The IRRI Pioneer Interviews

Conducted by Gene Hettel

RiceToday

Preface

Starting with the January-March 2008 issue of *Rice Today*, the magazine has published 12 excerpts from selected interviews that I have conducted with IRRI's rice pioneers. As one of the activities to commemorate IRRI's 50th birthday, I've logged more than 100 hours of videotaped conversations with more than 50 pioneers, ranging from the Institute's early researchers, to others recently retired, to researchers' spouses and children, to our research partners, and to the farmers themselves.

This booklet reprints those 12 articles. See the table of contents. Full transcripts of the interviews and their full video presentations are online at www.irri.org/publications/today/Pioneer_interviews.asp.

Hopefully, I will occasionally publish more in the future as I sift through the tapes and transcripts and, yes, continue to conduct more interviews because I know I've left out many key figures whose stories and insights deserve to be preserved as part of the Institute's rich history and legacy.

Gene Hettel
Contributing writer
Rice Today

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GENE HETTEL (3)

Luck is the residue of design

Peter Jennings, the International Rice Research Institute's first rice breeder (1961-67), with a long career in Latin America after his work in Asia, kicks off this historic series with a singular wit. He played a major role in the development of IR8, the rice variety that would ultimately change the face of agriculture across Asia (see* Breeding History *on pages 34-38 of* Rice Today *Vol. 5, No. 4). He reminisced on a warm, muggy day (20 July 2007) at his home in Gainesville, Florida. Here are edited highlights of the interview.

A matter of 5 minutes

I started graduate school at Purdue University in 1953. I was there almost 3½ years for my master's and doctorate. During my second year, a Mexican kid—Ignacio Narvaez—was in the office adjacent to mine. Ignacio was a wheat breeder for the Mexican Ministry of Agriculture associated with the [Nobel Laureate Norman] Borlaug group and he talked about Mexico and his work. I said to myself, "I want to work in international agriculture." I was consumed by this. But everything I tried to become affiliated with the Rockefeller Foundation was useless. Nothing happened. Rockefeller didn't need another plant pathologist.

So, I finished in 1957. Jobs were scarce. There was one job available in Madison, Wisconsin—a forage pathologist for the U.S. Department of Agriculture, which I was about to accept. At Purdue, I lacked one form for my doctoral thesis. I went to the dean's office in the School of Agriculture to pick it up. While I was talking to the secretary, Dean Ernest C. Young—also a consultant to the Rockefeller Foundation who knew me because of my frustrated attempts to get into the Foundation—walked by. He said, "Peter, what are you going to do?" I said, "Well, Dean, I'm going to go to Wisconsin." He responded, "Didn't you want to work with Rockefeller?" I said, "Yes." He said, "Wait a minute." The dean walked into his office, picked up the phone, and called George Harrar [then RF's director for agriculture and later RF president, 1961-72]. He left the door open so I could hear. He said, "George, I've got a kid here. He set some sort of an academic record here at Purdue and he wants to work for you and what are you going to do about it?"

So, I had two phone conversations with George Harrar. During those conversations, he said something I never forgot, "Would you want to live in the Philippines?" I said, "Of course!" That night, I had to look in my atlas to see exactly where in the Pacific the Philippines were. He said, "Well, we're going to do something there. It's going to take 3 or 4 years to get organized. Meanwhile, we'll have to find something for you to do [ultimately, brief stints in Mexico and Colombia]."

I have a profound belief in predestination, fate, and luck. Had I been 5 minutes earlier or later that morning at Purdue in the dean's office, I would not have crossed paths with Dean Young, there would have been no phone conversations with Harrar, and I would have had a career as a forage pathologist in the U.S.

George Harrar—he was magnificent!

So, I got a job with the Rockefeller Foundation in 1957. Terrific! What's the significance of this? Bob [IRRI's first director general, Robert F.] Chandler's book [*An Adventure in Applied Science*] cites the year 1958—about a year and a half after my telephone calls with Harrar—as the time when the Rockefeller and Ford Foundations first connected to thrash out the concept of IRRI. Harrar had "IRRI" on his mind when he talked to me much earlier on the phone about rice and the Philippines. You don't see that in Chandler's book. The driving force behind IRRI was George Harrar. He was magnificent, a giant!

Getting germplasm in the early days

When I finally got to IRRI in October 1961—as a breeder, not a pathologist—the first challenge was to assemble a comprehensive world collection of

rice varieties. For germplasm, IRRI had only some 300 odd varieties. I spent a lot of time wandering back and forth in the mud trying to look at these plants. I wrote a letter, co-signed by T.T. Chang [IRRI geneticist, 1961-91], requesting any germplasm in small seed samples, and sent it to rice workers or experiment stations in some 60 countries. These were the days when it was pretty easy to move germplasm from one country to another. The response was wonderful. Within months, boxes and boxes of seed packages were coming in. I guess within 2 or 3 years we had several thousand accessions.

Increasing rice yields

Another challenge was more complicated. Chandler kept preaching: increase yield! Okay, that's easy to say, but how do you do it? I spent a lot of time talking with Akira Tanaka, head of IRRI's Plant Physiology Department [1962-66]. We tried to develop a mental image in our minds of what the leaves, stems, culms, and general architecture would look like on an ideal rice plant that would yield more. We determined that, if we were going to make any progress, we had to dramatically change the plant type.

The first seminar I gave at IRRI was on what an ideal plant type had to look like if we were going to get higher yield. I wrote that up and sent it to *Crop Science* [Plant type as a rice breeding objective, 4:13-15, 1964]. There were no data, it was just philosophy. For some reason, *Crop Science* published it. Years later, I reread that paper, long after IR8 came out [in late 1966]. And it just seems to me that IR8 looks very much like what we were theorizing.

An epiphany

Well, the rest is history and just sheer luck. And it goes back to that first set of 38 crosses [that ultimately led to IR8] we made in late 1962. About half of them involved the three famous Taiwan short-statured varieties [Dee-geo-woo-gen, Taichung Native 1, and I-geo-tze]. They looked terrible under Philippine conditions. They were riddled with bacterial leaf blight. They were shaded by tall things. They were sterile and miserable, but short!

We grew out the F_1s [first generation]—38 combinations, which is ridiculous by today's standards. Thirty-eight crosses in a year—absurd! But that's what we had. So, we grew out the F_1s; they were terrible. They were worse than the parents themselves. They were gigantic—6–7 feet tall. We harvested the seed from each of the single crosses—38 populations. And for not having anything else, we had a large F_2 [second generation] population—4,000–6,000 plants from each single cross.

Maybe a month after transplanting, one day we looked out there. The plants from the first cross were tall—terrible. It was a jungle. It was bad. Then, we came onto the plants from one of the crosses that involved one of the three Taiwan short-statured varieties. We looked down the rows. Something had happened! It was an epiphany! I never had an experience like that in my life—before or since. There were tall plants and there were short plants, but there were no intermediate plants! The short ones were erect, darker green, and had sturdy stems and a high number of tillers. We counted the tall plants and short plants. Essentially, the ratio of tall to short was 3 to 1—obviously a single gene recessive for shortness! It may sound something like arrogance, but I contend that I knew, at that moment, the significance of this.

Mixing good science with luck

When I was a little boy, I was a fan of an American baseball team, the Brooklyn Dodgers. Their famous general manager was Branch Rickey. This wizard said, "Luck is the residue of design." I think he was right. Some people are lucky, some people are not lucky. Luck does appear on its own volition, I know, from time to time. But luck is a consequence of putting a lot of mental observational evidence all together and all of a sudden it happens, it works. There is always luck. But sometimes you earn your luck. You influence your luck for sure.

Go to www.irri.org/ricetoday to read the full transcript of the Peter Jennings interview in which he discusses more of his version of the IR8 story, distributing IR8 in the Philippines, his impressions of Bob Chandler and other colleagues during the early days, his rice work in Latin America including genetic versus agronomic advances, and his view on what are the challenges for IRRI as it approaches its 50th anniversary.

URBITO ONGLEO

IRRI'S FIRST rice breeder, Peter Jennings, briefs visitors on IR8 in April 1966 just 7 months before its official release.


JERBY AGUIHON (3)

Reflections of a rice widow

Carolyn Moomaw Wilhelm and her late husband, James ("Jim") Curtis Moomaw, arrived at International Rice Research Institute (IRRI) headquarters in Los Baños, Philippines, in November 1961 with an infant son in tow and ready for a grand adventure. After 8 years as IRRI's first agronomist (1961-69) and important posts in Africa and Taiwan, he passed away prematurely at age 55 in 1983. During a recent visit to IRRI—her first in 26 years—Carolyn spoke fondly about meeting and marrying Jim and their time at and beyond IRRI. Here are edited highlights of the interview.

Getting together at Washington State

Jim was the grandson of a very famous pioneer in the field of soil science, Dr. Curtis Fletcher Marbut, who did quality international work in South America, the Soviet Union, and Africa, as well as in the United States. This was always on Jim's mind and it honed his interest in doing similar research. Jim grew up on the Branch Experiment Station in Dickinson, North Dakota, where his father, Leroy Moomaw [also an agronomist and noted for his work with crested wheat grass], was superintendent for many years. Jim had a degree in botany (ecology), with a particular interest in applied agronomy involving soils, pastures, and grasses.

I met Jim at Washington State University—Washington State College in those days—in a class on soil microbiology. We were both graduate students, but he had been there several years before I met him during the 1954 fall [autumn] semester. He had come back from Alaska on crutches because he had "chopped" the wrong limb! He made an impression on me because he was on crutches—and he was my lab partner.

A year passed and we didn't pay much attention to each other. Then he visited me in the summer of 1955, when I was working at Yellowstone National Park during a break from my graduate studies. Suddenly, I realized this older man—he was 5 years older!—who had impressed me was interested in me. We were married almost immediately (within 6 months). He finished his very long research project, a study of grazing and burning of pastures in the Columbia Basin Region; I did a

GENE HETTEL

MRS. MOOMAW WILHELM stands in front of IRRI's long-term continuous cropping experiment, which her late husband started in 1963. Currently in its 132nd crop, it is the most intensively cultivated experimental site in Asia, and has provided important data on the effects of such a cropping system.

biochemical research project for an M.S. in the Bacteriology Department. Both of us completed our orals on 19 September 1956, packed up, and left that night en route to his first job as assistant professor of agronomy and soil science at the University of Hawaii. Hawaii in 1956 was not yet a [U.S.] state, but still a territory—and that in itself was new territory for us.

IRRI-bound on the USS Hoover

Jim was being courted by the Rockefeller Foundation, which by then [along with the Ford Foundation] had decided to establish IRRI. Originally, they were thinking Jim might go to Japan to do research in Sendai on Hokkaido. Then, Sterling Wortman [IRRI associate director, 1961-64], who had known and worked with Jim occasionally, suggested that Jim be considered for IRRI's first agronomist position. So, Jim was invited to see IRRI as it was being built [July 1961] and to meet [Director General Robert F.] Chandler and the rest is history. We were excited, very excited. We packed up and traveled by ship on the USS Hoover from Honolulu to Yokohama [Japan] and Hong Kong prior to docking in Manila. We spent several weeks in the Manila Hotel while waiting for our house to be finished and our household effects to be cleared.

That was the beginning of some very exciting times for us. Since I had already circumnavigated the globe with Jim (East Africa, Delhi, Calcutta, Bangkok, Hong Kong, and Tokyo during a Fulbright year to and from Kenya), I was not so shocked by the poverty we saw in the Philippines when we first arrived.

As a child, rice certainly was not something that I ever thought of. My mother would serve it to me with cinnamon and sugar—rice pudding. Now, thanks to IRRI, we think of it in an entirely different way. I'm very snooty about rice, even today you see. I don't want to buy that old stock that's in the market. I know some good Asian rice stores in Dallas and New York and where I live now [in Oklahoma].

James Moomaw on the world food crisis, summer 1976

The current climate of rapidly climbing grain prices, along with increasing reports of civil unrest due to unaffordable or unavailable food, makes the 32-year-old comments of Dr. Moomaw—then director general of the Asian Vegetable Research and Development Center in Taiwan—eerily prescient.

MOOMAW FAMILY COLLECTION

The food crisis is the result of specific failures in specific locations, for specific causes—usually weather or technology. It is not the trend, but the deviation from the trend, that causes disaster. Conceptually, the idea of a sudden "food crisis" is misleading. History has always known hunger, and, in fact, hunger was much more severe in the past, when populations were much lower. One hundred years ago, China had a drought that killed more than three million people. India has had food failures for the duration of its recorded history. Compared with past famines—the one in the 1880s claimed almost a fifth of their total population—hunger has been a negligible problem for India in the 20th century.

Nevertheless, there is no question that population growth exacerbates the problem of hunger, and, of course, many other social problems. It narrows the margin between the trend of production and the trend of human needs, making otherwise trivial deviations in production trends disastrous in their human consequences.

