cultivation

Before modern varieties, Sumardi planted traditional rices. He now plants modern rices and changes varieties each year based on insect and disease incidence. He has planted IR5, IR8, IR26, IR28, IR30, and IR36. When most of their farms were attacked by planthopper, farmers followed the recommendation of field extension workers to plant one of the more pest-resistant varieties. Farmers have difficulty marketing IR36 because it has poor eating quality, so they chose to plant Cisadane although it takes more time to mature. Sumardi uses organic fertilizer such as manure and rice straw, and applies 2 t sheep manure/ha with the first plowing at about 15 d before transplanting. After harvesting, all rice straw is incorporated in the puddled soil. For IR36, he uses the recommended dosage of inorganic fertilizer. His farm is close to a secondary canal about 20 km from a dam. He uses continuous flow irrigation and keeps 5-7 cm of water in his fields. He drains the fields at topdressing and 7 d before harvest.

Tractors were introduced by the government in the 1970s to overcome labor scarcity. Most people in Sumardi's area own or operate small farms and few have time to work for other farms. However, growing more crops each year with short-duration varieties requires more labor. Sumardi rototills the land by hand tractor twice, 15 d and 1 d before transplanting. Fields are hand weeded by women laborers 15, 30, and 40 d after transplanting. He applies insecticide on a need basis to control insect pests.

Sumardi plants Cisadane, a long-duration rice, as the first crop (November-March) followed by IR36 as a second crop (April-July), and an upland mungbean crop in August as the third. Beans are planted along the bunds of high fields. This is the predominant pattern in his area.

When Sumardi planted traditional varieties, he harvested 3.5 t/ha, but with modern varieties and consistent, suitable cultural practices, he harvests a stable 9-12 t/ha. Sumardi hires 45-50 persons to thresh a hectare of land in 1 d and pays them 1/5 of the yield. He sells about 70% of his produce and keeps the rest for home consumption. When the palay price is high, he sells at one time, but he staggers sales when prices are low.

## Learning

Sumardi first learned farming from his father, and in 1976 when he was a rice production trainee, he began learning new technologies from government extension workers. Since then, he has tested the recommended practices on his farm before disseminating them to other farmers.

Their farmer cooperative was established in 1977. Beginning in 1979-80, they received help from government technicians, from whom the farmers have accepted many recommendations. Each new technology is tested by the field extension worker before being put into wide practice.

Sumardi said the reasons for his and the cooperative's success are hard work, following extension workers' recommendations, cooperation among farmers, and a close relationship with formal and informal institutions.

## The cooperative

The *Rahayu farmers' group* was established in 1977. Sumardi has been their leader from the beginning. Thirty-six farmers who manage 53.7 ha belong to the group.

The cooperative coordinates working groups in land preparation, plant protection, irrigation, farm inputs supply (seed, pesticide, fertilizer, and credit), and product marketing. Other activities include organizing labor for cleaning irrigation channels, pest and disease control, consultations with farmer leaders, meetings with extension workers, meetings with the rural bank and village cooperative unit, pickup and hand tractor leasing, and sewing courses through the Family Welfare Education board.

The cooperative had cash assets of $5,383 in February 1985, and owned a hand sprayer, hand tractor, radio cassette, television set, pickup, sewing machine, and a farmers' shelter.

The organization of the Group is simple but effective. It consists of a chairman, a secretary, a treasurer, and two supporting staff. In addition, there are working groups responsible for specific activities. Membership meetings are twice a month and the group also conducts a farmer's course guided by a field extension worker. New technology is obtained through visits to the research station at Sukamandi, the Agricultural Development Center (ADC) at Plumbon, and the Rural Extension Center at Bayalangu.

The Group regularly plans activities for the next season. Current plans are to expand soybean and mungbean crops, to include farm youths in Group management and activities, and to improve training activities between member farmers, the surrounding community, and village extension workers. Home industry development and tertiary irrigation maintenance also are planned.

As group leader, Sumardi makes an annual plan for all farm activities, and suggests what to do and how to achieve target goals.

## Problems and constraints

Sumardi said there have been few resource constraints since the cooperative was formed. The cooperative manages input supplies, irrigation, and marketing and multiplies seeds from those provided by the extension department. Labor usually is the only resource in short supply. Sumardi said the most difficult problems are internal — those of discipline and cooperation. For success, it is essential that all Group members plant the same variety at the same time, and that before planting, all rat holes are cleared. If some members plant early or use a different variety (this can threaten everyone's crop), the group sometimes administers discipline by pulling up the erring members' plants or plowing up their planted fields. Sumardi said that increased rice production can only be achieved through cooperation among farmers. Postharvest and marketing problems must also be solved jointly by the Group.

**What science can do**

Sumardi said his group would like scientists to work on the following problems:

- Water management for secondary crops, especially in dry season.
- Optimum spacing and harvesting time for rice.
- Breeding an ideal rice variety that is early maturing, has good eating quality, and is resistant to all brown planthopper biotypes.

Sumardi said he is confident that science will contribute much to improved farming.

*For successfully integrating traditional and new technology into a simple and low-cost cultivation package enabling him to harvest yields of 12 to 15 tons per hectare a year from three crops of rice; for actively cooperating with agricultural research institutions in testing new varieties and cultivation techniques on his farm; for sharing his farming skills and seeds of high yielding varieties with other farmers through the An Phu Agricultural Cooperative of which he is chairman; and for proving to others that rice farming is a satisfying means of livelihood.*

# VO VAN CHUNG

*Tien Giang Province, Vietnam*

Vo Van Chung, born in 1930, is married and has six children. He attended school to grade 5, but stopped to help his parents farm when the Japanese occupation ended. His wife, who also has 5 yr of schooling, helps him farm. Their eldest child is 31 and a high school teacher. Their second child, 28 is a nurse. The 22 and 19 year olds are studying agronomy in college, and the youngest two children are in school. The baby is only 8.

Chung lives in Tien Giang Province on the Mekong Delta, the rice bowl of Vietnam. His grandparents settled the land about 100 yr ago. The soil conditions are favorable and waterways provide transportation and irrigation water. When his father died in 1954, Chung took over the 3.2-ha family farm. With it, he supported his mother, three brothers, a sister, and his own growing family. Harvests were good, and within 10 yr the family replaced the bamboo and thatch cottage with a concrete house.

Chung was an early experimenter with farming techniques and quickly adopted IR8 when it was introduced in 1968. Before 1968, his annual yield was 1.6 t/ha. With IR8, yields rose to 3 t/ha and in 1984 he harvested 12 t/ha.

Chung keeps 10 piglets for meat and sale and uses the manure on his riceland. He also puts 500 ducks in the rice field at booting stage. The ducks fertilize the soil, aerate the water, and eat weeds and insects. After harvest, they feed on paddy left on the field. His duck income equals the return from 1 ha of rice. In dry season, he plants watermelon and tomato and earns almost as much from each as from rice.

### A bridge to scientists

Chung's real achievements, however, are as a farmer-leader and manager of the An Phu Cooperative. He said that a farmer cannot succeed alone — only in consultation with scientists. The irony, he said, is that farmers are naturally skeptical of scientists. "Farmers only believe in other farmers," Chung said, referring to the majority and not to the few who are receptive to the ideas of scientists, technicians, and extension personnel. Chung is the scientists' bridge to the farming community.

Because of farmers' confidence in him, the faculty and students of Can Tho University use part of his land as demonstration plots for farmers. It is Chung, however, who leads the discussions. Before inviting farmers to inspect his demonstration plots, he visits their farms so he can talk wisely about the technology in question and make specific comparisons of the plots to their fields. He recognizes that a single visit is not always enough, so he makes several follow-up visits to his neighbors.

The greatest opportunity for personal recognition by provincial and national authorities arose from adversity. Brown planthoppers invaded the Mekong Delta in 1972, and he was among the first to plant IR26, a resistant variety. Four years later, however, a new brown planthopper biotype devastated the Mekong Delta rice crop. Scientists from Can Tho University gave Chung a few IR36 seeds. He transplanted 1 seedling/hill instead of the usual 3-5, which allowed him to multiply more seed than normal. For 3 yr, the brown planthoppers caused extensive damage to all varieties except IR36. Laughing, Chung recalls that in 1978 farmers were willing to trade a water buffalo for 40 kg of IR36 seed. But he shared his seed at cost with his neighbors, and gave the new seed to farmers who had resisted the new varieties. One season was enough to convince even the most skeptical of the value of the new variety.

### Managing the cooperative

Another of Chung's strengths is his organizational ability. The An Phu Cooperative is divided into seven production groups. Each group has a leader, deputy leader, and secretary who are in charge of management, labor, and inputs. Chung, who was elected chairman of the cooperative in 1980, is the overall manager. The seven production leaders report to him. There are 2,730 people in the cooperative and they have 200 ha of riceland and 60 ha of fruit. Each adult between 15 and 55 yr receives 1,300 $m^2$ of riceland to farm. Persons under 15 and over 55 receive one-third of that area. In addition, each family gets a 500 $m^2$ supplementary income plot.

Taxes are 700 kg of paddy/ha and fertilizers, insecticides, electricity, and communal and war funds cost another 800 kg of paddy. So, 1,500 kg of each harvest belongs to the State. The rest is for the farmer.

After small varietal trials, the cooperative members choose the variety they will plant and the cultural practices to be followed. They decide together, based on hydrology and soil conditions, when each area will be planted. All the cooperative's lands are planted within 1 mo.

Another aspect of Chung's managerial expertise is reflected in the cooperative's decision to plant 60 ha to sticky rice which can be harvested in time for Tet, the lunar New Year. Then, sticky rice is very much in demand and can be bartered for cement, lumber, nails, and other building materials. As a result of this decision, nearly all cooperative members have built permanent homes.

### Maintaining soil fertility

Chung said he can harvest two rice crops and one upland crop per year, but that organic fertilizer is needed to sustain yields — chemical inputs alone will not do. The profits from tomato and watermelon are high, however, and "it is good for the soil to rest from rice cultivation," he said.

At first, he said, yields were higher with NPK than with organic fertilizer alone. After a while, however, yields began to decline if only urea and no organic fertilizer was applied. The best combination, he said, is to apply manure, organic fertilizer, and chemical fertilizer. He applies 3-4 tonnes of composted manure and straw and incorporates it with 50-100-50 kg NPK. He applies 200 kg urea in 4 equal doses: basal, 15 d after seeding, around maximum tillering, and when 2 of 10 panicles/hill have headed. He makes the third application when the leaves start to yellow. He said this balanced N application gives the highest yields. If N is applied as recommended by extension workers, at two-thirds basal and one third 5-7 d before panicle initiation, empty spikelets are more numerous than with his method.

### Successful farming practices

Chung has found that successful farming depends on good land preparation and water management, and proper timing of planting. The land must be well-leveled for weed control, irrigation, and drainage. This also helps raise the pH on highly acidic soils.

Fields first are irrigated up to the tip of young seedlings and slowly filled to 5 cm depth. Hand weeding is a few weeks later and at heading. The weeds removed at heading are carried from the field and burned. Weed competition is a big problem and the slow initial growth of modern varieties gives the weeds a head start. The modern varieties recover after about 1 mo and can then successfully compete with the weeds.

Chung said that the same variety is not good for all seasons because of climatic and biotic factors. Dry and early season crops are direct seeded with pregerminated seeds — a practice dating from his grandfather's time. The main wet season crop is transplanted.

Insect control is a major preoccupation of the Cooperative members because pest populations increase with three rice crops. Although Chung recommends two rice crops followed by an upland crop, some farmers still plant three rice crops. For insect control, Chung uses resistant modern varieties and monitors populations by light traps and field observations. Twice a week, the seven production leaders meet with him to discuss the insect pest population. If they feel it is beyond their ability to control, they call in the district pest control officer. Rat control is laborious and time-consuming, but succeeds because of community effort.

Because all farm operations are planned by the cooperative and work is done together, Chung sees no shortage of labor in the immediate future, although compulsory military service often takes young men from the village for a long time. The cooperative has 3 hand tractors and 21 water buffalo. If extra tractors are needed, they borrow them from the district office.

**A better life**

The cooperative is 5 km from a market, but the large surpluses and sticky rice are bartered in Saigon. The cooperative has a tremendous marketing advantage over individual efforts. Once, farmers obtained credit from local rice merchants. The crop was usually purchased in the field at a very low price and credit needed to purchase inputs was very expensive. Today, the cooperative handles all input supplies and there is no need for credit.

The cooperative's goals are to make everyone well off. Chung forsees no change in the present system of individuals farming 1,300 $m^2$ each. The An Phu Cooperative started with 120 ha and has gradually added new members and land, bringing the total area to 260 ha. It has the potential to expand to 1,000 ha. Unproductive members can be expelled, but the cooperative has not had to take that step.

Although everyone in the cooperative is successful, Chung notes that women generally work better than the men. Most members have been able to build concrete houses and to buy radios, television sets, and motorcycles. The irrigation system was finished in 1981. The same year, electricity was provided to the cooperative. The riceland is fully irrigated and the profits from rice alone have significantly improved living standards. The supplementary plots, fruit, and animals provide additional income.

**Technology**

Chung said that high yields are more important than eating quality. But the new varieties have improved eating quality in addition to yielding well and having increased insect and disease resistance. He said the one drawback with modern varieties is their lack of seedling vigor. He said scientists also should study ways to increase fertilizer efficiency and should do benchmark surveys on soils, climate, and technology adoption so as to identify areas needing attention. Chung dreams of the day when there will be a hand machine for direct seeding and he can harvest with a reaper that "walks in the mud."

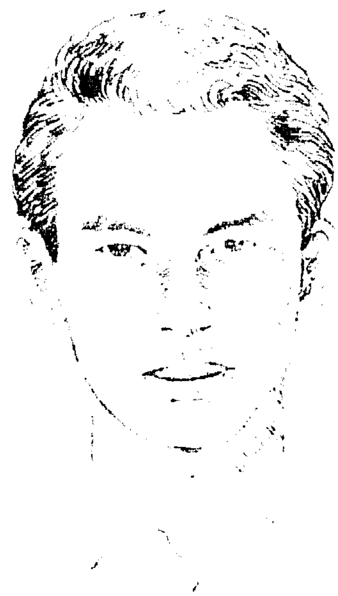
Chung said technology transfer for farmers is based on "what they see, what they have practiced, and what other farmers tell them." There is a prejudice against extension workers. Therefore, universities should have demonstration plots with farmer cooperators in many areas and not just near the university. He recognized that he is fortunate in being near a university, but his drive and interest have been as important in building his contacts with the university as its own efforts to reach out. Chung insists that slow adopters of new technology can be reached through other farmers.

A hardworking, sunburnt farmer, today Chung spends the greater part of his time as manager and leader of the cooperative. "Farming is tough," he said, "and I have other aspirations for my children. But farming has been profitable and rewarding for me and I guess that one or more of my children may become farmers. For myself, I am grateful for the opportunities I have had and am eager to share my experiences and to learn from others."

*For harvesting more than 8 tons of rainfed rice per hectare using local tools and varieties; adopting improved cultivation techniques promoted by the agricultural extension office; and for willingly sharing his knowledge with other farmers.*

# WIBOON INCLAI

*Phitsanulok, Thailand*



Wiboon Inclai was born in 1946 in Pichit, about 300 km north of Bangkok, where he completed his elementary education. From his parents, who were rice farmers, and their neighbors, he learned the basics of farming. In 1966, he married and started farming. But, an accomplished actor, Inclai spent much of his time touring with a folk drama troupe. It was only in 1976, when he inherited his 2.72-ha farm from the Buddhist priest who had adopted him, that he began to take rice farming seriously. Inclai said his experience in playing heroic roles gave him self-confidence and firm faith that good will triumph over evil.

**Learning**

Phitsanulok, in Watbot District, north central Thailand, is about 450 km from Bangkok. It has clayey soils and is in a plains area. Mean annual rainfall is 120 cm, most of which falls in wet season (May-October). The highest precipitation is in August and September.

To learn more of farming, Inclai interacted with extension workers from the Phitsanulok Agricultural Extension Office and rice technicians from the Rice Research Center. In 1984, he participated in intensive training in rice farming and seed production at the Phitsanulok Seed Center.

In search of high yields, as early as 1976 he experimented with rice varieties, both traditional and modern. In 1983, he planted RD21, and won first prize in the rice yield contest with a harvest of 8.7 t/ha. He has continued to plant RD varieties and averages 6.5 t/ha every season. He said, however, that dry season yields are higher than in wet season. Inclai is a grower of certified seed and was named a rice demonstrator by the Seed Center.

## Adapting technology

During 19 yr as a farmer, Inclai has developed his own farming techniques, many of them adapted from technology generated by research. He pays close attention to each step in farming. Inclai said that land preparation is fundamental to success, and he prepares his land differently from other farmers. Instead of using the usual 2-wheel tractor with cage wheels and a comb harrow, Inclai rototills his field about 20 cm deep with a Chinese-made tractor to incorporate material such as leaves, twigs, and grass into the soil.

He applies 3 t chicken manure/ha each year. He used to get it free from a chicken farm, but now must buy it because many farmers have followed his example. The chicken manure is incorporated into the soil with water and the field is left to bake in the sun. After 2 wk, the field is puddled again and allowed to stand for a week or 2 until gas bubbles are no longer visible. Consistent organic matter application has made his field's physical properties better than those of his neighbors, he said.

Inclai sorts seeds by putting them in a salt solution and discards those that float. He then washes and soaks the good seed in fresh water for 24 h, spreads them 8 cm thick on a fertilizer bag, and covers them with a thin plastic sheet and a wet linen sheet on top. The seeds germinate after 8 h and are broadcast in a prepared seedbed. The rice plants are ready to transplant in 3-4 wk.

Inclai applies 197.5 kg of commercial fertilizer 16-20-0 20 d after transplanting (basal) and 21-0-0 or ammonium sulfate (125 kg/ha) a few days before booting.

## Natural methods

Inclai was raised by a Buddhist priest who did not believe in killing. This moral principle is so much part of him that he avoids killing anything, even plant pests, if he can. He uses natural pest control by selecting the best seeds, applying fertilizer late (He noticed that applying ammophos too early made plants susceptible to pest infestation.), and keeping fields very clean — no bushes, no dried leaves, no weeds. He walks through his fields twice daily, swishing a stick, and the natural enemies (dragonflies, ladybugs, frogs, birds, and toads) prey on the insects that rise from the plants. He also puts black lights over his ponds and says the fish feed well on insects.

His fields and those of his neighbors are practically free from rats because they are kept clean. "Eight cats follow me when I take a stroll in the fields after dinner," he said. "Maybe that helps too." He believes that pests are brought by bad spirits. Before each growing season, he performs a ceremony that asks for protection against pests. He said it has always worked.

To control weeds, he applies a herbicide called Machete at 19.75 kg/ha 1 d after transplanting. A month later, he pulls out the weeds he sees.

## Other practices

Irrigation water comes from a small river, the Kwae-noi. A government-owned electric pump delivers to the main irrigation canals. In 1979, Inclai built a delivery canal to his fields. He attributes his high yields to having his own water reservoir and a deep well that assure an abundant water supply throughout the year. In dry season, he floods the fields to 5-10 cm depth during tillering and to 10-15 cm from booting to flowering. In wet season, he must drain excess water from his fields.

A few seasons ago, Inclai changed from hand harvesting to machine harvesting with his own tractor. Threshing also is mechanized. He rents his tractor and harvester to neighboring farmers. Like most farmers, he depends mainly on family labor — that of his wife, two children, and himself. Sometimes, especially for transplanting, he must hire labor.

## Family and community

Inclai sells part of his rice as seed, thereby getting a higher price than for selling grain. He also augments his income by serving other farms with his tractor and harvester. His wife helps by selling eggs and vegetables from their garden. In the afternoons, she hoes and weeds, or works in other farmers' fields. She is famous for her speed in pulling seedlings and can handle 500 bundles a day.

The family is very careful with money, spending most of it on farm equipment and inputs. Though a rice producer, he buys a native rice variety for consumption, "to remind my children that food costs money." Then he adds, "Besides, native varieties are tastier than modern ones!"