Agricultural technology will continue to solve problems. But can it keep up? That is what Robert Chandler, first director of both IRRI and the Asian Vegetable Research and Development Center (AVRDC), and George Harrar, former president of the Rockefeller Foundation), have been asking for 25 years. People cannot average their appetites—if your technology fails for whatever reason at just one time, you have disaster on your hands.

The areas of the world where the threat of future hunger runs highest, I believe, are the high-density, low-income nations, with relatively limited resources on a per capita basis. India, Indonesia, and mainland China all face difficulties. Although there has been less starvation, proportionately and in absolute terms, in this century than the last, it is possible that, with enough bad luck and bad planning, there could be as much by the end of the century, or more.

Go to www.irri.org/publications/today/Pioneer_Interviews.asp for more observations on a variety of topics by Dr. Moomaw, then AVRDC director general, excerpted from a 1976 interview conducted by journalist Nick Eberstadt.

There were very few Americans at IRRI in the beginning, but there were many other nationalities and they were also excited to be a part of this new venture. However, in some respects, the women [spouses] with whom I interacted were often quite lost and lonesome without the extended families they were accustomed to. The Chinese, the Ceylonese [Sri Lankan], the Indians came from cultures in which they had strong support systems. Coming [to IRRI] was a much greater sacrifice for them than it was for me or for any of the American women [who came to IRRI with their husbands in those days].

Going to Ceylon

[In 1967] IRRI received a grant from the Ford Foundation for rice research in Ceylon (today's Sri Lanka) and Bob Chandler offered Jim the opportunity to lead the project. [At first] I didn't want to go. We had four little boys (ages 7, 5, 2 and a half, and 1+) and I couldn't see myself coping and I was worried about obtaining potable water, milk, good food, and

ALVIN W. REGIER

CAROLYN WITH HER brood (*from left*, Bill, Charlie, Martin, and John) in front of their house at IRRI on 22 January 1967. Later that year, they joined Jim in Ceylon as IRRI's first outposted family.

other basic necessities. In the end, I agreed to go and we were quite a unit going into the IRRI program at Kandy [south-central Ceylon].

Most of the time, Jim was in the field. He was all over that island. He was so motivated to see everything and to get as many rice plots established as possible. He worked all the time and so I had my own responsibilities taking care of four sons. All of a sudden, we were the only ones [IRRI people in Ceylon and almost the only Americans!] and so everybody who was coming through, of course, either stayed with us or we entertained them. That was really fun for me. It was a very, very nice 2 years that we spent there. It wasn't easy, but it was nice.

Into Africa

After Ceylon, I was disappointed that we didn't come back to IRRI. I wanted to come back. I wasn't all that keen on going to Africa. We had arm-twisting sessions in New York with [Richard] Bradfield [IRRI agronomist, 1963-71] and the Rockefeller people who talked us into the job. We knew that it was important. We knew that this new institution [the International Institute of Tropical Agriculture (IITA)] needed what Jim could offer, and in the end we decided that we would do it and we went to Nigeria [in 1970].

Jim enjoyed IITA. He first went there as the rice specialist. Together with the resident Nigerian rice breeder, he developed the rice program and then became the farming systems leader. This broadened his scope a lot to include economics and soil and water management. Some of the people whom he hired in the department were just very, very good and very motivated—including Eugene Terry [a future director general of WARDA, the Africa Rice Center, 1987-96]. It was a big department with respected Nigerian staff too.

Then, Jim was offered the outreach director position. He accepted and traveled all over Africa putting in programs. I don't think he ever got to South Africa; he traveled mostly in the middle part of Africa. It was dangerous in many respects, mostly traveling in a small plane. It was very nerve-racking for me. Internal travel while we were in Nigeria was really very difficult because the roads were so bad. So, I didn't get to do very much traveling in Africa myself.

Still alive

Without Frank Byrnes [IRRI's first communications specialist, 1963-67], I would have lost contact with the international life after Jim died [of a brain tumor at the age of 55 in New York] in 1983. He's the one that made a real effort to keep me informed of what was going on at IRRI. His friendship continued after I moved to Dallas about 3 years after Jim died. I really didn't emerge for several more years until Frank invited me to Winrock [International; a nonprofit organization associated with the Rockefeller Foundation, where several former IRRI staff worked] in February 1989. This sort of jolted me out of my grief. It took me such a long time to recover because the boys were my major concern, and my fledging career and our move to Dallas were also major distractions. So, I really hadn't come out of it until I met Frank at Winrock. Finally, I could say I'm still alive; I'm still here.

Dirty boots and rice widows

Bob and Sunny Chandler were incredible people—inspiring, energetic, devoted, and generous. Bob had very little patience for trivia, however. He wanted everybody—all the scientists—to get their boots dirty right away, be out in the field. In fact, the story was he would go around and look at the boots. If a staff member hadn't been in the field that day, there were questions. Of course, Jim had no problem with that. Agronomy is the field. We admired both of them greatly and I learned so much from Sunny. Apart from my mother, she had more influence on me as a developing, maturing young woman than anyone else in my life and that holds true today.

Yes, we [the spouses of the early IRRI international staff] were rice widows. I think Bob Chandler actually coined that phrase. And that's what we called ourselves. He was an empathetic man and recognized our plight, but IRRI scientists, often away from home for long periods, had a job to do and we appreciated and supported that.

Go to www.irri.org/publications/today/Pioneer_Interviews.asp to read the full transcript of the Carolyn Moomaw interview in which she discusses more of her family's life at IRRI headquarters and in Ceylon, gives her no-nonsense impressions of other pioneer IRRI staff and their families, and describes how attitudes in Asia and Africa are completely different.


GENE HETTEL (3)

The problem solver

After 26 years at Cornell University in the United States, Nyle C. Brady became the International Rice Research Institute's (IRRI's) third director general in 1973. During 8 years at the helm, he pioneered new cooperative relationships between the Institute and the national agricultural research systems in Asia. After IRRI, he served as senior assistant administrator for science and technology at the U.S. Agency for International Development from 1981 to 1989 and was also a senior international development consultant for the United Nations Development Programme (UNDP) and the World Bank in Washington, D.C. Born in Colorado in the U.S., he earned his BS in chemistry from Brigham Young University in 1941 and his PhD in soil science from North Carolina State University in 1947. Now an emeritus professor at Cornell, he is the co-author (with Ray R. Weil) of the classic textbook, **The nature and properties of soils**, ***now in its 14th edition. He and his wife Martha are retired and live near Albuquerque, New Mexico.***

Coming to IRRI

Having worked at the nearby University of the Philippines at Los Baños as a visiting Cornell professor, I knew of the area and the plans of Bob Chandler [IRRI's first director general] and his group to set up the Institute in the early 1960s. In 1972, Frosty [Forrest F., Ford Foundation vice president of overseas development] Hill, chairman of IRRI's Board of Trustees, asked me if I wanted the job of director general [DG]. I had been working at Cornell University as director of research in the College of Agriculture. I asked a few friends what they thought and they said that it would be a good thing. So, I decided to try it. Of course, I also had to get permission from my wife [Martha] and she was delighted to go back to the Philippines with me.

Challenges and achievements

In those days, I thought the greatest challenge for IRRI was to influence, to the degree it could, quality research for our collaborators in developing countries. IRRI had made great progress, but it did not always communicate well. [We needed to foster] international cooperation between IRRI scientists and those in the developing world's rice countries.

This also involved inter-disciplinary collaboration to increase rice production around the world. When I arrived [at IRRI], there were four separate rice improvement research programs—i.e., in plant breeding, entomology, plant pathology, and agronomy. This was good because it was competitive, but I said, "Let's see what we can do if we can get together to develop a truly interdisciplinary collaborative research program." And we did, making full use of the thousands of genetic accessions [seed samples] in IRRI's germplasm bank.

Back then, the germplasm bank holdings were in paper bags! A fire could have destroyed everything. So, the first thing we had to do was to build [in 1976–77] a truly modern facility to store the seeds [see photo]. Second, we began evaluating those cultivars [housed in the new Rice Genetic Resources Laboratory, which on 24 October 1981 would be named the N.C. Brady Laboratory] for their resistance to different insects and diseases and for their tolerance of acidic, saline, and toxic soils and drought. Every department was involved. The plant breeders' products were evaluated by the entomologists, the plant pathologists, the agronomists, and the social scientists in terms of what was useful to them and to the farmers whom they were representing. This is how the Genetic Evaluation and Utilization Program (GEU as it was known) came into existence. I think it really revolutionized, internally, our ability to provide the world with products that could be used in breeding programs elsewhere.

The GEU was basically a plant breeding and genetic improvement program that the whole Institute was concerned with. And as far as I was concerned, it was fantastic! When we first started working on [this concept], there were some in the group who were not exactly enthusiastic, at least in dealing with me on this. But

very soon, I began to listen to them as they gave speeches talking about this Institute-wide genetic evaluation and utilization program, which basically involved evaluation of rice lines the breeders had developed.

Not the most popular DG

I wasn't always the most popular DG. You could ask anyone who stayed there for a while. Some thought maybe I was too demanding when I called them late at night for something. As a manager, I could have probably used more kid gloves. Sometimes, I was rather adamant on what I wanted done and, I guess, if I could do it again I'd be a little more gentle in my interactions with people and in working with them.

But what is of interest to me is that when I called upon scientists to go out of their way to do extra work or to take on an assignment over the weekend, I was never turned down. This was not because they were afraid of me, but because they loved their work and they loved IRRI. They were dedicated to the Institution and it was a great joy for me to see that happen.

Challenges for IRRI today

I think IRRI needs to make effective use of biotechnology and other modern research tools to help the plant breeders develop rice lines that efficiently utilize plant nutrients, that tolerate adverse conditions such as drought, and that are resistant to insects and diseases, thereby reducing the need for pesticides.

To do this, IRRI must have linkages with scientists in both the developing and the more developed countries. This is advice the whole CGIAR [Consultative Group on International Agricultural Research] system [which includes IRRI] could accept. I recognize the political reasons why this is difficult because some countries don't want to use biotechnology. But the developing countries need the improved crops much more than we do in the U.S. So, I think this is the direction in which IRRI and other such centers should and could go.

IRRI must also continue to push what it has been doing lately—more after I left than when I was there—to recognize the consequences of what we do to the environment in terms of pesticide use and fertilizer use, i.e., nitrogen getting into the water causing troubles later on. I think this is an opportunity for IRRI to develop high-yielding, quality rice in such a way that the soil, water, and atmosphere will not be adversely affected. It's a real challenge to know exactly how to do this, but I think it can be done. I'm not suggesting that the Institute is not doing it; it has already made remarkable progress.

We were there to solve problems

My IRRI experience ranks very high. I had three careers: one at Cornell as a professor and a teacher, one at IRRI, and then one in Washington, D.C. with the U.S. Agency for International Development, UNDP, and The World Bank. I won't say which one was the more critical. I will say that my experience at IRRI, not only for me but for my wife and family, was a highlight because we were involved in something that would help humanity. I felt I was working with a group of individuals, men and women, who wanted to improve the lot of people. They were not there just to do research and write papers; they were there to solve problems.

I remember one time, I think, grassy stunt virus suddenly invaded the Philippines. What did we do? Within a month, we had already evaluated and found certain lines that were resistant to the grassy stunt virus and our plant breeders were already crossing them to develop acceptable rice varieties. That kind of effort really is heartwarming.

It's IRRI class

I'll tell one story that relates to not the scientists but to a member of the [non-research] staff at the Institute, a Filipino. The CGIAR was holding one of its annual meetings in Manila and the participants decided to visit IRRI on a Sunday. When checking to see that everything was prepared for the luncheon to be served to this group, I approached one young lady who was helping with the service.

"Well, do you think it is first class?" I asked.

"No sir," she said, "it's better than that. It's IRRI class."

This exchange told me that she had pride in IRRI and in being associated with the Institute, which I thought was just great.

Go to www.irri.org/publications/today/Pioneer_Interviews.asp *to read the full transcript of the Nyle Brady interview in which he discusses more about his IRRI experience including the establishment of the International Network for the Genetic Evaluation of Rice (INGER) and IRRI in Africa.*

IRRI

ON 9 NOVEMBER 1976, IRRI Director General Nyle Brady ceremoniously sinks the first pile for the Rice Genetic Resources Laboratory, a structure that would officially (unbeknownst to him at the time) bear his name only a few years later.


JERBY AGUIHON (3)

Figures, fake guns, and fund-raising

For 25 years from July 1967, Thailand's Kwanchai Gomez was the International Rice Research Institute's chief statistician. She was also IRRI's first female international scientist in what was then a very male-dominated field. In 1993, Dr. Gomez moved out of statistics to work on donor relations as the head of the new Liaison, Coordination, and Planning Unit, which focused on an innovative experiment at the time: fund-raising. She returned to Thailand in December 1996 to spend 2 years at IRRI's Bangkok office and round off more than 3 decades with the Institute. Dr. Gomez, who remains in Bangkok, is currently executive director of the Asia Rice Foundation, which is based in IRRI's Philippine hometown of Los Baños

A new bride with a statistics degree

How did I get to IRRI? By marrying, in April 1967, a Filipino, Arturo A. Gomez [who was professor of agronomy at the University of the Philippines at Los Baños]. I had earned a PhD in statistics from North Carolina State University, the place where I met my future husband. After our wedding in Bangkok, I decided to resign from my teaching job at Chulalongkorn University and move to Los Baños to be with my husband. I hoped to find a job there instead of in Manila because going to Manila every day back then would have been horrible because of the terrible roads. Luckily, Burton Oñate, who was then chief statistician and head of the Statistics Department at IRRI, was going to take sabbatical leave at the Asian Development Bank in Manila for 1 year.