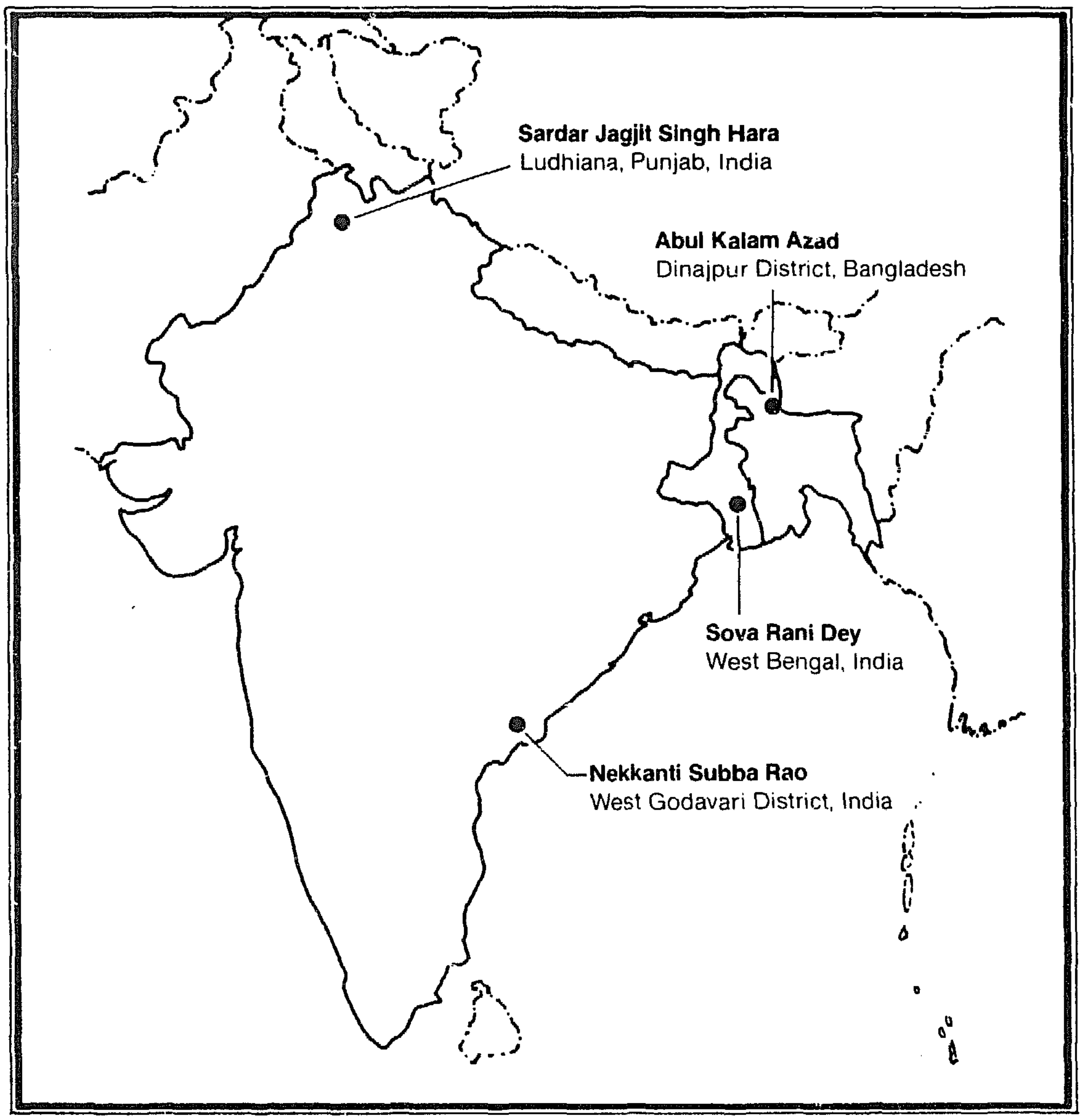
Although Inclai spends most of his time on his farm, he also interacts with other farmers in the community. He is a member of the Rice Farmers' Association, Watbot District, a member of the farmers' group of the Bank of Agriculture and Cooperatives, and a leader of the contact farmers in the village Agricultural Extension Service.

He is up-to-date in his knowledge of agriculture and open to innovation. He is not selfish with his knowledge and shares what he knows with his neighbors, sometimes using color photographs to illustrate his points and his farm as a concrete example.

He would like scientists to develop varieties that are cold resistant, with good eating quality and high yield potential. He said that good quality seeds should be available to farmers, and that farmers should exchange more techniques.

"Farming is hard work," Inclai said, "and yet, the biggest single factor in my success is my love for the work." He said there are other, easier jobs with greater compensations, but that he sticks to farming because it is in his blood. However, he realizes his children may choose less labor-demanding jobs. He plans to give the part of his land near the road intersection to his children if they want to use it for a business such as a garage or beauty shop, and he would like his children to have an easier life than his.

# SOUTH ASIA



**Sardar Jagjit Singh Hara**
Ludhiana, Punjab, India
**Abul Kalam Azad**
Dinajpur District, Bangladesh
**Sova Rani Dey**
West Bengal, India
**Nekkanti Subba Rao**
West Godavari District, India

*For pioneering on his riceland the use of integrated nutrient supply systems involving farmyard compost and chemical fertilizer, which enabled him to triple rice production; and for developing and promoting a pattern of intercropping, relay cropping, and crop rotation that allows farming families to be gainfully employed throughout the year.*

# ABUL KALAM AZAD

*Dinajpur District, Bangladesh*

Abul Kalam Azad grows as many as three crops a year. To increase and maintain soil fertility, he has pioneered the use of farmyard manure and green manuring in combination with inorganic fertilizers. With this technology, he has more than tripled rice and sugarcane yields (from 1.2 t/ha to 4.2 t/ha for rice and from 32.2 t/ha to 133.7 t/ha for sugarcane), and has become an example of the barefoot technician in his community.

## Family

Azad, 43, has been a farmer for only 8 yr. The only son of a small businessman, he was born and educated through high school in a district adjoining Dinajpur. He gave up college to become a salesman when his father died. During his travels he learned much of the potentials of farming through meetings with farmers. Azad inherited 5 ha of land from his maternal grandparents. In 1978, he decided to become a full-time farmer. He used his small savings as initial capital. Since then he has been nothing but a farmer.

His 32-yr-old wife, whom he describes as a full-time housewife, has few responsibilities on the farm. She supervises the workers when he is away from home. His mother, who lives with them, also sometimes helps with supervision. The Azads have four children, all sons, between 4 and 12. All but the youngest attend school.

## The setting

Dinajpur district is in northern Bangladesh, on high land west of the Brahmaputra River. Because the land is high, it is not severely flooded in the monsoon. Rice is the most important crop. The rice areas are generally flat with moderately shallow, well-drained, permeable sandy loam soils. Summers are hot and winters mild. Most rain falls during the monsoon. Tubewell irrigation projects of the Bangladesh Agricultural Development Corporation (BADC) supply the irrigation water to farmers in the area.

Azad's farm is in Joynanda, a BADC irrigation project area about 45 km from Dinajpur, and easily accessible by road. The farm is in the heart of Joynanda. It is near the local market and the Somali Bank, a government-owned bank that serves the credit needs of local farmers.

## The resource base

Azad's farm comprises 10 parcels ranging from 0.13 to 1.21 ha, and totals 7.4 ha. The parcels are scattered but all are accessible by bullock-cart from the main farm. In addition to the land Azad inherited, he purchased 2 ha more in 1983 and 1984. Except for parts of 2 parcels, the rest of his farm (82%) is fully irrigated by three BADC tubewells. He pays an annual irrigation fee of $37 through the bank.

Azad's crop diversification scheme relies heavily on hired labor. Of his family, he alone works in the fields. He employs five permanent male workers, whom he refers to as colleagues and treats as members of the household. Each is paid 1.5-1.7 t rice/yr. Daily food is not provided but gifts are given on special occasions. In addition, about 10 workers, both men and women, are regularly engaged and paid cash wages. At transplanting and harvesting, 25-30 workers may be hired.

Azad said permanent workers are necessary because of the skills required by some farm activities, most notably the production of compost. To make sure all his permanent workers are skilled in all farm operations, he regularly rotates their assignments. Azad said there is no scarcity of hired labor, mainly because he pays higher wages than neighboring farmers. Also, there is considerable surplus labor in the area despite employment opportunities at local sugarcane and food processing centers.

Animals are still the main source of power for the farm. Azad keeps six plowing buffalo for land preparation and other draft requirements. The dung they produce is a vital composting material. Four cows are kept for milk for family consumption and to supplement the dung requirements. The manure from 65 chickens and ducks raised on a semicommercial scale also is used for compost.

Azad has 200 jackfruit trees, 12 mango trees, 40 coconut trees, and 4 lichi trees. The lichis are eaten at home, and the other tree crops are sold in the market. Until recently, Azad grew bamboo and donated it to the local mosque.

## Cropping patterns

There are three crop seasons: boro (November/December-May), aus (March/April-July/August), and aman (July/August-November/December). Azad uses four cropping patterns depending upon land elevation, soil type, and resources. Three of them are complex 3-yr rotations.

The first rotation minimizes turnaround time by making use of relay sowing. Sugarcane is relay planted into aman rice, and intercropped with potato or chickpea and then ratooned. Another pattern starts with aus rice or jute and includes sugarcane relay planted into aman rice and ratooned once. The third pattern starts with aus rice or jute, which is followed by mustard. It includes boro and aman rice relayed with wheat, green manure, and legumes and ends with another aman rice crop.

In a 1-yr rotation that Azad proposes to implement this year, wheat will be relay sown into aman rice at flowering, and green manure or pulse will be relay sown into wheat at the last irrigation.

## Cultural practices

At least 10 rices, mostly modern varieties, are grown on Azad's farm each year. A few local varieties are grown for home consumption. Azad said good eating quality is the characteristic of local varieties that he misses in modern varieties. Some of the varieties that command high market prices also are resistant to insect pests and diseases.

Azad identifies promising varieties based on information from the extension department, friends, research stations, and the BADC. He tests them for suitability, and if they perform well he multiplies seeds for larger plantings. To ensure vigorous seedlings and good crop establishment, rice seeds are tested in saltwater and nonviable seeds are removed before sowing.

Land is prepared with a moldboard plow drawn by two buffalo, and a harrow. Fields are plowed immediately after harvest to incorporate crop residues and 13 t compost material/ha. Five plowings usually are necessary to properly incorporate the compost. Deep plowing is done every 4 yr with a tractor hired from the Sugar Corporation. Azad said tractors do a better job of incorporating compost than buffalo and that mechanization will not displace farm labor in

Joynanda because there are local off-farm employment opportunities. Moreover, he believes that more labor will be needed with further cropping intensification such as he is practicing.

Fields are flooded except during tillering and after panicle initiation. Azad minimizes application of crop protectants. He applies no herbicides and depends on hand weeding to control weeds. He applies insecticides on seedbeds, and applies them in the field only on the recommendation of pest monitoring teams that visit the farm twice each season. The most common insect pests are stem borers and gall midge. They cause enough damage to warrant preventive measures. The most common rice diseases are bacterial blight and sheath blight, for which the only remedy is to plant resistant varieties. Although both insect pests and diseases are important, Azad said insects cause the most damage.

Azad has pioneered the combined use of green manures, compost, and inorganic fertilizers. Legumes such as dhaincha, Bogamadula, and pulses are incorporated as green manures every other year. About 100 t compost/yr is produced on the farm. The compost uses buffalo and cow dung, chicken manure, rice straw, water hyacinth, and soil from the bottom of the ponds. One laborer works daily at making all the materials from the farm into compost. Azad spends at least 1 d each week in this activity. Two 1.8- × 3- × 3.6-m and 3- × 4.5- × 2.5-m compost pits are maintained. Each year, rice fields get 13 t compost/ha and seedbeds get 20 t. Depending on soil conditions, other fields get compost every 2 yr. Compost is incorporated about 13 cm deep for rice. Applying compost has greatly improved the water-holding capacity of the sandy soil and has reduced need for chemical fertilizers.

In addition to compost, Azad applies 190 kg urea/ha, 50 kg trisuperphosphate/ha, and 30 kg muriate of potash/ha. NPK rates are 45-30-15 in aus, 95-86-59 in aman, and 100-100-60 in boro. Trisuperphosphate is applied basally. Muriate of potash is applied basally in aman, basally and as topdressing in boro, and topdressed in aus. Urea is applied to modern varieties in four splits in aman and boro and three splits in aus.

## Production, yields, and income

Modern rices yield 4.2 t/ha in aman and 5.5 t in boro. Aus yields are 2.2 t/ha. The regular sugarcane crop yields 137.2 t/ha and the ratoon crop 54.9 t (Table 1). The technology mix is largely responsible for the high yields, but Azad said that irrigation has increased his yields more than other factors have.

**Table 1. Estimated yields and net income for the Azad farm.**

| Produce | Yield (t/ha) | Net income ($/yr) |
|---|---|---|
| *Crop* | | |
| Rice | | |
| Aman (MV) | 4.2) | |
| Boro (MV) | 5.5) — | 1111—1481 |
| Aus (local) | 2.2) | |
| Sugarcane | | |
| First crop | 137.2) — | 1111—1481 |
| Ratoon crop | 54.9) | |
| Turmeric | | 926 |
| Potato | 18.3) | |
| Jute | 2.5) — | 370— 555 |
| Wheat | 2.2) | |
| Jackfruit | | 185 |
| Mango | ) | |
| Coconut | ) — | 185 |
| Bamboo | ) | |
| *Livestock* | | |
| Chicken, eggs | | 222 |
| Estimated total | | 4111—5037 |

## Improving productivity

Azad identified several physical and socioeconomic factors that limit improvement in farm productivity. He said he would like to see improved methods of land preparation, water management, fertilizer application, crop establishment and control of weeds, insect pests, and diseases. He emphasized the importance of deeper plowing that is possible with buffalo, and said that tractors will partly solve the problem. He said scientists should develop better farm implements. Mechanization and better record-keeping may also ensure timeliness, which is a factor critical to crop intensification.

Although Azad said that modern varieties perform better than the local varieties at both low and high input levels, he would like modern varieties to have eating quality comparable to that of the local varieties.

Input availability generally is not a problem. Most agricultural inputs can be purchased either locally or at Dinajpur or from the Sugar Corporation. Livestock and poultry feeds are from the farm. The Livestock Department provides veterinary services once a year.

Because most of the farm produce is sold at the local market, marketing is convenient and involves minimal transport cost. Because vegetables are seasonal, prices sometimes are very low. When that happens, Azad sells them in Dinajpur. Marketing has improved since the temporary Processing Center was built in Joynanda 10 yr ago. The availability of formal credit and preferential interest rates also has improved.

## Learning and teaching

When Azad started farming in 1978 he knew little about modern farming practices. His best sources of information were extension personnel, farmers, research personnel from the Bangladesh Agricultural Research Institute and the Bangladesh Rice Research Institute, and various publications. He emphasized, however, that he had to make his own experiments to determine the best practice. Today he travels extensively to observe new practices. He has visited BRRI at least 10 times in the last 4 yr, often bringing with him soil and plant samples for testing. He spends at least an hour a day reading about agriculture in Bengali and English.

Azad's success has imposed upon him the duties of a barefoot technician. He regularly visits farmers in the community to share his experiences with them, and sometimes is asked by the Extension Service to visit farmers in other locations. Part of his responsibility is to test new technologies for himself and for others.

There is no community farm organization in Joynanda, but there are informal farm discussion groups. Azad spends at least 2 h each day in the community sharing his experiences and gathering new knowledge.

## The future

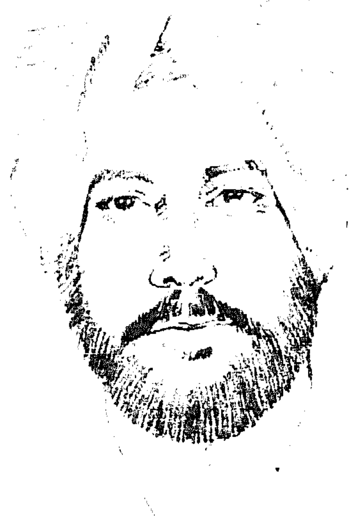
Azad emphasizes the importance of education before trying to organize farmers. He said that farmers must know modern farming practices before organization will work. He thinks that the complexity of multicrop farming requires skills and special training and that a college degree would help. He has made it a point to train his laborers in most farm activities so that even when he leaves the farm, operations are not disrupted.

As a successful farmer, Azad would like "to own a tractor, maintain high crop yields, and help fellow farmers improve their lot." He would like to see his sons become "a pilot, an engineer, a doctor, and an agriculturist. But," he added, "I will allow each to decide for himself when the time comes."

*For his scientific management of a rice farm; innovativeness in producing high quality seeds; and for his key role in the diffusion of new farming technology and bridging the gap between potential and actual yields.*

# SARDAR JAGJIT SINGH HARA

*Ludhiana, Punjab, India*



Sardar Jagjit Singh Hara is a progressive seed farmer from the Punjab, which is the breadbasket state of India. Situated in northwestern India, the Punjab has fertile, mostly alluvial soils, and 600-700 mm annual rainfall, mostly during the July-October monsoon. The state is crisscrossed by a network of irrigation canals and dotted with shallow tubewells.

**Family**

Hara, who is in his mid-forties, and his wife have a daughter who is studying for an MS in nutrition and a son in 10th grade. Of Hara's three brothers, all but the youngest, who is in the United States, are farmers.

Hara and his wife own 8 ha of land. It is level, fertile, and completely irrigated by tubewells. They own an electric and a diesel pump for irrigation — the diesel is used when there are power failures. The farm is 12 km by road from Ludhiana.

Hara inherited the land and learned farming from his father. His family bought a piece of land and settled near Ludhiana when they moved from western Punjab during the partition of India in 1947. At first, the local people made fun of them as being too citified to farm, but this view soon changed. In 1951, they were the first family to own a tractor in the Punjab.

As a boy, Hara did not like studying and tried to avoid school life. After a short break from school, however, he entered college, found that college studies are not as rigid as in secondary school, and completed an MA in Economics.

Even at age 14, Hara was keenly interested in machinery and enjoyed driving and repairing tractors. This, he said was one of the factors that led him to become a farmer. Hara is a full-time farmer. He said that to be successful, one must concentrate on one thing at a time. He manages the farming operations and marketing and his wife, also a college graduate, does the housework and account keeping.

## The farm

Hara grows wheat, rice, potato, and groundnut. He strongly believes in proper crop rotations to maintain soil productivity, and said that wheat-rice and rice-potato rotations seriously deplete the soil of its nutrients. To maintain good soil health, he plants a green manure crop, when there is time, between two main crops. Once, he grew cotton and maize, but has replaced them with rice because it is more profitable. Hara also produces watermelon seeds, which he markets under his own name. On clayey fields, he grows wheat-rice or rice-potato. On sandy soils, he plants groundnut or watermelon as the second crop.

All Hara's crops are grown for seed. He has a contract with the National Seeds Corporation and the Punjab State Seed Corporation. These agencies supply him breeder seed or foundation seed of specific varieties for seed multiplication, and he must maintain certain quality standards. Hara receives 150-200% more for seed than if he sold grain in the market. He has not needed credit.

## Farm practices

Hara applies both organic and inorganic fertilizers to maintain soil fertility. To determine how much inorganic fertilizer to apply he uses soil test values. For instance, he noted a buildup of phosphorus and potash in the soil, so has reduced application of those nutrients and relies more on nitrogen. Soil tests identified deficiencies of micronutrients like zinc and iron. He has solved this problem by applying zinc and growing green manure.

Hara has prepared soil fertility maps of his entire farm, and every 2 yr arranges soil testing through the Punjab Agricultural University, Ludhiana. Hara started growing green manures about 7 yr ago when he realized that soil productivity was declining through continuous use of chemical fertilizers. Through experience and the knowledge he has gathered from agricultural scientists, he recognizes most plant nutrition disorders, plant diseases, and insects. He has easy access to inorganic fertilizers, herbicides, fungicides, and insecticides in the Ludhiana market.

Hara sometimes conducts small experiments on his farm. For example, he discovered that broadcasting urea dust in the field in the morning, when there is dew on the rice leaves, increases urea efficiency. He believes that urea dust that sticks on the wet leaves acts like urea sprayed on leaves. Therefore, the rice plants receives nitrogen both from the soil and through leaves. He wrote an article on this for *World Farming*. In another experiment, he found that urea made by one company was not suitable for morning dusting because it contained too much biuret. The concerned factory was informed.

Hara believes in minimum tillage and energy saving. He said that a fine seedbed encourages more weed growth than a coarse one. If needed, intensive, deep tillage can be done once every 2 or 3 yr. Hara prefers to grow transplanted rice on puddled fields. It saves him land and time for another crop, and also reduces water requirements. Direct seeding requires 3 or 4 wk more irrigation than transplanting.

## Problems

Hara is a strong believer in mechanization. He said it is necessary to increase cropping intensity when labor is scarce. He finds cultivation by animal power time-consuming and more expensive than that by tractor. Hara owns a tractor with tillage implements, a reaper, and a thresher.

He believes that mechanization will not displace farm labor, but will rather generate more employment. For example, he cited the mushrooming of small-scale workshops in and around Ludhiana.

"Why are economists so worried about labor displacement by mechanization in agriculture when the world outside agriculture is so rapidly adopting modern technology?" he asked. "For example, typewriters are being replaced by word processors, and people prefer to travel by air -- even for short distances. Doesn't everybody need a good quality life, including the farmers?"

"Labor is daily becoming more scarce," he said, "which was not the case 20 or even 10 yr ago. Today," he said, "Punjab farmers depend mostly on migratory labor from the neighboring states of Uttar Pradesh and Bihar. As agriculture continues to develop in those states," he said, "the migration of laborers is dropping. Also, recent political problems have significantly affected labor migration to this state."

## Giving and receiving information

Hara receives most of his agricultural information from Punjab Agricultural University, where he is a visiting professor and teaches general farming to undergraduate students. Other sources of information include government extension agencies, radio, television, and printed material.

Hara plays a key role in helping his farming community. He is president of the Punjab Young Farmers' Association and state convenor of the Rural Youth Volunteers Corps. They hold regular meetings, discussions, and lectures. Hara often participates in radio and television programs. Sometimes he visits other farms and, if asked, suggests crop improvements. Farmers often come to him with plant samples and ask him to identify nutritional disorders, diseases, and insects. He suggests appropriate chemical controls and dosages. There is, however, no cooperative farming group in his area.

### Success

Hara said the main reasons for his success in farming are availability of innovative technology and inputs and hard work. He does not face many problems in agriculture, but said that many farmers have trouble with the lack of input quality control and with marketing. For example, a farm supplier once sold ashes as superphosphate. If Hara were given authority, he said he would exercise strict control over the quality of inputs and produce, and would improve marketing facilities.

If he were a scientist, Hara said he would intensify breeding to develop early maturing varieties with resistance to insect pests and diseases, emphasize the importance of minimum tillage, and advocate the judicious use of fertilizers based on soil tests. If made director of a research institute, Hara would encourage his scientists to listen to farmers, visit with them, and try to understand their needs, rather than designing hypothetical research projects. He said, "Agricultural research should be farm-oriented and recommendations should be made while considering the economy and farmers' profits."