So, he heard about this new bride with a degree in statistics who was nearby. He contacted me and suggested I apply to be his "temporary" replacement. Bob Chandler [IRRI Director General, 1960-72] and Colin McClung [IRRI assistant director (1964-66) and associate director (1967-71)] interviewed and hired me and the rest is history.


IRRI
DR. GOMEZ at IRRI in the 1960s

As a statistician at a research institute like IRRI, my goal was to see that all rice researchers, be they in the field or laboratory, used the proper statistical techniques and procedures. To my surprise when I came, statistics—be it experimental designs or statistical analyses—were not appreciated, understood, or used very much in any of IRRI's experiments. That was a challenge for a very young person like me, a woman—the only lady scientist for a long, long time at IRRI, not to mention being an Asian from Thailand. It was difficult working with these very renowned, relatively older, scientists and telling them that they ought to be using statistics in their experiments.

Things changed for the better when I talked to Hank Beachell, then the chief plant breeder [and eventual World Food Prize winner in 1996]. I thought, if I could convince him, maybe I could convince the others as well. So, I asked him why he was not using statistics in his yield trials. He looked at me and said, "What do you statisticians know about field experiments and the problems we breeders face every day? You guys sit in your air-conditioned room and expect to tell us what to do in the field." I was taken aback, but not angry. I thought about this overnight.

A good perspective

The next day, I went to Beachell and thanked him profusely for having given me a very good perspective. Maybe I could win him and the others over about using statistics if I conducted my own field experiments.

Now, I didn't know anything about field experiments. I didn't know much about rice research to start with. When Chandler and McClung interviewed me, they asked me two questions: "What experience do you have with rice research and what knowledge do you have about rice?" I said the closest I ever got to a rice plant was when I was traveling from Bangkok to

Ayutthaya, in the Central Plain of Thailand, and I saw the rice plants along the road as the car passed by, and that I also knew nothing about rice research. I thought that would be the end of the interview, but it continued and they hired me anyway!

I went to Bob Chandler and asked him for some resources to conduct field experiments because until then the Statistics Department had never done any field experiments and thus no resources were available. Chandler said: "Take whatever you need; I am pleased that you're going out to the field." He said this because, at the time, our chief world-renowned soil scientist, Felix Ponnamperuma [IRRI's first soil chemist, 1961-85], only worked in the lab. Chandler had tried to push him out to the field but he never succeeded. So, after I started conducting experiments, he went to Ponnamperuma and said, "If Kwanchai can go to the field, so can you." It worked. Ponnamperuma did go out and conducted field experiments after that.

I learned a lot by conducting field experiments. S.K. De Datta [IRRI agronomist, 1964-91], my mentor and teacher, taught me everything I needed to know about conducting rice field experiments. I have always been grateful to him for that. After that, I was able to talk to the researchers much more easily and was able to convince them of the need to use proper statistical procedures in their experiments. I probably was the first statistician anywhere who conducted field experiments to get closer to the scientists.

Helping behind the scenes

There are certain professions that may be doomed to be behind the scenes. Statistics is one of those. We were used to it and we did not mind it very much. We took pride in seeing researchers using proper statistical procedures in their research. I appreciate the comments of Ronnie Coffman [IRRI plant breeder, 1971-81], which affirm that the use of statistics at IRRI has really helped the scientists.

Regarding Coffman's comment about the statistics situation before 1971, that the yield trials were not replicated [*see box, below left*], I must defend Beachell. Actually, he was right. In those days, he really did not need statistics for his yield trials. In the late 1960s, some of the new varieties were yielding 8–9 tons [per hectare] while the traditional ones were yielding 1–2 tons. For that kind of difference, you can see it with your eyes! You did not need statistics to prove it.

Of course, those were the good old days of Hank Beachell. Such large yield differences did not last long. So, as time passed, researchers had to start looking for smaller differences—3, 2, and even 1 ton per hectare. For that, statistics were needed to detect differences that were becoming smaller and smaller. Researchers required more precision in making measurements, and in controlling experimental errors so that small differences could be detected.

IRRI researchers began recognizing the importance of statistics not only because I went to the field to conduct experiments but also because the situation had changed. Statistics became a hit because the researchers knew they could not detect those smaller differences scientifically by themselves. So, they came

On Kwanchai Gomez and the importance of statistical analysis


GENE HETTEL

Nyle Brady, IRRI director general (1973-81), in his pioneer interview: "Kwanchai Gomez was a great organizer. For the Genetic Evaluation and Utilization (GEU) Program, she was the one who kept the records of what was going on. I remember going to meetings during which she said: 'Now you guys I know have been doing some studies to determine resistance to various insects and diseases, but I don't have any records of what you've done. I can't write it up if you don't tell me about it.' So she got on their backs and she was remarkable in that way."

Ronnie Coffman, plant breeder (1971-81), said: "If I had to identify the person most responsible for the development of IR36 [at one time the most widely planted rice variety in the world], it would probably be Kwanchai Gomez. She designed the sensitive, quadruple-lattice yield trials that caused us to notice it. IR36 was an open plant type, not very attractive to the eye. Prior to the establishment of those yield trials, we would have almost certainly thrown it away. Prior to 1971, the IRRI breeding program did not replicate its yield trials, much to the chagrin of Kwanchai."


GENE HETTEL

Graham McLaren, Dr. Gomez's successor as chief statistician and head of the IRRI Biometrics Unit and its various incarnations (1993-2008), said, "It was the GEU that allowed the introduction of new methodologies. Today, it's difficult to find opportunities to introduce new methodologies and that's a frustration. Teaching statistics and bioinformatics is a challenge as well. There is huge demand for training in this area, but it is also a very difficult topic to teach and to keep people's attention so they grasp the principles without getting bogged down in the detail."


ARIEL JAVELLANA

knocking at my door. We became quite popular because the scientists needed us. When they first arrived in my office, they would say apologetically, "Oh, by the way, we don't know anything about statistics." And I would say, "Oh, but I don't know anything about your field of discipline either, so let's talk."

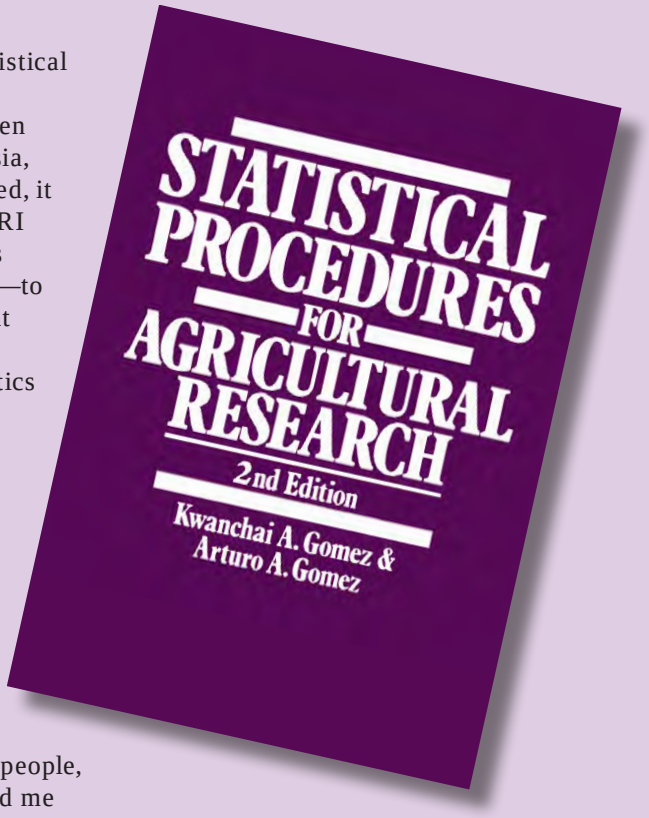
I want to reiterate that the negligible application of statistics in the early years of IRRI was not anybody's fault. But I appreciate the remarks of Coffman and Brady [see box]. Of course, the Genetic Evaluation and Utilization (GEU) Program was Brady's baby. He created it and I only helped him organize it. The GEU was truly multidisciplinary. The scientists of different disciplines were not used to working together. They argued a lot, but that was okay. It was never a personal thing. I enjoyed those years. It was not easy, but it was fun. We made the GEU a success and a lot of good rice varieties—like IR36—came out of it.

Applying statistics worldwide

My goal as a statistician was to get statistics applied in rice experiments—not only at IRRI but throughout Asia and the rest of the world. I think that, in my small way, I achieved that. IRRI became a user of statistics. During those years, it became the model. National program researchers came and saw what IRRI was doing in the area. Of course, they followed and put statistics to use in their rice experiments as well.

We had many nondegree training programs in those years. Statistics became a key course in those programs, accounting for 2–4 hours to 20–30 hours per course. I think that helped our cause greatly—for many years, everybody who passed through IRRI for training learned something about statistical applications in rice research. So, when they went back home, they were able to apply the concepts.

I must thank IRRI for enabling me to do two things that I believe helped greatly in my efforts. One is that, while on sabbatical leave at Stanford University, I wrote a book with my husband [Statistical Procedures for Agricultural Research]. That book has been read and used not only in Asia, but all over the world. [Indeed, it is the most popular book IRRI has ever produced.] This has been one of my greatest joys—to produce an effective tool that can help achieve my goal of teaching people about statistics whether they are students or working scientists.



The book was written 32 years ago, updated a bit in a 1984 second edition published by Wiley, and is still available. In those days, desktop computers were not accessible to everybody, so I put in the book all the statistical calculations in detail. Many people, especially statisticians, asked me why I had to detail each and every statistical analysis, step by step. My reply: if you use a computer, suddenly the answer comes out. You don't know what went on because the program did it for you automatically. My detailed explanation in the book helps researchers to understand why and how a certain statistical analysis was computed. This would help them to understand how to interpret the results better as well.

The second thing that IRRI enabled me to do was to develop a statistical computer package called IRRISTAT and make it free to everyone who needed it. IRRISTAT became one of the most widely used statistical packages available in Asia since, at that time, most Asian rice researchers did not have ready access to other existing but Western-designed statistical packages due to their high costs. In recent years, a slightly different Windows-compatible version, called CropStat, has been developed by Graham McLaren's group and is now available online via the IRRI Web site (www.irri.org/science/software/cropstat.asp).

[Local politics and advances in the discipline led to gradual changes. The Statistics Unit became Project Management Services and Biometrics in 1990, simply Biometrics by 1992, then expanded to Biometrics and Bioinformatics in 2001, and finally became the Crop Research Informatics Laboratory in 2006. From 1993, Dr. McLaren headed the unit until September 2008, when he left IRRI to work in Mexico for the Generation Challenge Program.]

From statistics to fund-raising

Statistical knowhow was not required to head IRRI's new Liaison, Coordination, and Planning Unit [created by Klaus Lampe, the IRRI director general at the time, in 1993 to focus on establishing close relationships with IRRI donors], and I was thus reluctant to take on the job. I finally agreed to take the job—for two reasons. First, IRRI was having financial difficulties and someone needed to go out and look for funds to sustain its operations. I believed that I owed IRRI a lot. I had gained a good reputation in the statistics discipline because of IRRI. So, I wanted to repay. A special unit for donor relations was never tried before. Somebody had to set up the system and I was pleased to help.

Second, even though I wasn't sure if I had the right qualifications

JOSE RAYMOND PANALIGAN

KWANCHAI GOMEZ and her "statistical" successor Graham McLaren inspect a plot of IR36 at IRRI. Some attribute the selection of this famous rice variety—once one of the world's most widely planted—to the use of proper experimental design and statistical analysis.

to do the job well, I knew that Lampe trusted me and I trusted him, which was an important ingredient for the success of such a unit. Besides, Lampe was a good fund-raiser and had in fact taught me a lot. I knew that I could always count on him to help me out when I needed it.

A call to arms

When Lampe arrived as director general in 1988, I was just a working scientist and never had much of a chance to see him. However, one day, he called me to his office saying there was a problem: "Your son Victor [who was 10 years old at that time] brought a fake gun to the international school today," he frowned, "and he had a 'real' bullet as well. The school principal wasn't very happy about that." I thought to myself, "Oh, my god, how could Victor bring a real bullet to school and where did he get it from? Then, Lampe immediately said, "You know any boy at his age might do something like that. Don't worry too much about it." With a great sigh of relief, I said, "Oh, ok, thank you," and left his office in a hurry.