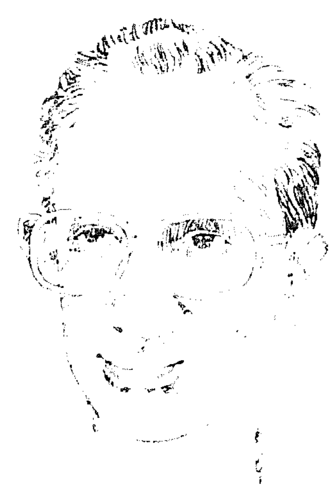
### The future

When asked if he would like his son to join him in farming, he said "It depends entirely on my son. I will not pressure him to enter any profession." One thing he is sure of — "if my son joins us in farming, he will raise the level of farming, just as I did after taking over farming responsibilities from my father." Hara said, "My family and I are well satisfied with the farming profession and the life that it enables us to lead."

*For harvesting an average yield of more than 8 tons of rice per hectare by planting high yielding varieties and practicing good farm management; and for active collaboration with the All India Coordinated Rice Improvement Project in testing new varieties and producing certified seeds, thereby helping to establish mutually beneficial links between scientists and farmers.*

# NEKKANTI SUBBA RAO

*West Godavari District, India*



Nekkanti Subba Rao lives in Atchanta village in West Godavari district of Andhra Pradesh, India. The village is on the Godavari River Delta, and has very fertile black cotton and alluvial soils. The northeastern monsoon brings heavy rains in kharif (July-October), when rainfed rice is grown. In rabi (November-March), crops are irrigated through the Godavari Barrage Project, which provides irrigation for 11 mo of each year.

"There can be no famine with good agriculture," said the soft-spoken Rao. A successful entrepreneur in his mid-forties, he chose agriculture as a profession soon after he finished high school. He grows rice for seed and grain, and produces hybrid and certified seed of maize, sorghum, and bajra.

Rao attributes much of his success to keeping up with new agricultural information. He closely follows the mass media and keeps in touch with the Agricultural Research Station at Maruteru and the All India Coordinated Rice Improvement Project at Hyderabad (AICRIP). He selects most modern varieties based on yield attributes, fertilizer response, insect pest and disease resistance, and good grain quality that determines their marketability.

### Then and now

In 1960, Rao used farming methods that were inherited from his father, as were his 10 ha of land. Land preparation was by bullocks and a wooden plow and harrow. Today, he uses moldboard plows and disk harrows pulled by a tractor, and seedlings for up to 20 ha are grown on 1 ha of nursery plot to reduce production costs. In 1960, the use of inorganic fertilizers was unknown. They weren't available and only farmyard manure was used. Extensive use of inorganic fertilizer began in 1966 kharif, when TN1 was introduced, which caused virtual doubling in yields. Table 1 shows recent fertilizer schedules.

Rao's current practices are unlike the traditional seeding rate of 25 kg/ha with random planting. Line planting, twice gap filling, and early planting (December) have been used since 1967. Since 1975, plant protection chemicals have been applied and since 1983, insecticide has been applied as needed. Weeds, which never have been a serious problem, are efficiently controlled by hand weeding at 30 and 60 d after transplanting. The effects of periodic insect and disease outbreaks are combatted by planting two or more varieties in each cropping.

## Modern and traditional varieties

Rao's introduction to modern varieties and technologies began with visits to the Agricultural Research Station at Maruteru. In the early sixties, the enthusiastic young Rao was welcomed by scientists and researchers there who gave him useful information; the link he established with AICRIP is still alive. "People from those places know what they are talking about," he said.

Describing the details of varietal selection, Rao said he chooses varieties based on seasonal suitability — some are best for wet season and some for dry. Rices such as MTU10, Jagannath, MTU8087, MTU8002, Hamsa, IET1991, IET1993, IR36, MTU5249, and

**Table 1. Rao farm fertilizer schedules.**

| Kharif | | Rabi | |
|---|---|---|---|
| *Seedbed application* (kg/ha) | | | |
| P | 22 all | P | 4 basal |
| N | 50 basal | K | 29 basal |
| | | N | 180 in 2 splits |
| Seed 1,000-1,250 kg (enough for transplanting 20 ha) | | | |
| 4- to 5-wk-old seedlings used for planting | | 3-wk-old seedlings used for planting | |
| *Main field application* (kg/ha) | | | |
| P 9 basal | | P 48 basal | |
| K 12 at 20 d after transplanting (DT) | | K 29 at 20 DT | |
| N 30 at 20 DT | | N 80 in 3 splits | |
| Green manure | | Farmyard manure at 5 t/ha | |
| (sun hemp/green or black gram) | | Zn 6 (since 1980) | |

MTU5293 perform best in kharif and IR8, Jaya, IR20, IR50, IR62, and BPT1235 are better for rabi. There is, he said, a lack of varieties for rainfed and dry conditions, which is why dry season rice is not successful in Atchanta. Rao said modern varieties have no apparent disadvantages compared with traditional rices, and that he doesn't miss desirable characteristics of the old varieties in the modern ones. He said modern varieties yield relatively higher than traditional varieties even under low input conditions. Of course, applying fertilizer and plant protection chemicals increase yields even more. Rao considers the new rices acceptable in consumer quality, milling, and marketability.

Rao named the major cropping patterns in Atchanta: rice (140-150 d) - rice (140-150 d) - pulse (black or green gram, 60-70 d), rice - rice - sun hemp, and rice - rice - fallow. At the end of the rabi rice crop, about 10-15 d before harvest, pulse or sun hemp seeds are broadcast, without land preparation, in the standing rice crop. No irrigation or fertilizer is applied, but the pulse crop is sprayed once with insecticide. After the pulse pods are harvested, or after 69-70 d of sun hemp growth, the crops are plowed in as green manure for the kharif rice crop. Rice - rice - pulse is the best and most remunerative of the rice-based cropping systems because it provides essential pulses for the family diet.

## Other farm activities

Rao keeps 5,000 broiler chickens, mainly cared for by his son, 10 Jersey and Holstein-Friesian milk cows, and 6 draft bullocks. Chickens and eggs are easy to market. The milk is sold to the nearby Horlicks factory (Horlicks is a milk- and malt-based powdered beverage). Poultry and cattle are used to fertilize the fields and the rice straw is fed to the livestock. Feed concentrates also are purchased from the local market. Rao spends about 50% of his time managing the livestock, which provides about half his income.

Rao also grows hybrid seed and multiplies seed of maize (GSF-2), bajra (HB4), and sorghum (CSH-5) on rented land. He is closely associated with the National Seeds Corporation and the Andhra Pradesh Seed Development Corporation, government agencies for quality seed production and marketing. About 40% of produce from the rice farm is bought as quality seed by neighboring farmers. Of the rest, 66% is marketed and 33% is used to pay laborers and for home consumption.

## Yields and prices

Since 1965, Rao's yields have improved dramatically (Table 2). Rao markets his own produce. He said that rice prices have changed little,

Table 2. Rao farm rice yields, 1960-84.

| Season | Yield (t/ha) | | | | | |
|---|---|---|---|---|---|---|
| | 1960-65 | 1967 | 1970 | 1975 | 1980 | 1984 |
| Kharif | 2.8 | 2.8 | 5.6 | 5.6 | 5.6 | 5.6 |
| Rabi | 3.8 | 8.3 | 7.5 | 7.5 | 7.5 | 7.5 |

and have recently declined. He considered 1980-82 as the best years in the last decade: weather was good and there were almost no pest and disease problems.

## Labor and machinery

Rao hires labor for farm operations, as needed, especially during planting, weeding, and harvesting. He also permanently employs a farm manager and a tractor driver. His labor use follows a pattern of 30 labor days/ha for transplanting, 1 for fertilizer application, 28 for 2 hand weedings, 1 for pest control, 1 for irrigation, and about 50 for harvesting and threshing. He hires 1 laborer/1,000 birds to tend the chickens and 2 workers to tend the cattle.

Although it is not difficult to get labor, Rao felt that labor costs and availability will soon become a big problem. Therefore, the development of small, low-cost machines such as transplanters; safe, efficient power sprayers; reapers, and driers, all of which can be locally manufactured and serviced, will someday determine the economic viability of rice cultivation. Switching over completely to machines would be good management, Rao said, adding that other farmers of his region feel the same. Labor displaced by mechanization would be readily absorbed by more labor-intensive farming systems such as banana and coconut plantations. He pointed out that improved cultivation practices have not significantly reduced labor requirements.

## The family

"Higher income from better farming has made my family happier now than before," said Rao, attributing that to more purchasing power, enhanced entertainment possibilities, and higher social status. He did say, however, that the success has given them less and less leisure time. His wife Laxmi Nagesuwari, a secondary school graduate, helps her husband in bookkeeping and seed marketing. The rest of the time she cares for the family: their only son Venkateswara, his wife, and a grandson. Venkateswara Rao works with his father. He completed secondary school before going to work on the farm, where his special interest is in livestock.

### Work with the community

When asked what he likes most about rice farming and to identify the best moments in his work with the community, Rao said, "Each and every one!" He is active in the Farmers' Forum, of which he has been secretary since it was formed in 1967. The Forum honors meritorious farmers and organizes demonstration trials, field visits, and meetings with researchers and agricultural administrators. Rao said the Forum's programs have helped the farming community to learn and put into practice new ideas, materials, and techniques, which have produced many benefits. Rao also belongs to the Research Advisory Council of Andhra Pradesh Agricultural University (APAU), which honored him with a district award in 1967 and state awards in 1973 and 1978.

Rao tries new varieties and practices on a 0.25-ha experimental plot. If they work, he uses them throughout the farm. Often, neighboring farmers follow suit.

### Success

Rao lists the following reasons for his success in rice cultivation.

*Modern varieties.* Rao recalled proudly that in 1966, he was one of the first farmers to plant Taichung Native 1 for national demonstration. He also tested IR8 in rabi 1967, and supervised its first large-scale demonstration-multiplication — on about 2,000 ha at Atchanta — on instructions from the Government of India. The following year IR8 was planted on 1,600 ha in the village and the seeds were distributed throughout the country. Since then he has taken an active part in identifying and multiplying high yielding varieties. Recently, he tested IR60 and IR13525, which is a short-duration variety that is resistant to brown planthopper and suitable for cultivation in rabi. He also cooperates with extension workers on minikit trials.

*Availability of inputs.* Fertilizers, pesticides, and application equipment are locally available, which Rao attributes to the village cooperative.

*Machinery.* In 1960, Rao bought a tractor and accessories. The machine has increased efficiency and timeliness of farm operations.

*Improved cultural practices.* Adaptation of modern cultural practices developed at research centers has increased cropping efficiency and yields.

*Group exchanges.* Meetings with farmers, agricultural administrators, and scientists have facilitated adoption and spread of new technologies. Although college education can be an added advantage to a farmer, Rao said it is not essential.

## Science, government, and farming

"Science has a great role to play in helping farmers," Rao said, "because the cost of cultivation continues to increase and outbreaks of insect pests and diseases result in severe losses to farmers." He listed the following as urgent tasks for researchers:

- breeding multiple-resistance varieties that combine good grain quality and high yields,
- direct seeding technology,
- drainage systems for problem areas,
- enhanced (20-d) grain dormancy to prevent immediate germination and facilitate storage, and
- profitable hybrid rice cultivation methods for different agro-climatic conditions.

"These are the areas I would focus on, if I were made director of a research station," Rao said.

"Community participation and proper government policies can also significantly influence returns," Rao said. Streamlining the cooperative system by developing a single-window approach where all necessary inputs, including credit, are available to farmers at a single location at the proper time, and with the same window taking care of marketing would enhance system efficiency. Rao also would like to have credit facilities extended to small machinery shops. Atchanta needs a community threshing floor and drying and storage facilities. According to Rao, a major objective of such a community system would be to prevent exploitation of farmers by middlemen.

Rao thinks the government should provide judicious support prices, further liberalize the credit system, develop a crop insurance scheme, and support research on socioeconomic management and institutional and policy constraints that prevent rice farmers from adapting improved practices. Nationalizing commercial banks, liberalizing credit policies, and supporting rice prices have been effective government actions to benefit farmers. He criticized the extension network, however, for a lack of closeness between extension workers and farmers, and suggested the problem might be solved by increasing the ratio of extension workers to farmers.

"Unions, associations, and the like are the order of the day for obtaining a better deal in terms of monetary returns," Rao said. "It is time for farmers to organize at regional and national levels for effectively improving the life of the farming community. As over 70% of the population is rural, such associations could make rapid strides in increasing rice production. We farmers are ready to do all we can to increase food production. With support from society and technical guidance from scientists, our dreams can and will come true."

*For developing a remunerative rice farming system that gave yields of 9 tons of summer rice per hectare and 5 tons of winter rice; for her judicious adoption of modern farm practices and high-yielding varieties; and for unselfishly sharing her knowledge with other farmers.*

# SOVA RANI DEY

*West Bengal, India*

Sova Rani Dey, 47, is a native of Assam. The daughter of a tenant farmer, she studied through 8th grade. At 16, she married Basanta Kumar Dey and moved to Calcutta. Three years later, while visiting her parents in Assam, she received news of her husband's death. She returned to her parents-in-law in Calcutta and 6 mo later gave birth to a son. It was then that she realized how miserable their life was — in a rented house with no land. When her son was 8 mo old, she decided, with the permission and help of her in-laws, to look for a job. A nun at the Red Cross helped her study nursing, and she was soon appointed as a nursing aide in a rural health center in North Bengal. In 1959, she was transferred to a rural health center in Nadia, West Bengal, where she still lives. Even then, the thought of retirement with no house nor land bothered her, and this motivated her to become a farmer.

**Beginning**

In 1959, Dey bought a goat. Her son was interested in feeding it, so she bought four more. In 2 yr, there were 14 goats. Her success encouraged her, and with earnings from goat sales, she bought a hybrid cow. This began the small dairy farm, which now includes 15 cattle, 10 of which are milk cows.

In 1969, she bought 1 bigha of farmland (7.5 bighas = 1 ha) and planted Ratna, following methods she learned from her father. The land was unirrigated and was originally planted with one crop of traditional rice. Dey's rice yield was good — 3 t/ha — so she followed it with a crop of jute.

Planting rice and jute and integrating those crops with the livestock farm yielded a good income, but Dey did not stop there. In the early 70s, she used her savings to buy 0.2 ha of residential land near the main road, and also a tubewell. She built a small hut and planted coconut, mango, and jackfruit. She began to cultivate eggplant, gourd, and okra in a corner, some spices, and potato. The remaining area was planted to fodder crops. In 1973, she bought more land and now has 1 ha.

## The farm

Dey's farm is about 40 km from Calcutta. The climate is semiarid, with temperatures ranging from 10 to 45°C. About 70% of the annual 1,400 mm of rain falls in the June-September monsoon. The soil is fertile, sandy loam, and Gangetic alluvial. Wet season rice is rainfed. Dey's farm is in 4 parcels in a village of about 6,000 people. The house is on the main road leading to a market town, which is 10 km away. The rice farm also has access to the main road.

Cropping seasons are aus (May-September), aman (July/August-December), and boro (January-May), and the local cropping pattern is jute (aus) - rice (aman) - rice (boro). Boro rice is grown only where there is irrigation. Other common rotations are jute - rice - wheat, or jute - rice. Dey generally follows the jute - rice - rice pattern, but she chooses the pattern based on profitability — for instance, she avoids jute if all the neighbors are planting it.

Dey integrates her field rotations into a system that includes hybrid cattle, poultry, and beekeeping. After rice (0.4 ha), her main interest is fodder crops (0.2 ha). She grows enough fodder to feed the livestock, and therefore does not worry much about the increasing cost of commercial feeds. She owns a mill for cutting and chopping fodder. There is enough rice bran for the poultry. The cow dung is kept in 3 tanks to decompose for 4 mo and then is spread on her fields.

## Labor

Dey permanently employs two laborers. They are hired, as is customary, for cash wages, family living accommodation, food, and traditional gifts of clothing at festival times. For intensive operations, she employs 5-7 workers. Land preparation, transplanting and harvesting, threshing and hauling are managed that way. Weeding labor is hired on a daily basis, and Dey prefers women for weeding. Wage rates fluctuate with the prices of essential commodities. Small farmers tend to suffer more from such fluctuations because most large farms can assure regular contract laborers of more working days.

## Cultural practices

Land preparation is time-consuming. Dey uses a tractor for first plowing and bullocks for the next two. Twelve tractors are available for hire from large farms in the village. Dey said that tractors complement manual and animal power: in the district there aren't enough strong bullocks for the first plowing.

Fertilizer, at rates recommended by extension workers, is incorporated during land preparation. Dey said that organic manure maintains soil fertility and productivity. In aus, she uses only green manure, because applying chemical fertilizer costs more than what she receives for the increased production.

Dey plants several high yielding varieties. The availability of seeds is announced in radio broadcasts and agricultural publications. Sources of seeds include

- the Directorate of Agriculture, through its officers;
- private nurseries that have outlets in different districts and charge higher prices;
- the Agricultural University of West Bengal (BCAU) which gives free seeds to farmers for research purposes; and
- minikit trials, which are provided by extension workers to about 10% of local farmers.

Dey owns a shallow tubewell, which provides necessary irrigation. She floods her rice fields with 2.5-5 cm of water and drains them just before flowering. Dey applies pesticides when needed. If crop damage is low and the cost of chemicals is higher than the probable loss, she doesn't spray. If infestation is high, she applies recommended rates.

Part of the rice harvest is stored for home consumption and the rest is sold, usually within 15 d of harvest. Parboiled rice is dried and then milled in commercial rice mills in the nearby market.

## Livestock production and marketing

Some of Dey's 15 cattle are local and the rest are hybrids supplied by the Dairy Development Corporation of West Bengal, which also has artificial insemination services.

Cattle are fed with fodder produced on her farm, and supplementary feed is bought through the cooperative society, of which she is a member. Fodder is stored in the open, where it is neatly piled on bamboo slats held between four bamboo posts. Cattle are checked twice monthly by veterinarians hired by the cooperative.

Dey's 10 milk cows produce 50 litres milk daily, which is collected by the Milk Cooperative Society. The average price, based on fat percentage, is $0.33/litre. Dey also keeps chickens and ducks, mostly for home consumption, but occasionally markets the surplus. She said she plans to expand the poultry enterprise.

**Beekeeping**

In 1975, Dey heard about the potentials of beekeeping on a radio broadcast. Her son attended seminars given by the radio station to learn about beekeeping. They improvised a box and collected beehives from the nearby forest because commercially available hives are expensive. They now have four boxes. The honey is used at home and sometimes sold to neighbors. In winter, honey production is high because bees can get nectar from mustard. A beekeeping problem is pesticide poisoning.

**Yields and income**

Dey harvests an average 6 t/ha in boro and 3.5 t/ha in aman. Neighboring farms harvest 4.5 t in boro and 3 t in aman. Her maximum yields were 9 t in boro and 5 t in aman. The 9 t yield was achieved in 1981 when she first used modern farming methods and planted Jaya. Conditions were ideal, she said, and soil fertility had not yet been depleted by continuous cropping. Dey said she could harvest higher yields if soil analysis was available to identify micronutrient deficiencies, and if well-adapted varieties were available.

Dey earns 80% of her income from farming and 20% as a Nurse Grade IV. Normally, 50% of farm income is from livestock and 50% from crops. Natural calamities sometimes reduce income from crops to 30% or less. That is why she prefers livestock to crop farming, and besides, capital increases faster in livestock. She estimates that Rs. 70,000 ($5833) used in building her house came from farm earnings.

**Learning**

Dey first learned farming from her father and then from neighbors. Although others were already growing modern varieties, she began to plant them and to use the modern technology package only in 1971.

The field extension wing of BCAU, the first scientific institution she ever visited, has been an important source of information. In 1973, at a BCAU Agricultural Fair, she was impressed by the exhibits and realized that farming could really be scientific. She often seeks the advice of a subject matter specialist who is her neighbor. She listens to radio interviews with progressive farmers and to other farm broadcasts. Agricultural publications in Bengali, taped programs on farming used by extension workers, and other progressive farmers also help her learn new technologies.

## Problems and suggestions

Dey provided a thoughtful analysis of problems in farming. She said that aus yields are low because higher elevation land does not retain water. Without adequate water, fertilizer and other inputs cannot help. She noted that wet season rice yields are lower than boro yields. Continuous cropping depletes the soil of nutrients, especially micronutrients. She said land should have rest to regain fertility, but there is no substitute land to cultivate.

Dey said that if she were a scientist, she would conduct a thorough soil analysis to identify nutrient deficiencies and determine the cropping pattern best suited to each soil type. Research on varietal improvement for specific soil problems also is necessary.

Dey considered some operations, such as plowing with a tractor, uneconomical on small farms. Because most farms in the village are small, farm owners should cooperate on farm operations such as plowing, irrigation, and mechanical spraying.

Dey saw certain limitations of women farmers. Pregnancies and birth make them unfit for farming and child care takes time away from farming. Women farmers are not treated as equals of men, so it is difficult for women to supervise and hire male laborers. Experience as a social worker, however, has helped her handle this problem with tact. Dey gives generous tips of extra food, and by making the men feel she is like a mother to them, she wins their respect.

Other problems she cited are lack of capital for inputs and irrigation, and the high cost of inputs.

Dey has strong feelings about how government should help small farmers. If she were an agriculture minister, she said, she would provide an efficient extension arm to bring technology to the farmers. She would extend credit to small farmers, provide inputs when they are needed, and develop a good pricing policy for both inputs and outputs. She said government should buy rice from farmers during harvest season to avoid exploitation by private merchants.