Now, I didn't know Lampe well before this and it was the first time we had really ever talked. But, two days later, he called me again to his office. I thought to myself, "Oh, what did Victor do this time?" But I was wrong; it had nothing to do with Victor. Lampe told me IRRI was being asked to do strategic planning. It would be the first time for such an exercise at IRRI and he needed somebody to organize the group that would prepare the plan and he would like me to handle it.

He added that this task would really take a lot of my time and I may not have time to do statistics. At the time, I thought he just wanted me out of statistics, but then maybe he saw something in me earlier in the week when we discussed guns and bullets. I thought long and hard about his request and finally said: "Ok, I will agree as long as I still can be in the Statistics Department. Strategic planning shouldn't take the whole day, so he said, 'Sure, sure, sure.'" Of course, not many years later, he changed his mind about me staying in statistics. But, anyway, we became close coworkers, more so for me than with any other directors general during my 32 years at IRRI. So maybe Victor was responsible for bringing us together. Otherwise, he may have never noticed me.

Go to www.irri.org/publications/today/Pioneer_Interviews.asp to read the full transcript of the Kwanchai Gomez interview in which she discusses more about her IRRI experiences, including her recollections of six directors general and other colleagues and her work today with the Asia Rice Foundation.


JERBY AGUIHON (3)

Dedicated scientists—a child's inspiration

***During the summer of 2006, Usha Rani Palaniswamy returned with her father, K.M. Palaniswamy, to the International Rice Research Institute (IRRI) for the first time in 35 years. In 1968, as a young child, Dr. Palaniswamy moved from India to Institute headquarters in Los Baños, Philippines, when her father was assigned to IRRI's Statistics Department. Fondly recalling those days through the mind and eyes of a child, she relates how the experience influenced her future career in science. When interviewed, she was an assistant professor of plant physiology at the University of Connecticut. Today, she is chair of the Division of Natural Sciences and Mathematics at Excelsior College in Albany, New York. She also pays loving tribute to her father, who at age 78 died tragically in a road accident in India on 5 December 2007, a little over a year after his own Pioneer Interview (see box) during the same 2006 IRRI visit. She is the co-author (with her father) of* A handbook of statistics for teaching and research in plant and crop science *and more recently of* Asian crops and human dietetics.**

Growing up

During my stay at IRRI, I really grew up. Coming from India [Tamil Nadu Agricultural University where my father was based], I had the opportunity to interact with new cultures that I found to be friendly and warm. We were greeted with great smiles and were most fortunate to make some very good friends during our stay.

Although I was only 10 years old, I had the opportunity to observe many dedicated scientists at work. I was impressed with that dedication, exemplified by my own dad who was out of the house all day working very hard. In one way or another, all the scientists focused on one plant—a single crop, rice, which is the most important one in the whole world. I thought a lot about plants then. Plants play such important roles in our lives in many different ways besides just giving us food. It was for these reasons, the dedication of the IRRI scientists and the importance of plants, that I decided to become a scientist myself—specifically, a horticulturist.

IRRI provided our entire family with a unique opportunity to interrelate with new cultures and to learn about the world and the people in it. I look back at my time at IRRI and see it as one of the greatest periods of my life. I really matured as I had interactions with not only the great culture of the Philippines but also other cultures that were part of IRRI's international community, including Koreans, Thais, and even Indians from different states in my home country whom I would not have had the opportunity to meet if my dad had left us in Tamil Nadu.

Warm local culture

I fondly remember the large trees with white flowers at IRRI headquarters and the green grass on which we would have picnics and share our snacks in the evening with my dad and his colleagues [see photo, *below*]. We would come to IRRI on the bus and enjoy the fountain, the lights, and the cool


PALANISWAMY FAMILY ARCHIVES

HAPPY DAYS at IRRI circa 1970: Usha Palaniswamy (*with white headband and glasses*) enjoys snacks with her father Kodiveri (*to her left*), mother Indrani (*in front of her*), her three siblings (*from center to right in back row*) Meera Devi, Vijayaraghavan, and Rajeswari, Statistics Department research assistant Rosalinda Alicbusan Graham (*second from left in back row*), husband Bill, and family friend Verna Estaphia (*left foreground*).

air-conditioned lounge. We came for the movies screened in the Chandler Hall Auditorium and were greatly appreciative of the gifts that we little kids would get at Christmas time.

The local people with whom we interacted were so kind. As Hindus, we never really appreciated Christianity or celebrated Christmas before coming to the Philippines. We stayed at the Gonzales Compound outside of IRRI and the landlady would knock on our door and offer us rice and different desserts. Since my mom is a vegetarian, our hosts made a point of offering us many vegetables and fruits that were growing in their gardens. We had great appreciation for the local culture, which is so very warm and friendly. I look back on this all with fond memories, enjoying it all.

Excerpt from K.M. Palaniswamy's Pioneer Interview: On IRRI's fastidious but accommodating director


JERBY AGUIHON

During my stay at IRRI, I had several occasions to accompany Dr. Robert Chandler [IRRI director general, 1960-72] in and around the Institute. I observed that he had a keen interest in keeping the IRRI grounds very clean and neat. Once, when I was walking with him in the cafeteria, he saw a cigarette butt on the floor. He bent down, picked it up, and carried it all the way to a waste bin. It was very surprising to see a person of his stature cleaning up the area. But it was a memorable lesson [teaching by example] for all of us watching.

One very important event I remember was the moon landing by the American astronauts on 20 July 1969. At that time, Dr. Chandler opened the lounge so all the staff from IRRI and the University of the Philippines at Los Baños could watch the landing on the TV. Everyone was silent and watched very keenly. When the landing was over, we expressed our joy and happiness with smiles all around. It was a great event in history that, thanks to Dr. Chandler's accommodating forethought, we all had a chance to witness.

A model for research

I returned to IRRI [in 2006] to look into including the Institute as a model of successful agricultural research outside the United States in a curricular development and innovation project I'm working on [funded by the U.S. Department of Agriculture/Cooperative State Research, Education, and Extension Service – International Science and Education Competitive Grants Program]. I hope to inspire young students to become agricultural scientists just as I once was years ago by my IRRI experience. IRRI can truly be an educational model to show that real-world issues and problems can be solved through science and research.

Agriculture is the most basic of professions that has touched the lives of people since time immemorial, since antiquity. That will continue and it is very important that we keep the younger generation excited about agriculture and that they consider agriculture as a desirable career option. My effort here is to incorporate IRRI's techniques in my curriculum design and university teaching. Many universities in the United States should be very excited about research that's happening overseas and making students aware of it, as well as thinking about playing an important collaborative role in alleviating poverty through scientific efforts in agriculture.

A tribute to dad

My dad—my inspiration and role model in my life—was very passionate about rice. We both shared fervor for the plant sciences. He enjoyed watching farmers working in their fields in the early morning. As I have been living outside of India for a long time (in the United Arab Emirates since 1982 and the U.S. since 1994), I had not had much time with him. So, I took advantage of our summer 2006 excursion to IRRI.

We went out for morning walks and watched the workers in the IRRI rice plots. His face would light up immediately as he would smell the air and start talking about the importance of agriculture in the human experience. During his scholar days at IRRI and the nearby University of the Philippines at Los Baños, he studied under Dr. Kwanchai Gomez, IRRI's chief statistician [see Figures, fake guns, and fund-raising, on pages 16-19 of Rice Today Vol. 7, No. 4]. So, it was no surprise that, even 35 years later, he was quick to point out the importance of statistical methods in field experiments. He could immediately pick out an off-type in a plot and say how important it is to rogue a plot [remove infected or undesirable individuals from a pure population] that is being used for producing good seed or obtaining good experimental results.

Dad was a self-made man who raised all his children to be scholars. He continued to learn and obtained his PhD. He held several key positions as department head of physical sciences at Tamil Nadu Agricultural University; professor of statistics at Khartoum University, Sudan; and an expert with the United Nations Economic Commission for Western Asia in Iraq.

Since retirement, he was working on a book, *Guidelines for rice researchers in the estimation of some plant parameters*. I contributed some of the chapters and hope to complete it soon in his memory.

He was in excellent health so his passing, due to the road accident in Coimbatore, was all too sudden for any of us to grasp as being real.

Go to www.irri.org/publications/today/Pioneer_Interviews.asp for this and other Pioneer Interviews as IRRI approaches its 50th anniversary in 2010.


GENE HETTEL (3)

In the Punjab—an outstanding farmer revisited

On 5 June 1985, the International Rice Research Institute (IRRI) honored 14 exceptional farmers in 10 Asian nations—truly pioneers in their own rite—by inviting them to the Philippines to participate in a special multilevel symposium that brought together outstanding scientists, farmers, and political leaders—all part of IRRI's 25th anniversary celebration. As IRRI approaches its 50th anniversary in 2010, we are trying to locate these same farmers 25 years later to find out their progress and get some updates. The first one we found is Sardar Jagjit Singh Hara who farms in Punjab, the breadbasket state of India. In November 2008, departing Rice Today editor Adam Barclay and I visited him on his farm about 12 km outside of Ludhiana. He was billed as a progressive Punjabi seed farmer 25 years ago. Since his recognition then, Mr. Hara has often been visited by agricultural researchers and leaders who have come to see and evaluate his farming practices. Perhaps the most dramatic visit was the simultaneous appearance of a Nobel Peace Prize Laureate and a future World Food Prize Laureate on the same day.

Something I had never dreamed of

My father, S. Ram Singh, was a progressive farmer and I would say that I inherited from him the gene that bestowed upon me my love for agriculture. After earning my master's degree in economics in 1960, I worked full time on this farm to produce seeds, as my father had. I also continued to grow various crops [wheat, potato, corn, ground nut]. In 1966, when the rice revolution came, I started to grow rice, not only as a commercial crop but also for seed production.

In 1985, to my great surprise, I got a big honor when I was recommended for an IRRI award as an outstanding farmer. My wife, Surjit, was also invited but, because of family reasons, she couldn't accompany me. It was a great occasion. I was so excited and elated that such a huge international honor would come to me—something I had never even dreamed of. It was gratifying to meet the 13 other Asian farmers recognized that day. I was unique [among that group] because I was a seed producer.


ADAM BARCLAY

I returned home with a "charged battery" because I had seen so many field trials at the IRRI research center—how to add fertilizer, the latest hybrid rice technology, etc. I wanted to share those things I learned with my fellow farmers here. I acquired this culture of sharing experiences from the International Farm Youth Exchange Program in America, which I attended in 1966. Generally, people want to keep their knowledge to themselves, maybe to put it in book form and sell it. But I had a commitment, a vow, to share my experiences, such as those I had at IRRI. When I came back from IRRI, around 100 farmers came to me and asked many questions, which I tried to answer. So, I would say I was married to IRRI.

Two more memorable occasions

On 22 April 1987, one great occasion happened. Norman E. Borlaug [the 1970 Nobel Peace Prize Laureate] visited me on my farm and, just by coincidence Gurdev S. Khush [IRRI's then principal plant breeder and future 1996 World Food Prize Laureate] also came. So, hanging on my wall now is a unique and rare picture (*photo opposite page*) of these two world-renowned scientists—a wheat breeder [Borlaug center] and a rice breeder—with one fortunate farmer. It is difficult to describe in words how I felt that day.

In September 1991, [the then IRRI director general, 1988-95] Dr. Klaus Lampe visited the nearby Punjab Agricultural University (PAU), an institution I am deeply associated with. They told him about me, that I am an IRRI outstanding farmer awardee, and so he came to see me. When he saw my setup, he invited me to come to IRRI again. I told him, "Dr.

HARA FAMILY ARCHIVES

Lampe, some of my farmer friends want to come with me." He said, "Okay, we cannot pay your airfares, but all other arrangements for your stay will be taken care of by IRRI." Six of us came to IRRI in September-October 1992. It was a wonderful occasion. In my life, I have had many great experiences, but my two visits to IRRI and the visits of Drs. Borlaug and Khush to my farm on the same day are the most memorable ones.

Hara farm—a showcase for the rice-wheat rotation

Today, our farm is a joint family venture of 60 acres (around 25 hectares). Since my brother works in California, in the U.S., as an electrical engineer, I manage things around here. This is a large-scale demonstration farm, which is still in the process of resolving a big controversy. There is an ongoing debate in Punjab and all over India concerning whether or not wheat and paddy can be profitably grown in rotation. But when disbelievers come to my farm, I can prove to them that these two main cereals can be grown together.

Prior to the Green Revolution, rice was not popular in Punjab. It was grown only in the low-lying areas along the riverbeds and was not a regular crop like wheat, cotton, corn, etc. But, with the arrival of IR8 in India in the 1960s, along with the package of practices for the Punjab cropping pattern, the crop has been grown here ever since even though the water table is getting lower in this part of the country.

Previously, government experts couldn't convince farmers to transplant late. They transplanted early because there was a lack of mechanization, and diseases and insect pests were less of a problem. Recently, the government persuaded many farmers not to transplant before 10 June. Now, this year [2008], the results are very good. The water table is recharged and, luckily, the monsoon has also been favorable.