## Community service

As a social worker, Dey meets all sorts of people and she willingly helps them. "Seeing is believing" is her motto. When neighboring farmers see her crops, they often ask about her secrets. She teaches them modern farming practices and often extends loans to them.

When Dey's goat farm became successful, she began giving goats to landless people who are willing to care for them. The first offspring are given to her and the next are shared equally. If only one kid was born, the milk is shared equally instead. Dey is happy that some people who received goats from her have earned and invested money from them.

She teaches poor women to prepare and sell cow-dung cakes for fuel, and even donates to them some dung from her cattle. Dey travels by bicycle to other villages to teach women about family planning and advise them about farming and education. Four or five landless women are now raising livestock because of her advice. Dey is planning to start a society to involve women in cottage industries.

**Cooperatives**

Dey was actively involved in starting the Singania Cooperative Society, a village-level dairy cooperative. At first she had difficulty convincing farmers to join, but the cooperative now has 150 members. Dey is the treasurer and her son is the secretary. Their main problem is lack of supply of milk for the market. Dey also belongs to the Nagarukhra Agricultural Cooperative Society, a regional organization with 1,700 members, which gives credit at low interest rates for buying inputs.

**Changes**

Twenty years ago farmers were unaware of scientific practices, Dey said, and agriculture was not considered a prestigious occupation. Today, there are many channels of information dissemination to inform farmers about improved technology. Still, she said, college education is necessary in farming so farmers are not only dependent on others' ideas. There are many experiments a farmer with scientific background can do, although such testing does require more time spent on the farm.

Although Dey is actively involved in serving the poor in her district, she still spends half her time farming, but even that is not enough. Her son is a full-time farmer and she only supervises, but she visits the farm regularly and carefully monitors the crops.

Dey said she is more than happy with her present life, saying, "I get high production from my farm, enjoy my social work, and am respected by fellow villagers."

"My son recently married," she said, "and I look forward to introducing my grandchildren to the joys of farming."

# INSIGHTS

What insights can be drawn from the experiences of the 14 outstanding farmers? Is it even possible to draw general conclusions about so disparate a group? What lessons do they have for scientists in agricultural research, extension workers who promote the results of research, and policy makers concerned with development issues? What lies behind their achievements, and can those factors be replicated for the benefit of others?

To begin, each outstanding farmer is fortunate to live where nature favors agriculture. All have good soils, and those such as Yeon Do Kim of Korea, who had not, have solved the deficiencies. Each has an assured source of irrigation that enables two or more crops a year. Input supplies have not posed a serious problem to any farmer, in terms of timeliness, cost, or availability. Where individual ownership is possible, all the farmers own the land they cultivate except one, Serapio San Felipe of the Philippines, who nevertheless makes a good living as a tenant farmer and enjoys security of tenure. They have been spared the worst devastations of floods and typhoons. And each one is abundantly gifted with the personal qualities — drive, determination, initiative, industry, and persistence — that are the basis of success in any field. All this may be subsumed as luck. Beyond this, the diversities are most striking, but serious probing reveals underlying commonalities.

**Land ownership and economic status**

Besides working in a great range of ecological settings — from cold-threatened northern Japan to flood-prone Philippine lakeshores and bracing desert dryness in the Punjab — the outstanding farmers manage farms of varying size and different soils. One hectare of land is enough to provide a decent living to several. Some own more than 10 ha and are more prosperous. None of them is a subsistence farmer. Each produces largely for the market, invests earnings in the farm, and buys some necessities with cash.

This is true even of the Chinese and the Vietnamese farmers, who live where land is communally owned. Vo Van Chung of Vietnam, never a subsistence farmer, was earning a reasonably good living from 3.2 ha at reunification in 1975. Today, farming state-owned land, he takes home the produce of much less than that. Yet he is able to make enough profit — and to make it for the entire cooperative. Qu Yong Shou said that in China, since the new responsibility system was established about 5 yr ago, the family has enjoyed the benefits of extra produce marketed after deducting the share payable to the State. This significantly increased their profit.

The Indonesians Sumardi and Marto Safuan are representatives of farmers' groups. Both had small farms and were just above subsistence level until the cooperative movement began. Membership in the cooperative has given them access to credit, information, inputs, and markets, and is the basis of their current prosperity. The extension services also operate through the farmers' groups. The creation of this solid organizational structure has made government effective in agriculture and has linked small farmers to the commercial sector.

Although the sociopolitical systems in which the 14 farmers operate are diverse, it must be emphasized that rice farming in all of them provides a good livelihood only when it is viewed as a business. For seed growers like Jagjit Singh Hara and Subba Rao of India and Wiboon Inclai of Thailand, this is immediately obvious, but it is equally true for the others.

Of the 11 farmers who own land, 10 inherited most of theirs but bought more. Only Sova Rani Dey of India bought all of hers. San Felipe never really explained why he has stayed a tenant farmer for 33 yr, but it is likely that good land in his area is difficult to buy. The Chinese and the Vietnamese originally acquired their land by inheritance, before the change to a communal system, and therefore can be classed as landowners.

### Women as managers

Although women are ubiquitous in rice agriculture in Asia, few are managers of farm enterprises. Inheritance laws and social structure are the major reasons. Etsuko Tada, her parents' only child, inherited land in a country that encourages young men who marry heiresses to take their wife's family name, thus enabling the property and name to be passed on, as illustrated by Koichi Kimura. Tada's decision to continue to farm her land as her main source of livelihood was personal. Sova Rani Dey, on the other hand, deliberately acquired land and entered agriculture, seeing it as a source of income and, more important, of security.

The personalities of these two women draw attention to themselves. Both have boundless energy. Tada runs her entire farm single-handedly, operating and maintaining all the machinery she uses. Her only assistant is a fragile and elderly mother. Her sole complaint is that the machines are not better designed. Dey, now stout and motherly, continues to pedal her bicycle long distances every day to advise village women on health and family planning while also managing the farm. The achievements of these women are remarkable by any standards. But they also highlight the powerful motivating value of ownership.

### Changing attitudes toward farming

The ages of the 14 farmers, most of whom are in their 40s, indicate the change in attitudes which has accompanied the gradual commercialization of farming in Asia. At 54, Qu, the oldest in the group, probably took it for granted, when he entered farming, that it was the only thing to do, and there may have been few other choices. Kim, 25, the youngest, abandoned a city job to become a farmer. He saw the farm as a business with potential for profit, although he might not have done so if there had not been a family farm.

Of the other farmers, several chose their occupation — Abul Kalam Azad of Bangladesh, the Japanese, and the Indians. Even Wiboon Inclai of Thailand, motivated by the unexpected acquisition of a piece of land, gave up a more glamorous, but insecure life as a performer to settle down to rice farming. Only six of the farmers — Qu, Chung, Sumardi, Safuan, Kahlan, and San Felipe — saw agriculture as their traditional occupation. Those six have changed their attitudes over time, and are today businessmen and not subsistence farmers.

### Farm mechanization

The use of and attitude toward mechanization and labor is yet another area where the initial impression of contrast in practice masks significant convergence in attitudes. At one extreme are the highly mechanized farms of Kimura and Tada. The list of what they own, individually or cooperatively, is substantial, and even what is cooperatively owned usually is individually operated. At the other extreme are the Indonesians and San Felipe. They are wholly dependent on animal power for plowing and hauling, although the latter has a threshing machine. The other farmers are partially mechanized and are acquiring more machinery. They strongly state their preference for machinery over manual laborers and draft power. The seed farmers, Hara and Rao of India, are the largest operators of machines and unequivocally state the need and preference for more mechanization. Both Azad and Dey articulate the need for tractors to achieve the quality of land preparation necessary for modern farming. Several of the others use a personally or cooperatively owned or hired tractor for plowing. The nature of land preparation, even more than the availability of labor or animal power, dictates this requirement.

The Japanese farmers transplant mechanically, and the others expressed the need for machines to eliminate this backbreaking manual operation. Chung wistfully hopes for a direct seeding technology that will get rid of the centuries-old "bent back" of the rice farmer and for a reaper that can "walk in the mud." For harvesting and threshing too, machinery is being used or is sought to be used by all of them, mainly because of the scarcity of labor and the larger quantities of grain that must now be handled. San Felipe, the classic small farmer, owns a threshing machine, as does Inclai. It is only in the Indonesian cooperatives where community labor is still available for threshing that the need for threshing machines was not expressed. While some farmers spoke of abolishing drudgery, the larger farmers in the group are deeply conscious of the need for mechanization because of a growing scarcity of labor.

## The paradox of farm labor

The farmers all perceive labor as a scarce commodity, not only as a growing trend, except for the Bangladeshi and the Indonesians, but also for now. They say enough labor is not available (needs are increasing with the intensity of modern farming) when it is needed — in cycles of a few days at intervals through the year. For laborers, although double and triple-cropping provides more work cycles, there nevertheless is not enough to provide anything but intermittent and insufficient employment. Earning opportunities for farm laborers still are not enough to guarantee a year-round living.

This rural underemployment has caused massive rural-to-urban migration, while at the same time, the landowners complain of labor scarcity and insist they are being forced to mechanize. In such circumstances, farmers do not see themselves as displacers of labor. The implications are clear. Mechanization is an inevitable consequence of modern, scientific farming, and work opportunities for surplus labor in the rural areas must be created in the off-farm sector.

### The family and the future

Family labor alone is inadequate, even if willing, to handle modern farming pressures, and must be supplemented by either hired labor or mechanization. But, is family labor enough even with machines? How do the successful farmers see their children meeting this need? Do they see their children as farmers?

Again, there is surface diversity — in the size of the family and the farm and in the family's role in farming and aspirations for the future. Qu, an early adopter of family planning in China, has only two children, as do the Japanese and Hara. Dey and Rao have only one child each. Sumardi and San Felipe expressed no difficulty about raising and educating families of six on the income from a small farm. The first is proud that he does not need his children to work on the farm, and the latter is equally proud that his children are exceedingly helpful in farm management.

All the farmers, however, expressed modest reservations about their children's future. Rao and Dey have already established their only sons, both adults, as successors in the family business. The adult children of Qu, Chung, Tada, Sumardi, and San Felipe already have other occupations, but one of San Felipe's sons is working on the farm. Most of the parents hesitate about the future. If their children are young, they say they would leave it to the children to make their decisions. Most hope that at least one child will become a farmer, but comment on its disadvantages. The consensus is that farming is hard work and a hard life; and they would wish for a better and easier future for their children. Only Tada, Kimura, and Kim are actively promoting a "return to the farm." Tada's children have shown no sign of becoming farmers, while Kim is a living example of such a choice.

### Knowledge is power

Success in modern scientific farming inevitably requires knowledge, training, and continuing access to new knowledge. Almost all of the outstanding farmers not only have access to scientific knowledge, but are in close, constant contact with universities and research institutes. Chung has maintained close links with Can Tho University since he became a demonstration farmer for them, Hara and Rao are regular visitors at nearby agricultural universities, and Azad and San Felipe also frequently visit research institutes. All the farmers listen to radio and television and read the available literature relating to agriculture. All maintain close relations with extension workers, attend training courses and seminars for farmers, lead farmer discussion and study groups, and travel to gather additional information. Although the styles and media vary by country, all the farmers are zealous information gatherers.

This trait seems to have little to do with their level of education. Of the 14 farmers, 6 have elementary school education, and 3 are secondary school graduates. The women are at the middle school or junior high level. Only Kimura is educated, through junior college level with specialization in agriculture. Hara has a master's degree in economics. All, however, exhibit the energy to seek information that they need when they need it, rather than waiting for it to come to them. This is their single most common trait. Their ability to anticipate their need for and their willingness to acquire information are basic to their success. Success has not been merely a question of their personal dynamism and drive: it also represents their clear understanding that without a solid information base progressive agriculture is impossible.

**Communication channels**

The first adapters of new technology, and significantly the 14 are all firsts, are likely to be outgoing, enterprising individuals who seek out information and apply it. But how can the rest be reached, and do the first adapters become channels of communication? The answer is yes.

Here too, style differs by country. Dey, as a social worker, finds time to share information with farmers and lets them "see for themselves" on her farm. Chung is the link between the university and neighboring farmers, and organizes farmer discussion groups and field tours. Hara and Qu have been recruited by nearby universities to teach students through formal lectures and demonstrations, and Qu has apprentice trainees. San Felipe, Kim, and Inclai are much in demand as speakers at training courses and seminars. Rao sits on the research advisory council of the agricultural university and founded a local farmers' forum. All of them are active members of local and regional farmers' organizations and associations in which knowledge sharing is a prime goal. Sumardi and Safuan stressed that group discussion and sharing within the farmers' group have been major avenues of progress.

Seeing is believing, and each farmer practices this age-old method of teaching by demonstration; their farms are examples of what they talk about. They travel widely and are much visited. Their visitors' books are full of signatures; wry complaints were heard about the amount of time spent in entertaining; and in China, the government has even given Qu a small allowance to meet the costs of entertainment. Their leadership and educative role in their communities is forceful. Extension departments, already aware of this, are utilizing them fully.

**Profitability**

If rice farming is a business, how profitable is it? Almost every outstanding farmer practices diversified farming. Not only that, they earn a substantial part of their income from sources other than rice. One-third of Kimura's income is from mushroom cultivation and two-thirds is from rice. Kim said peach farming is more profitable than rice. Qu, after reserving some rice for family consumption, earns six times more from his privately owned orange trees than from rice. Chung said that watermelon, tomato, and ducks each return the equivalent of 1 ha of rice, not to mention the community profit from growing sticky rice at the appropriate time. Dey and Rao said that half their income comes from livestock, and that livestock farming is less risky and builds capital faster than cereal farming. Azad earns as much from sugarcane as from rice, and nearly two-thirds of that again from a cash crop such as turmeric. Kahlan depends on coconut and cacao, and San Felipe on fish culture as secondary source of income. Safuan of Indonesia receives nearly 25% of his income from activities other than rice farming. The two who depend mainly on rice are seed growers, Inclai and Hara. Tada has a highly diversified enterprise, but mostly to make the farm self-sustaining. Although she sells flowers, cattle, and vegetables, she does not claim a large proportion of income from those sources. Soybean processing, however, is of major importance. Sumardi engages in rice farming at the marketing level, but plants a diversity of crops for home consumption and is considering expanding them.

The inescapable conclusion is that rice farming is not highly profitable unless specialized, as for seed, and must be part of a farming system. This is not, however, a return to the older idea of rice growing as part of a cluster of productive and maintenance activities in which subsistence farmers were engaged, but is a new and higher level of the spiral, which recognizes the commercial aspects of farming. For the individual, risks must be spread over a variety of activities. From a policy standpoint, various incentives and support systems must continue and be strengthened if farmers are to be induced to stay in rice farming. Most governments would rather not face the alternative of allowing rice prices to shoot up to induce higher rice production through market forces alone. Disturbingly, as input prices increase and more inputs are needed, these support systems will have to grow until the demand for rice stabilizes. A strong effort will be needed in rice growing areas to generate employment opportunities and additional income through diversified on-farm and off-farm activities.

### Attitude toward science

What are the farmers' demands and expectations of science? How do they view scientific research and its contributions to progress in farming? None hesitated in answering the question, "What would you do if you were made director of research?" The answers came thick and fast.

Unanimously, they gave first priority to varietal improvement, which they see as the only-long term way of meeting the challenges of adaptive pests and pathogens. The emphasis on varietal improvement also is a response to the rising costs and labor demands of inputs. Each farmer clearly expressed the need for constant work by plant breeders to develop new rices that will not only continue to be high-yielding but also have other desirable qualities. All mentioned resistance to insect pests and diseases, and some specifically named the pests and diseases from which they wished to be protected. Almost all would like to see short-duration varieties that permit multiple cropping and almost all mentioned better eating quality. Those from the colder regions spoke about cold-tolerant varieties and, interestingly enough, so did Inclai from Thailand. Other desirable qualities were long dormancy, increased seedling vigor, submergence tolerance, deep water types, resistance to salinity and iron toxicity, and adaptability to different moisture regimes. The farmers tended to regard scientific institutions as plant breeding centers.

Second in importance were pest control and soil problems. While identifying the need for research on improved chemicals for insect, disease, and weed control, all the farmers expressed awareness of the high cost of chemicals and several cautioned about their safety hazards and possible long-term environmental damage. Azad regretted the inability of science to deal with the age-old problems of rats and birds.

Several farmers articulated the need for rapid and extensive soil testing as a means to assess fertility, suggest possible remedial measures, and indicate suitable practices and cropping patterns. Kim and Hara had made excellent use of available soil testing facilities and had taken appropriate action. Dey, Azad, and San Felipe were among those who pleaded for attention to specific soil problems.

The next on the list of problems proposed for research attention were methods to improve implements and machinery, water management, and direct seeding technology. Azad wanted better plows for deeper plowing, and Tada stressed machinery more suited to women, especially in view of the trend in Japan for women to take over farm management while men look for other part-time or full-time employment. The plea for reapers and transplanters and a technology for direct seeding stemmed from a clear realization that labor-saving techniques must be found in a future where labor will become even more scarce for the traditional drudgery jobs. Drainage problems and cultivation of deep water rice were stressed by the Indonesians. Qu and Rao, from different points of view, pleaded for the development of high quality hybrid rices.

### Learning and teaching

Several other problems for scientific research were referred to, sometimes by only one person: some were primarily related to the extension network. Kimura cited the need for rapid information transfer systems. Hara wanted scientists to have more dialogues with farmers, respond to farmer suggestions, visit farms more often, and develop farm-oriented rather than institute-oriented research. Several others spoke of the need for extension agencies to be closer to farmers — in several dimensions, ranging from a higher ratio of extension workers and closer contact between farmers and workers. Indirectly, this concerns the researcher because it draws attention to the two-way role of extension: bringing farm problems to the attention of researchers and carrying research results to the farm.

With characteristic modesty, the farmers said little about what scientists might learn from them, but by reading between the lines one might make a few guesses. Qu's experience is illuminating. With little formal education, but through years of close and patient observation of rice plants, Qu learned facts that have since been corroborated by researchers. His rule-of-thumb method of relating fertilizer and water management to change of leaf color is wisdom born of experience, but also a scientific discovery because it can be both replicated and theorized. It is fortunate that the Chinese system is responsive to the discovery of barefoot scientists like Qu.

### Perception of policies

Although forthright on the role of science, the farmers were reticent to speak on the role of government. Eight of the 14 did not comment on government. The rest approved of their government's action to support farmers and agriculture in general. Pleas for action concentrated on the need for government intervention in marketing, and included discussion of official procurement policies, timeliness, support prices, and price predictability. There also were suggestions for quality control, lower input prices, timely availability of inputs, better and more liberal credit, and more effective extension services. It was clear, however, that they were speaking for farmers in general rather than about themselves, as they had rarely experienced these problems. They did, however, perceive such problems as obstacles to the success of neighbors and friends. Rao suggested schemes for crop insurance, and Kahlan felt that government should do more to promote farming as a way of life. Tada, who shares this concern and is actively promoting the return of rural youth to the land, and Kim, a "returned youth," did not say they saw a role for government in such a movement. They seemed to place more confidence in individual initiative than in official intervention, while recognizing the supportive role that government can play.

**Professionalism**

In the final analysis, what distinguishes these outstanding farmers from their peers and links them together is their total acceptance of farming as a profession. For these men and women, farming is a livelihood, not just a way of life. They approach it with the cool-headed competence and single-mindedness found in professionals of any field. This is the thread that makes them true farmers, a category that often is meaningless when applied to millions of their fellow-countrymen.

Many rural Asians depend for subsistence upon a variety of occupations and activities, one of which is growing rice. They are variously described as small, or marginal, or subsistence farmers — words that fail to accurately describe their lives. But not so the 14 persons described in this book. They are indeed farming professionals. With their decisions to turn knowledge into power, they have entered the world of scientific agriculture.

It is as professionals that they interact with the worlds of science, of business, and of government — worlds that often are confused about how to establish contact with nonprofessionals in rural life. The modern world can deal with these farmers as professionals. They can be expected to react like economic man, the dream of the classical economist, or the profit-maximizing corporation. Dey, for instance, articulated in clear terms how she operates at the profit margin. She decides what crops to grow and whether or not to apply an extra kilogram of fertilizer.

The recognition of this emerging class of professional Asian farmers is of great significance. A pessimistic conclusion would be to imagine that the "people" cannot be reached by research, extension, or government until they have become professionals, which is an obviously distant possibility. A more optimistic and realistic approach would be to understand and value the professionals and to use them as gateways to the nonprofessional world of rural people. The people described in this book are excellent examples. All of them have proved themselves good communicators — two-way and willing. Their desire to serve others is readily apparent in their words and actions. Whether the aim of science, extension, and government is to increase food production, or whether their target is the larger aim of development, these farmers who have one foot in each world, could play a tremendous role in the interaction between the two.

It is as professionals and communicators that these 14 men and women must be recognized and saluted. This conclusion has profound implications. For scientists, this implies the need for constant endeavor to keep pace, if not one step ahead, with the challenges posed by problems emerging from their fields where scientific agriculture is practiced, and for a realistic attention to costs. For extension workers, it suggests the value of enlisting farmers as professionals in the two-way learning process. And for policy makers, it once more emphasizes the need for continued support, through a variety of measures, to rice cultivation. Such support may include generation of new employment opportunities for rural labor and initiation of a cooperative support framework for small farmers. The interpretations, and the directions toward which they point, may be a matter for debate. But as regards those whose lives and work are documented here, no debate can detract from their achievement.

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