Wheat and rice are like two wheels on the same vehicle. If one wheel goes down, the other wheel cannot function either. I think these two "wheels," wheat and rice, complement each other. This year, the yields and the price of both crops have been good, rice with a slight edge over wheat, I think. Most importantly, we are feeding the people. I feel proud that I'm producing good-quality seeds for my farmer friends so that they can have better and better yields (For more on South Asia's rice-wheat cropping system, see *Strengthening the system* on pages 18-23).

Convincing the young that agriculture is a noble profession

[In his 1985 interview, Mr. Hara said that he would not pressure his son, Gurshaminder, to follow in his footsteps on the farm. And, true enough, "Dr. G. Hara" is a senior consultant surgeon at the Oswal Cancer Treatment and Research Foundation in Ludhiana. Now nearing 70, Mr. Hara worries about who will take over the family farm—maybe his grandson, Tejeshwar, but that is by no means certain.]

It is a burning issue these days that no young educated, dedicated person wants to be in agriculture. Why? First, it is a very hard job. Second, opportunities for growth are limited. Most importantly, agriculture in developing economies like India's is considered as a way of living, not as a profession. When trying to persuade my only son to stay on the farm, I suggested that he would get an opportunity to go abroad to see farms in America and Australia and to observe the research trials and experiments at IRRI. But he ultimately still said, "No. What is life on the farm? You work like a horse and there is no social life."

Indeed, professions in the city are more glamorous and the current generation is more money-minded rather than service-oriented. Why am I in agriculture? I wanted to be independent and to not be tied to the monotony of the same chair in the same office with the same job. And, secondly, God is my boss. I learned to drive on a John Deere tractor when I was 13 years old and that hooked me on agriculture despite the drudgery and the risk.

Now, the situation is changing; the world is crying for food security. I hope good sense will prevail and that, someday soon, the world will declare agriculture to be a noble profession just like medicine, law, and education.

In the complete transcript of this interview at irri.org/today/Pioneer_Interviews.asp, Mr. Hara discusses mechanization, water management, economics, and the major challenges today in Punjabi agriculture.

G. HETTEL/J. IBABAO (12)

Challenges for IRRI: a cross-section of opinions

In a departure from presenting excerpts of a single pioneer interview, this installment presents a diverse cross-section of responses to one question: As IRRI approaches its 50th anniversary in 2010, what do you see as the Institute's greatest challenge? Interviews were conducted between June 2006 and June 2009. More will be added online as interviews continue

Randy Barker, IRRI agricultural economist and head, Economics Department, 1966-78; acting head, Social Sciences Division, 2007-08

When I first came to IRRI in 1966 just before IR8, people at that time looked at IRRI and said, "that's a nice set of buildings," but they didn't think the Institute would ever produce anything. There was a real skepticism about whether IRRI would ever amount to much. Joining IRRI was like buying into a stock that all of a sudden took off.

In the early days, the IRRI mandate was fairly simple and straightforward, increase rice production in Asia, and so the focus and the priorities were there. Since that time, we've gone from food security to environment and poverty and other areas. So, in many ways, the mandates of IRRI and of the other centers tended to expand.

The real challenge now is being sure that IRRI operates in the area where it has the greatest comparative advantage. For example, the challenge for upstream work is to have the appropriate connections with the advanced institutions for developing biotechnology research. When going downstream, this means, in part, the ability to transfer some of that biotechnology expertise and focus it on those areas that will complement what the NARES [national agricultural research and extension systems] are doing.

Nyle C. Brady, IRRI director general, 1973-81

I think IRRI needs to make effective use of biotechnology and other modern research tools to help the plant breeders develop rice lines that efficiently utilize plant nutrients, that tolerate adverse conditions such as drought, and that are resistant to insects and diseases, thereby reducing the need for pesticides.

To do this, IRRI must have linkages with scientists in both the developing and the more developed countries. This is an advice which the whole CGIAR [Consultative Group on International Agricultural Research] system could accept. I recognize the political reasons why this is difficult because some countries don't want biotechnology to be used for this purpose. But the developing countries need the improved crops much more than we do in the U.S. So, I think this is the direction in which IRRI and other such centers should and could go.

IRRI must also continue to push what it has been doing lately—more after I left than when I was there—to recognize the consequences of what we do to the environment in terms of pesticide use—and fertilizer use, that is, nitrogen getting into the water causing troubles later on. This is being done, but I think even more can be done. I think this is an opportunity for IRRI to develop high yields of quality rice in such a way that the soil, water, and atmosphere will not be adversely affected.

Ronald Cantrell, IRRI director general, 1998-2004

Clearly, it is the funding issue. What comes with the funding uncertainty is creating some difficulty in hiring staff. IRRI has been able to continue to hire good international staff. But there is uncertainty caused by restricted core funding and the threat of the loss of all USAID funding [in July 2008]. If you are a bright young scientist just out of

graduate school, do you want to take a chance on starting your career there? "There" meaning not necessarily IRRI but "there" meaning in that kind of system. So, unless there are some things that will stabilize the funding, it may create some problems for IRRI in the future of being able to hire international staff. I think that is the greatest challenge that IRRI will face. The culture of the Institute is rich; it's great. I just think it needs to have a more stable environment.

Kwanchai Gomez, IRRI head statistician, 1968-93; liaison for coordination and planning, 1993-96; consultant, 1997-98

I think IRRI's greatest challenge is to define clearly the kind of contributions it still can make to the rice world. IRRI cannot just keep doing the same things it did at the start. IRRI has come a long way [47 years as of the time of the interview] and the rice problems of the world have changed drastically. IRRI must define what its present goals are; who are its clients and what are their expectations? What does the rice world need and what and how can IRRI contribute?

It's true that IRRI is an aging institution, and it may not be easy to re-define its goal, its mandate, and adapt new strategies and directions at this point in time. But, unlike old people, it is still easier to revive and renew an old institution. And I think IRRI should be able to find the way.

IRRI has a new strategic plan, *Bringing hope, improving lives*. Some see it simply as a patch-up job of what it is doing now or maintaining a status quo. Whenever a strategic plan is developed purely by the people from inside the institution, it carries too much baggage; it's heavy. Who will work on a strategy and work plan that will put them out of their jobs tomorrow? Nobody, of course! I myself had worked closely with the first IRRI strategic plan; I should know.

Ronnie Coffman, IRRI plant breeder, 1971-81; currently chair, Department of Plant Breeding & Genetics, and director of International Programs, Cornell University

Global warming and the rise of sea level could prove to be the greatest challenges for IRRI, for plant breeding, and for rice science in general because, as you know, the majority of rice is found in the large low-lying river deltas of Asia. The Ganges, the Brahmaputra, the Irrawaddy, the Mekong, all those big deltas are, in some cases, only a few inches above sea level. So, right now, the minimum prediction for sea-level rise is a conservative projection of 38 inches by the middle of this century. This will obliterate places like Bangladesh, West Bengal, and the Mekong Delta.

This is huge. So, what will happen, slowly, or maybe not so slowly, is that brackish water will get pushed up the rivers and affect the growth of the rice. And you get less and less fresh water coming down because glaciers are melting in the Himalaya at the rate that people can't believe. So, you're going to get a scarcity of fresh water and then the rising sea level that pushes in the brackish water. That's going to push the cultivation of rice way back in a gradual, or maybe not so gradual, manner. So, salinity tolerance might offer some help. But I think the global warming and the resulting rise in sea levels—and remember that 38 inches is the minimum prediction; others are predicting more and faster—that portends a real crisis in rice cultivation.

M.S. Swaminathan, IRRI director general, 1982-88; currently chairman of the M.S. Swaminathan Research Foundation

There are challenges and I'm sure IRRI is aware of them as it modifies its mandate. During its first decade [1960s], IRRI's challenge was to improve productivity. The second decade had the challenge of putting it into a farming systems background. During my decade, we had the challenge of mainstreaming considerations of ecology and equity in technology development and dissemination and also building national rice research institutions, including one in the Philippines.

IRRI's greatest challenges today are against the backdrop of globalization. The UN Millennium Development Goals (MDGs) present a challenge for IRRI because, for 40% of the world's population, rice is a staple. So, the very first MDG, reducing hunger and reducing poverty, depends greatly on IRRI's work, along with its national partners. So, there is a great responsibility. Then, of course, MDG number 3 is gender equality and empowerment of women, where again IRRI has been the flagship of the gender equity movement in the world, the first scientific institution, which started strong gender mainstreaming of its work. I would say the number-one challenge is this new vision for IRRI, which places poverty alleviation and hunger elimination at the top of its agenda.

Another challenge is dealing with the public/private partnerships in an IPR [intellectual property rights] environment. As they commonly

say, the "Green Revolution" was a public-sector enterprise, while the "Gene Revolution" is a private-sector enterprise. So, how are we going to develop this new kind of partnership between the public and private sector without compromising IRRI's commitment to help poor farmers? Social inclusion for access to new technologies should be the bottom line of IRRI's technology dissemination policy.

Tom Hargrove, IRRI editor and later head, Communication and Publications Services, 1973-91; most recently coordinator of information and communications, International Center for Soil Fertility and Agricultural Development

IRRI's greatest challenge is to continue to do the work it is doing and keep the money coming in so that it is able to carry out the plan. The world is changing so much right now that we don't have any idea of what really is going to happen. There's obviously not just a food crisis, which has been building up for a long time. Then, these different factors hit all at once: a decrease in funding for research and the demand for food and fuel with 30% of the U.S. corn crop going into ethanol. At the same time, Indians and Chinese are achieving higher incomes and they want to drive cars too and, as incomes rise, they eat less rice and want more meat.

Of course, fertilizer (nitrogen, potassium, and phosphorus) is essential to the nutrient production needed to make the ethanol and to feed the livestock to accommodate the changing food habits of China and India. All of these things are coming together. A farmer in Togo or Mali in West Africa who grows rice or any other crop, a couple of years ago, had to pay twice what a farmer in Iowa has to pay for a kilogram of urea. Now, with the price of fertilizer doubling, tripling in the United States, I think it's going to be almost impossible in Africa. This could be one of IRRI's greatest challenges in Africa if indeed there's to be an African Green Revolution.

Gurdev Khush, IRRI rice breeder and principal scientist, 1967-2001; currently adjunct professor, University of California, Davis

As the national programs have become stronger, IRRI has started putting emphasis on certain areas where it has a comparative advantage, such as in molecular biology and biotechnology. IRRI stopped naming varieties because the national programs have become strong enough so we only need to supply them with germplasm. The challenge will continue for IRRI to find new techniques, which can help the national programs.

In breeding, I think we have to continue to find approaches to increase yield potential and to identify new sources of disease and insect resistance so that they can be supplied to the national programs. Also, IRRI needs to use the new genetic engineering technology. The environment for accepting genetically modified crops is not as good as it should be, but eventually, I think, in a few years, the national programs, the farmers, and the NGOs will start accepting genetically modified materials. Molecular biology techniques to use include molecular marker-aided selection and identifying QTLs [quantitative trait loci] for difficult traits, such as drought. So, the challenge is to work with national programs to incorporate all these techniques into breeding approaches. This should lead to rice improvement efforts that focus on increasing the yield potential and developing varieties with novel traits.

S.K. De Datta, IRRI principal scientist and head, Department of Agronomy, 1964-92; currently associate vice president for international affairs and director of the Office of International Research, Education, and Development at Virginia Polytechnic Institute and State University

When I was at IRRI, I didn't realize until I left how inward-looking we were. Somehow, we felt that our donors will continue to support us no matter what we do. I think IRRI scientists have to go beyond the inward-looking posture to communicate and network with the best minds all over the world and to collaborate much more aggressively. Otherwise, down the road, I can see that we'll have problems garnering funds.

What I have noticed over the last 5–6 years is that IRRI is not making headlines in the United States, when, 5, 10, or 15 years back, IRRI news was major news here in the *Washington Post* and the *New York Times*. I don't see any breakthroughs coming out, which are hitting the headlines. [At the time of the interview on 25 June 2006, this was perhaps true, but now, in 2009, IRRI is routinely making headlines in the U.S. and around the world; see irri.org/media/articles.all.asp.] We need to generate more relevant knowledge and technology and to communicate with the U.S. and other industrial nations so they feel excited about IRRI's research and support it on a sustained basis.

IRRI must communicate its new knowledge and technology, which will help the next generation of food producers and consumers around the world. The primary beneficiaries are the developing regions, but let's not forget that the developed regions are our partners and we need to do a better job communicating with them as to why they need to support IRRI and other CGIAR centers. So, I consider that as a big, big challenge because resources are shrinking all over the world.

Robert Herdt, IRRI economist, 1973-83, head of the Economics Department, 1978-83; later director, agricultural sciences, and vice president, The Rockefeller Foundation; currently adjunct international professor of applied economics and management, Cornell University

I think IRRI's greatest challenge is how to turn over management and responsibility to the Asian countries that are the primary beneficiaries. There are many hundreds of millions of people in Asia who are still in need of the benefits of new technology and higher productivity, but there are also hundreds of millions in other countries in the world who are in a lot worse shape. Rice research is at a high level of development in Asia. This is something that Asian countries should take more responsibility for. If they don't feel like there is enough value to them having a regional research institute, then I personally don't believe the rest of the world should be supporting the whole thing. So, that's the biggest challenge.

Klaus Lampe, IRRI director general, 1988-95

I guessed that you might ask such a question. I recall the very first draft of a new strategic plan, developed in 1994, with the title IRRI towards 2050. It was rejected in the committee and by the board because the horizon was seen to be by far too long. Of course, nobody knew if IRRI would exist in 2050.

However, in my view, there are five functions, which I stressed at that time and still valid for IRRI in 2050: (1) to house the base collection of the world's rice germplasm and to perform the many evaluation, research, preservation, and service functions that this responsibility entails; (2) to collect, evaluate, select, and make accessible information on current rice research and development programs, rice and rice-related research, and global rice research resources—human, financial, and physical; (3) to retain a response capability, which can catalyze the use of those resources through internationally recruited teams working on topics of supra-national importance; (4) to organize and convene conferences, task forces, seminars, and meetings to facilitate the exchange of information and to focus the application of knowledge on the resolution of emerging problems; and (5) to define research needs that can be taken care of by existing research centers worldwide, promote funding, and harmonize the implementation.

Given its mandate, IRRI's future, its lifetime, will largely depend on its successful search for excellence in all aspects of its endeavors: excellence in research planning and implementation; excellence in human resource management, cooperation, and collaboration; excellence in efficiency and effectiveness at all levels; and excellence in its financial resource management and not to forget in public awareness, creating conducive donor-, partner-, client-, and target-group relationships.

Gary Toenniessen, managing director, The Rockefeller Foundation, and long-time IRRI collaborator

The biggest challenge for IRRI today is that many of the national programs that it is assisting are also becoming very strong. IRRI needs to really find its niche in Asian situations, in which the national programs are now quite capable as well. I think there really is a niche for IRRI. It's doing those kinds of things that can be shared across all of the rice research institutions in Asia or worldwide and that wouldn't likely be done by a national program or, if they were, that they wouldn't get shared. IRRI needs to be a coordinator, a source of knowledge or information, and continually a source of breeding lines, which have traits that have been generated through advanced science done throughout the world that no national program can probably access.

The new Sub1 lines that have submergence tolerance are a good example. The initial real work on that was done at the University of California, Davis. Not only was the technology transferred, but the person who did the work, David Mackill [IRRI senior scientist; see *Scuba rice: stemming the tide in flood-prone South Asia* on pages 26-31 of *Rice Today* Vol. 8, No. 2], was transferred as well from California to IRRI. And so, the next phase in that process was done at IRRI and all submergence-tolerant materials are now being shared with the national programs. I really do think there's an important role for IRRI to be the conduit by which and through which the best science in the world gets applied to rice research and then shared with the national programs in Asia.

IRRI

To read further comments and additional background via hotlinks and video clips from these and at least 13 other pioneers, go to the *Rice Today* Web site at **irri.org/publications/today/challenges.asp.**

IRRI 50 1960-2010


GENE HETTEL (3)

"Rock" and Rice:
The Rockefeller-IRRI biotechnology saga

Next year, 2010, marks not only the International Rice Research Institute's (IRRI) 50th anniversary but also a half century of collaboration between the Institute and its co-founder, the Rockefeller Foundation. This includes an alliance that started a quarter century ago to help create the new discipline of rice biotechnology. When that effort began in 1984, Gary Toenniessen, currently a managing director of the Foundation, led the charge to bring the new developments in molecular and cellular biology to rice. In this interview, he shows what can be accomplished with around US$120 million of funding and a cornucopia of ideas.

A career with the Rockefeller Foundation

After graduating from the State University of New York at Buffalo, I received a fellowship from the U.S. Public Health Service that sent me to the University of North Carolina at Chapel Hill, where I spent 5 years getting my PhD degree in microbiology. When I was looking around for a job at the end of that training period, the Rockefeller Foundation (RF) contacted me about a new type of postdoctoral fellowship they had, for which one worked with the Foundation while also pursuing some research at a nearby research institute. I received one of those fellowships and, within a year, I was made a program officer of the Rockefeller Foundation. So, for almost my entire career, which is now 38 years, I have been a program officer in the New York office of the Rockefeller Foundation.

In my opinion, IRRI is one of the Rockefeller Foundation's great success stories. The whole idea for IRRI came out of the Foundation. It was based on what Nobel Peace Prize Laureate Norman Borlaug had accomplished with wheat. The thinking was, if you could breed for wheat in Mexico and have those varieties adopted over the vast areas of South Asia, maybe you could breed for rice in a single location and have those varieties, or at least those breeding lines, be used across the vast areas of Asia where rice is grown. So, the Rockefeller Foundation convinced the Ford Foundation to partner with it to create IRRI. Within 3 or 4 years, IRRI's first variety, IR8, came out and had a huge impact throughout South Asia and other regions. But, many more fruits were to come from the Rockefeller-IRRI association over the next four and a half decades.

I was trained as a microbiologist and that meant molecular biology as well. So, when the Foundation, in the late 1970s to early 1980s, decided to move into applying the new tools of molecular and cellular biology to crop improvement, I was one of the people on the staff who knew something about molecular biology and I assumed more responsibility for the Foundation's investments in that area. Once the Rice Biotechnology Program began in 1984, I, more or less, ran that program from the New York office. We also had John O'Toole, a former IRRI agronomist and rice physiologist [1974-84], working in the program, initially from India and then from Bangkok; and Tosh Murashige helping in China, Korea, and the Philippines.

In recent years, we are working more in Africa. So, I spend a lot of time on the African Program today. But, I have to say that the most rewarding work I have done with the Foundation was from 1984 to 2002, when we invested about US$120 million in the Rice Biotechnology Program. I worked very closely with IRRI during that whole period.

The RF changes course—from doing to funding

In 1980, Dr. Richard W. Lyman became the president of the Foundation. His feeling was that foundations really should not be operational. They should be organizations that provide funds to others who get the job done. In the case of agriculture, he congratulated us for helping establish IRRI, the International Maize and Wheat Improvement Center (CIMMYT), the International Center

In October 1995 on the IRRI farm during the Foundation's Rice Biotechnology Meeting held in conjunction with Rice Genetics III, Dr. Toenniessen (*3rd from left*) confers with (*from left*) Gurdev Khush, IRRI rice breeder and principal scientist, 1967-2001; Ken Fischer, IRRI deputy director general for research, 1991-99; Darshan Brar, IRRI rice breeder and currently head of the Plant Breeding, Genetics, and Biotechnology Division (PBGB); John O'Toole, IRRI agronomist and rice physiologist, 1974-84, and later Foundation associate director; Zhikang Li, IRRI molecular geneticist and currently coordinator of the International Network for Molecular Breeding, Beijing; Robert Herdt, IRRI economist, 1973-83, head, IRRI Economics Department, 1978-83, and later Foundation director, agricultural sciences, and vice president; and Swapan Datta, IRRI senior scientist in PBGB, 1993-2005, and currently deputy director general for crop science, Indian Council of Agricultural Research.

for Tropical Agriculture (CIAT), the International Institute of Tropical Agriculture (IITA), and a number of the other international centers, and also for creating mechanisms, such as the Consultative Group on International Agricultural Research (CGIAR), to fund those centers.

At about that time, a team of external advisors agreed with Dr. Lyman that it was now possible for the Foundation to bring its field operations to a close. In fact, I can remember their report stating that, in many ways, the era in which expatriate scientists go out and actually do research was coming to a close, and what the Foundation should really do is to find ways of supporting international centers and strengthening existing national programs. So, the advisors recommended that the Foundation work in two principal areas. One was to make sure that the new advances that were occurring in cellular and molecular biology were applied to tropical crops important in developing countries and the staple foods of the poor in those countries. Second, the Foundation should develop a strategy for Africa, where the food situation was deteriorating.

Creating rice biotechnology

So, we then moved quite quickly to implement the first recommendation, which was to apply the new developments in molecular and cellular biology to tropical crops. Dr. Alva App, a new RF director of agriculture, came in. Al had actually spent about 6 years [1976-82] at IRRI as a visiting scientist, seconded to IRRI as an employee of the Boyce Thompson Institute for Plant Research to lead the work on the *Azolla* [a tiny nitrogen-fixing fern]–rice combination. So, it's clear to me that, from the time Al arrived, we were going to work on rice because he quite correctly recognized its importance. But, I still conducted a very systematic process of looking at the eight most important crops in determining whether or not the breeding programs were strong enough in those crops to make it reasonable to introduce a biotechnology program and what the impact would be if the Foundation did do that. When we compared all of the results, rice was clearly at the top. We could build on what were already strong breeding programs. IRRI was there, so we had a strong partner to work with and, of course, rice fed more people than any other crop.

First of all, we received approval from our trustees to make a major long-term commitment. So, the initial document that went to the Foundation's trustees in December 1984 informed

them that this was likely to be a 15-year-long program, or longer, and, at that time, we said that the Foundation was likely to commit US$80 million or more. If you actually adjust $80 million for inflation over that period of time, it comes out to about $120 million.

We designed the program to have three major components. The first was to "create" rice biotechnology. Molecular biology was a brand new discipline in the early 1980s and there was nobody in the world except for a few Japanese who were doing serious work on rice molecular biology. IRRI had no biotechnology program. There were no rice molecular biology programs in the United States. So, it was a wide-open opportunity for the Foundation to lead the effort to really create a significant biotechnology research program for the most important food crop in the world.

Creating the technology meant creating a molecular genetic map of rice and then creating the tools that would allow the genetic engineering of rice. It meant understanding the way the rice genome is structured, and understanding at the molecular level the relationship between rice and rice pathogens. There was a lot of investment in those basic tools that make up the set of technologies that we call biotechnology.

Finding relevant traits

The second component was to work on the traits for which one would want to use those tools, once available, to introduce into rice. But, we needed to understand those traits at the molecular level in order to use those tools. We hired Bob Herdt [IRRI economist, 1973-83; head of the IRRI Economics Department, 1978-83; later, director for agricultural sciences at RF and vice president; see his tribute to Norman Borlaug, *passion, persistence, and persuasion,* pages 32-34] as our colleague at that time. Previously, his job at IRRI had been to prioritize traits that IRRI was going to work on so he had already developed the methodology for prioritizing traits. He did the same thing for the Foundation's rice biotechnology program.

It is basically a technique that measures the yield forgone because you do not have that trait. For example, at that particular time, there were no known genes for resistance to the rice tungro virus, which, at that time, was causing a lot of problems in the Philippines and other countries in Southeast Asia. So, that turned out to be very high on his list of priorities. There were reasons to believe that biotechnology would work as a way of addressing the tungro virus. Bob outlined our research priorities for rice biotechnology in the 1991 book Rice Biotechnology, which IRRI breeder Gurdev Khush and I edited [see http://snipurl.com/qv0uh].

Building molecular biology capacity in Asia

The third component was capacity building in Asian rice research institutions. In countries such as India, China, Thailand, and the Philippines, we tried to link the more fundamental research programs with the rice research institutions within those countries. That involved a lot of training. During that 17- to 18-year period, the Foundation supported about 400 fellowships for Asian scientists. Many went to advanced laboratories in the U.S., Europe, Australia, and Japan, where we were funding the work on tool development. Most of the actual work that led to important discoveries was done by Asian scientists in a laboratory in the U.S. or somewhere else. Since they were really the "inventors" of the tools, they had the real sense of ownership. When they went back home, there was a real sense of pride and desire to use those tools within their home countries and the Foundation supported them when they went home.

Over time, the funds that were going into tool development and into work on the traits shifted from the West—the U.S. and Europe—to Asian countries, particularly China, India, and Thailand, where they began developing real capacity. By about 2000, when we would have meetings of our rice biotechnology network, we had scientists from the major companies working in biotechnology asking to come to those meetings.

We also had scientists from laboratories that we were not supporting around the world asking to come to those meetings because they would learn, not only the most recent results in rice biotechnology but also in biotechnology in general, from some of the Asian programs that we were supporting. That is when we realized that we had achieved our goal, when the Asian scientists were at the forefront of doing the research on tool development and working on the traits. We recognized that we had accomplished our goal of making sure that the new tools on molecular biology would be applied to rice and that has certainly proven to be the case. We see Asian countries continuing to make major advances in the development and application of rice biotechnology. China and India, for example, now have as much capability as Monsanto or Syngenta or any of the major corporations. So, that's an overview of the Foundation's Rice Biotechnology Program.

Go to www.irri.org/publications/today/Toenniessen.asp for the complete transcript with links of Dr. Toenniessen's pioneer interview, in which he tells little-known facts about the fascinating Golden Rice story, the ardent competition among scientists to develop the molecular map for rice, and the challenges that are being encountered to take the Green Revolution to Africa.


GENE HETTEL (4)

The trouble with you economists!

On a hot day in July 2009 on the campus of Cornell University, Randy Barker and Robert Herdt, former agricultural economists at the International Rice Research Institute (1966-78 and 1973-83, respectively), got together to reminisce about their days at IRRI and to reflect on the evolution of research in the social sciences at the Institute. Doing his homework ahead of this dialogue that I arranged, Dr. Barker wrote down some key recollections, which are excerpted here.

When I was an agricultural economist at Cornell University in 1965, I agreed to go to Los Baños [Philippines] with my family for two years as part of the University of the Philippines College of Agriculture–Cornell Exchange Program (UPCO). Next door to the college was the newly established International Rice Research Institute (IRRI). The Ford Foundation representative on the IRRI Board, Frosty Hill, had insisted that there be a position for an economist. So, in 1963, Vernon Ruttan was hired as IRRI's first economist (in the mid-1970s photo *at right* with me and Bob Herdt, *left*). But, after two years, Ruttan had to return to the States. In mid-1966, Bob Chandler, the IRRI director general, offered me the position. IRRI and Cornell reached an agreement that I would work half-time for each until the two years were up in 1967, after which I would be full-time at IRRI.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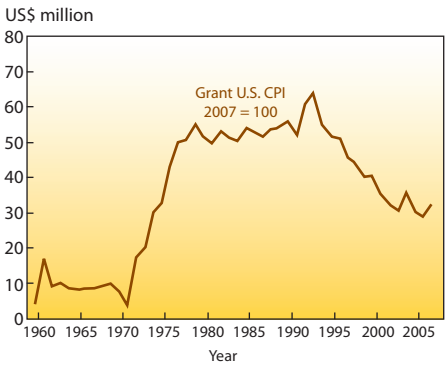
The early years

Ruttan had laid a good foundation for research and had established contacts with economists elsewhere in the Philippines, particularly at the University of the Philippines School of Economics in Manila. Even after joining IRRI full-time, I continued to teach one course a year at the College of Agriculture and an occasional course at the School of Economics—a good two hours or more drive from Los Baños. There was method in my madness. Through teaching, I was able to identify promising graduate students to come to IRRI to do their thesis research with us.

When I joined IRRI in 1966, no one had ever heard of the place, and many at the College looked across the railroad tracks and over the fence and wondered if anything useful would ever come out of the fancy buildings and housing. The establishment of IRRI reflected growing concerns about food security in Asia. Bob Chandler kept a tight grip on the reins and we had a sharply focused mission—increase rice production in Asia.

In August 1966, we released IR8, the first of the so-called semidwarf varieties, and that changed everything. Joining IRRI was like buying a penny stock that suddenly took off. The big jump in the IRRI budget came in the 1970s when Nyle Brady was director general (see IRRI's budget graph, 1960-

IRRI budget, 1960-2007



2007). Because of concerns about the consequences of the Green Revolution, there was even more money for the social sciences.

I joined IRRI at a time when the agricultural scientists, such as Norm Borlaug, thought that economists were part of the problem, not part of the solution. The last thing they wanted was to have an economist dealing with policy issues. So, my first task was to build some bridges.

Much of our research dealt with farm surveys. Lloyd Johnson, head of IRRI's Agricultural Engineering Department [1960-68], with the help of Stan Johnson [no relation], had initiated the "loop survey," a frequent survey of rice farms along the national highway in Central Luzon to observe their farm practices, particularly in land preparation. Stan Johnson [1966-68]—and later Bart Duff [1970-90]—was the economist assigned to the Agricultural Engineering Department to work specifically on the economics of mechanization. Covering the same loop in 1966-67, we initiated a farm household survey. This survey has been conducted about every five years, even to this day, to track changes in farming practices, yields, costs, and returns.

Also, in a number of years, we conducted an experiment on the experiment station. I argued with the administration that our objectives and experimental designs would be different from those of the agronomists; not the usual analysis of variance, but more points on the production function. One day, Bob Chandler, who had been out in the field with a visitor, called me in to his office because he wanted to know why there were so many weeds in some of our plots. I said those were my low-input treatments, and he seemed to be satisfied. After a while, Ronnie Coffman, IRRI plant breeder [1971-81], coined the acronyms ZIP (zero inputs), LIP (low inputs), and HIP (high inputs), but they never caught on with the agronomists. Conducting experiments helped me to better understand the problems and to learn the tricks of the other scientists.

During this early period, I learned a lot from Lloyd Johnson, an engineer with a broad range of research interests—mechanization, water management, farm survey, and experimental design. Johnson was one of the first staff members hired by IRRI in 1960 to develop the 80-hectare experiment station. In 1967, USAID gave a large grant to IRRI to work specifically on mechanization. A short time later, Johnson left IRRI for the International Center for Tropical Agriculture (CIAT) in Colombia. This left a big hole, particularly in the area of water management.

In 1972, we had an opportunity to hire a second economist. We picked Tom Wickham, a young agricultural engineer at Cornell, who had a minor in economics. The engineers at IRRI were working on mechanization, but I figured that, if we were doing research on rice, we certainly should be doing research on water management. Wickham had done his thesis research in the Philippines as a part of the UPCO exchange program. Water management research was in the Agricultural Economics Department for two or three years, but, under Wickham, it soon developed into a separate department Wickham later became the first director general of the International Irrigation Management Institute (IIMI, now IWMI), established in Sri Lanka in 1984.

After hiring Wickham, and with my own activities, I felt that we were becoming too interdisciplinary. With the hiring of Bob Herdt, another up-and-coming Cornell economist, and later Yujiro Hayami, we restored the balance. In mid-1973, I returned to Cornell for a one-year sabbatical leave. Herdt was hired until I returned, and fortunately he decided to stay on for ten years.

Constraints and consequences

We had two main projects in the department—"constraints" and "consequences." Why weren't some farmers adopting the technology? Who were the farmers benefiting from the technology? There was a good deal of discussion and research on "consequences" and a number of conferences on the pros and cons of the Green Revolution both inside and outside of IRRI. And, as pointed out earlier, funding was adequate. Research on consequences produced some interesting results. Critics of the Green Revolution argued that only the large farmers and landowners would adopt and benefit. We found that the rate of adoption was just as high or even higher among small farmers and tenant farmers. In fact, the plots nearest the house seemed to give the highest yield.

The research on "constraints" was Bob Herdt's main focus and it led to a unique IRRI contribution in both methodology and research results. For four years, Bob and I worked with S.K. De Datta [IRRI agronomist, 1964-92] and Kwanchai Gomez [IRRI head statistician, 1968-1993] on "constraints to high yield." We called ourselves "the gang of four" (photo below shows gang reunion at Cornell in 2000) and conducted experiments in farmers' fields in six different countries to see if the yields from our level of inputs would beat their yields. Most farmers, in general, were doing quite well though in spite of underinvesting in fertilizer in the dry season. However, the expenditure on insecticides in most years did not justify the cost, a finding that would be proven time and again in the future.

In 1974, I convinced my Iowa State University classmate Yujiro Hayami to come to IRRI for two years. I consider Hayami to be, perhaps, the best agricultural economist in Asia. Not only is his mind better than mine, he can also beat me on the tennis court. What distinguishes Hayami is his ability to do very macro development research and very micro farm-level research. Even after returning to Japan

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and writing his seminal book with Vern Ruttan, Agricultural Development: An International Perspective, he has continued his research involvement at IRRI. With Masao Kikuchi, he published A Rice Village Saga: Three Decades of the Green Revolution in the Philippines.

Hayami and I delved into the policy area in the mid-1970s, advising the Philippine government (secretaries of finance and agriculture) on fertilizer pricing. It was just a matter of understanding the fertilizer/rice price ratio. Some may have forgotten that we had an energy crisis in the 1970s similar to what we have experienced recently. The Philippine government had rushed out and imported a lot of fertilizer, which couldn't sell at the purchased price. Then Agriculture Secretary Arturo Tanco invited me to a meeting where they planned to make a decision. I declined, saying that this was their decision. I read the next day in the papers that they had lowered the fertilizer price. This was, I believe, the only time in my life I had a direct influence on policy.

After I left IRRI in 1978 to return to Cornell, Herdt took over as head, who, in turn, departed in 1983 to become science advisor to the Consultative Group on International Agricultural Research Secretariat. Later, he joined the Rockefeller Foundation as director of agricultural sciences and he now works "in retirement" at Cornell.

IRRI continued to obtain the services of excellent social scientists: John Flinn [IRRI economist, 1978-91]; Christina David, whom I hired as a research assistant, went on to earn her Ph.D. under renowned economist Peter Timmer at Stanford and, after leaving IRRI, is still doing quality research on the Philippine agricultural economy; Prabhu Pingali, who left IRRI for the Food and Agriculture Organization (FAO) and is now the head of agricultural policy at the Bill & Melinda Gates Foundation; David Dawe, another of Peter Timmer's students, who left IRRI to join FAO; and Mahabub Hossain, who left IRRI to become executive director of the Bangladesh Rural Advancement Committee (BRAC), which today is one of the largest Southern development organizations, employing more than 120,000 people.

"Back home" at IRRI

Recently (June 2007 to June 2008), I had the opportunity to return to IRRI as acting head of the Social Sciences Division (SSD). Mahabub Hossain had returned to Bangladesh and IRRI was searching for a new SSD head. So, here I was 30 years later in the same old job—well, not quite.

Many people asked me, "What was it like to be back in Los Baños again and working at IRRI?" I looked at this question from two perspectives: you can't go home again—back home to the old form and system of things, which once seemed everlasting but is changing all the time (Thomas Wolfe, 1940, You Can't Go Home Again), and "the more things change, the more they stay the same—and you can go home."

When I read the local Philippine newspapers, the Star, the Inquirer, the Bulletin, it seemed that nothing had changed. The same old families were running the country and arguing among themselves. Corruption was rampant. (Of course we have corruption in the United States, but much of it is legal). From the outside, IRRI—both the Institute and the staff housing—looked much the same as when we had left in 1978. There were a few additions here and there and, of course, the trees had grown. At the guest house, where I stayed, the Western-style menu for meals, I think, had been set back in the 1960s. Two of the staff there remembered my children from the 1970s. I began to think, "Maybe I can go home again." But that was before I went to the research center itself to see what was going on.

The trouble with you economists…

One day, about the time that rice prices were reaching unprecedented highs in February 2008, due, in large part, to the rise in oil prices and to the underinvestment in research over the past several years, I was in IRRI Director General Robert Zeigler's office. He started the conversation: "The trouble with you economists…" (I thought to myself, how many times have I heard that? But I never heard anyone say, "The trouble with you plant breeders or the trouble with you plant pathologists."). Bob went on: "The trouble with you economists is that you are always looking back, you are never looking to the future." I said, "Bob, you should feel lucky; we economists are very bad at predicting the future." To verify this point, economists failed to predict the current "financial crisis" that occurred just a few months later.

Go to www.irri.org/publications/today/Barker.asp for the full chronicle of Dr. Barker's IRRI reflections, including why perhaps one can't go home again, the importance of other social sciences beyond economics, a rundown of the excellent social scientists who have served IRRI over the years, and the new language of impact assessment. Also at this Web location, find links to selected clips and the full 1:15-hour video of the engaging and enlightening conversation between Drs. Barker and Herdt.

A juggling act:
Gender barriers and molecular maps

Susan McCouch, an associate geneticist at the International Rice Research Institute (IRRI) in 1990-94 and currently professor of plant breeding and genetics at Cornell University, was truly a pioneer—in more ways than one. She was an integral part of the team at Cornell that developed the first-ever molecular map of rice while, at the same time, being among the first female scientists to break the gender barrier in agricultural research. Back in 1985, when she applied to be a graduate student in Cornell's plant breeding program, she was placed on probation because she was a female with a young child. Even so, during her July 2009 interview on the Cornell campus, she pointed out that, although she experienced difficulties and challenges as everyone does, she didn't really believe that hers at both Cornell and IRRI were centered on gender issues.

Finding meaningful work in the developing world with rice

I ended up at IRRI in a quite round-about way. I actually came into science late in my career. I had lived and traveled extensively in Latin America before coming back to the United States for graduate school. I had realized that my background in literature and history wasn't going to give me the tools that I needed to find meaningful work in the developing world, which was one of the aspirations I had.

So, I returned to the United States with interests in agriculture, nutrition, food supply, and health (but not necessarily medicine). That range of interests converged on the field of agriculture and specifically on rice as a staple food. Access to food was the understory for a lot of the nutritional problems and nutrient deficiencies that I had seen during my travels.

At the time I entered graduate school, I didn't know that I would be able to study something so well-suited to my interests. I entered the PhD program in plant breeding and genetics at Cornell University as an older person, after my first child was born. I had deferred to my husband's career preparation first. By that time, we were thinking very hard about how we could "architect" a life that would give us both professional opportunities in the developing world.

Being female with a young baby forces probation

While my husband, Paul Coen, was in veterinary school, I was a staff technician at Cornell. During that time, I took a very well-known international agriculture course. Through conversations with many participants during that course, I concluded that I wanted to do graduate work in plant breeding. It had not occurred to me before but it fit very well with many of the interests I had, and with my MS preparation in plant pathology.

In 1985, when I applied to the field of plant breeding at Cornell, it was the first time that a female with a young baby was accepted to become a graduate student. Several of the professors felt it was too great a handicap, and that I would never work in the field. I think they felt that, maybe, I was going to attend classes, get an education, but never work professionally. So, I was accepted on probation and I had to prove myself. Despite the fact that many of the male students in the department had young babies at home, this was not grounds for questioning their professional aspirations. But, anyway, I entered the department and I worked very diligently and I think I demonstrated a serious commitment.

My timing was really fortunate because the Rockefeller Foundation's Program on Rice Biotechnology had

IRRI ARCHIVE

IN 1990, Dr. McCouch and laboratory technician Marifa Lanuang Corral use liquid nitrogen to harvest tissue from IRRI field plot–grown rice plants for DNA extraction.

just started in 1985. Ray Wu [the late Cornell professor of molecular biology and genetics, who was widely recognized as one of the fathers of plant genetic engineering], Ronnie Coffman [IRRI plant breeder, 1971-81 and currently director of Cornell's International Programs], and Cornell plant breeder Steve Tanksley had put forward a proposal to do some molecular biology on rice that would involve developing, in those days, an RFLP [restriction fragment length polymorphism] map. So, as I entered the department and considered the various opportunities that presented themselves as PhD projects, this was the one that stood out in my mind. Initially, I was told that I didn't have the qualifications to take on that project. But I slowly worked my way into it and, after the first year, was selected for a fellowship under that program. So, my PhD program was largely funded by the Rockefeller Foundation.

Great teamwork—developing the first molecular map of rice

I became a full-fledged graduate student in 1986. During that time, I worked very closely with two Chinese colleagues [Z.H. Yu and Z.Y. Wang] who were also Rockefeller-funded scholars. Our threesome—the two scholars and I—put together that first RFLP map of rice, which was published in 1988 [*Theoretical and Applied Genetics*: Molecular mapping of rice chromosomes, 76:815-829]. It was a great achievement derived from teamwork. We learned a lot from Steve Tanksley, a tomato geneticist, who was making his first foray into cereals, specifically rice. The RFLP technology, as those who worked with it know, is cumbersome and very tedious. It involved a lot of work using radiation and almost a 24-hour routine in the lab. We worked day and night to develop this map, and it was a great accomplishment in its day—135 markers across rice's 12 chromosomes. Anyway, it was the first molecular map of rice, very historic, and we were very excited.

I made my first trip to IRRI to present the results of that work in 1988. I remember being stunned by the number of researchers at IRRI in so many diverse fields, all of them concentrated on rice. I was excited by it all. I think people were equally excited by the work we were doing at Cornell. There was a very good synergy and I think that first visit cemented a relationship that would evolve into a job opportunity at IRRI when I finished my PhD.

The IRRI experience

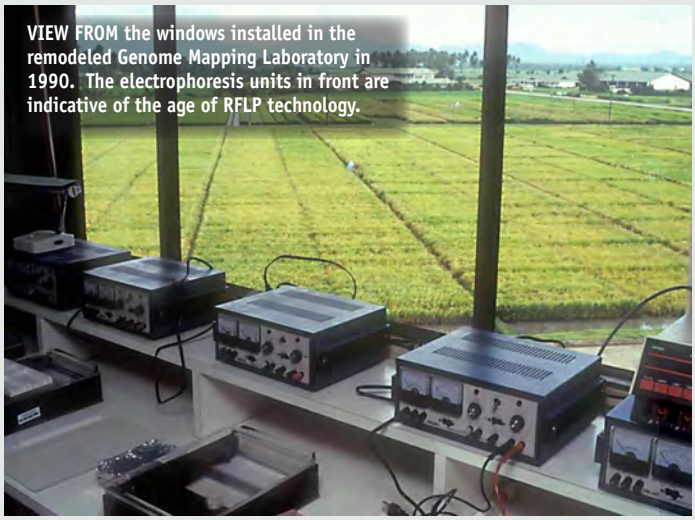
In 1990, when I received my PhD from Cornell, I had just given birth to my second child, Andre. When he was about 8 weeks old, the family moved to the Philippines so that I could take up a position as an internationally recruited geneticist at IRRI. My first task was to set up a molecular breeding lab—a historic first.

We were on the cutting edge of the technology based on what we had developed at Cornell, and we were going to try to implement it at IRRI, putting the molecular markers into action in the context of plant breeding—and in the context of rice improvement for the developing world. For me, it fulfilled my dream of combining science—and the excitement of the new kind of science that was just emerging at the time—with the frontier of developing new varieties of rice. We aimed to encourage better use of the natural resources that were available to people. Of course, the other underlying theme was: could we use genetics to minimize the amount of pesticide use and improve fertilizer efficiency? Today, we're very interested in water-use efficiency as well.

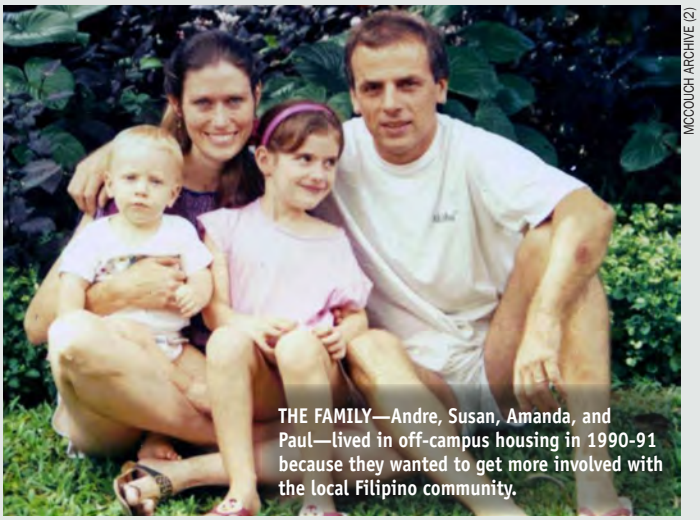
Creating excitement overcomes resistance. All of this came together in this wonderful career opportunity. I think that my family really appreciated what it meant to me, after 4 years in the PhD program, to have the chance to go to IRRI and try to integrate the new genetic tools into the breeding process there—it was something that required as much interpersonal and political will as scientific expertise. During the early days, there was a fair amount of resistance to spending time and money on using molecular markers to do something that the breeders thought they already did very well. There was a time when the new technology was both embraced and resisted, and a little bit resented. I was right at that edge. So, I did my best to try to introduce the technology in ways that would allow others to share the excitement of what I believed was possible when these markers were used to identify genes controlling the traits that breeders selected for.

And so, for the last 20 years, that is what I have spent my life doing. We've continued to use a participatory approach. I've tried to bring people from diverse backgrounds into the process and share the excitement of what science has meant to me. At the same time, I've tried to learn from others where the most pressing problems lie and to address those problems using germplasm and natural variation that is of most interest to them. This has always been a combined effort to show others what was possible and to use genetics wisely for plant improvement.

Greatest achievement: Genome Mapping Laboratory. I think my greatest achievement at IRRI was developing that first marker lab—I think it's still called the Genome Mapping Laboratory [now referred to as the Molecular Breeding Laboratory]. This program has been modified and enlarged and now occupies a central place in the breeding program. Just thinking back to what it meant to pioneer such a program, I remember the very first look



VIEW FROM the windows installed in the remodeled Genome Mapping Laboratory in 1990. The electrophoresis units in front are indicative of the age of RFLP technology.



THE FAMILY—Andre, Susan, Amanda, and Paul—lived in off-campus housing in 1990-91 because they wanted to get more involved with the local Filipino community.

MCCOUCH ARCHIVE (2)

I had at what the space would be—there were no windows; it was just a brick building with a garage underneath. I said: "I think the first thing we need to do is to put in windows so we can look out on the rice paddies and the beautiful volcanic mountains in the background." Indeed, we insisted on that. I still walk into that laboratory and remember the decision to put in the windows that was part of designing the facility. To see it functioning and working today and booting out good science and good products is probably the greatest reward.

Greatest frustration: no work for spouse. The hardest thing for me was that my spouse was unable to acquire a work visa. In 1990, spouses could not get work visas. [Even today in the Philippines, a work permit for a spouse is not automatically given upon application and depends on what kind of work the permit is being requested for.] Paul had a veterinary practice in New York and he had expected to be able to work in the Philippines. He was paying back his student loans and foregoing a normal salary line. He had a skill set that would have been useful. I think the greatest frustration was that he couldn't work and he found it very difficult to develop meaningful professional relationships. That is why the family moved into a "shuttle" research relationship during the last 3 years of my 5-year contract, that is, I traveled back and forth between New York and the Philippines.

Mistaken identity: all Caucasian women look alike. There were just two female internationally recruited staff members at that time at IRRI. It was rare to be female in the scientific arena and my colleague Rebecca Nelson [IRRI molecular plant pathologist, 1989-96] and I were the two females. Other than the fact that we both are Caucasians, we really didn't look alike. She has dark brown eyes; I have blue eyes; she has very curly hair; I have very long straight hair; and during one year she was pregnant. So, about the time she was 9 months' pregnant, walking around with a big belly and her curly hair and brown eyes, and me with my long, straight hair, and no belly, I can remember that many people would see me passing and say, "Hi, Rebecca," and they'd see her passing and say, "Hi, Susan," because, I think, to them we looked very much the same. We laugh about that even today. People still ask me, when I visit IRRI, how is my husband, Johnny? Of course, Johnny is Rebecca's husband and Paul is mine—they still confuse us! That is something we always found very humorous.

National staff make IRRI tick. I think the national staff are what really make IRRI tick. When I first went to IRRI, my learning curve about Asia, about rice, and about many of the things that I now do professionally started with the knowledge that was transmitted to me by the national staff.

Cultivating a loyal "extended" family

I was at IRRI for a relatively short time—really just under 2 years with my family, although I've spent many weeks and months there since that time. I think it was really the foundation of my career. It allowed me to join that "extended" family that IRRI has created over its 50 years and to be a participant both from within and from without.

A great joy has been the interaction with the Filipino staff and the people whom I trained and the many international scholars who came to my lab or whom I've known through my collaborations over the many years. Training people enables one to keep extending the sense of family. People go back to their countries where they continue to work and interact in the international arena. Having participated in an emerging program when molecular breeding technology was just coming on-line really solidified a kind of family bonding that we still enjoy today.

Overall, I believe that this extended family is very loyal to the vision and to the ideal that IRRI represents. So, even if I feel that we need to reinvent ourselves and to reinvent many of our international organizations, I think we all keep somewhere deep within us the vision of what the organization represents, even as it evolves and becomes something new.

Go to www.irri.org/publications/today/McCouch.asp for the full transcript and video clips of Dr. McCouch's interview, in which she also reflects on the challenges of being a female in scientific research; the creation of IRRI's new training course, Rice: research to production; IRRI challenges in 2010 and beyond; and what the future holds, in her view, for packaging better rice varieties for the world's production systems.


GENE HETTEL (3)

Thank you, Margaret Thatcher!

Dr. Michael T. Jackson started his career in genetic resources in the UK and Latin America during the 1970s and '80s and then spent 19 eventful years at IRRI (1991-2010) in various capacities—germplasm specialist and the first head of the Genetic Resources Center (GRC, created in 1991); program leader for Rice Genetic Resources: Conservation, Safe Delivery, and Use; and then, in a complete turnabout, Director for Program Planning and Communications (DPPC).

As head of the GRC, he overhauled operations and procedures at the International Rice Genebank to meet FAO international genebank standards and to be regarded by the Commissioned External Reviewers of Center Genebanks "as a model for others to emulate." He led the collection of 27,000 wild and cultivated rice samples from underexplored regions in 22 countries in South and Southeast Asia, sub-Saharan Africa, and Central America. As DPPC, he played a key role in reinvigorating IRRI's resource mobilization efforts by setting up an efficient project management and coordination system that earned the confidence of the Institute's donors.

In mid-February 2010, my former boss discussed a wide range of subjects, mincing no words in typical "Mike Jackson" fashion.

Birds, maps, and genetic resources

I've always been interested in nature and in geography. As a young boy, I spent many hours bird watching and looking at maps. When I began to think about what to study at university, I thought it would be great to do a degree in zoology and take up ornithology as a career. But I came to realize there were very few posts in ornithology. In any case, my interest in plants grew. So, I attended the University of Southampton starting in 1967 and spent 3 years there, half the time on learning about landforms, glacial processes, river processes, etc., and the other half working on a full botany degree. After Southampton, I took a new one-year master-of-science course in plant genetic resources offered at the University of Birmingham. This fit into my interests at the time and my intention was to finish the course and find a job.

At the end of my first semester in early December 1970, Jack Hawkes, the head of the Department of Botany, asked me, "Mike, how would you like to go to Peru in South America for a year?" Well, I had always been fascinated with the map of South America. It's a huge continent of jungles and mountains. I had always wanted to visit Peru and here was the opportunity. So, I said, "When do I get the ticket?"

Best of both worlds

Well, it didn't quite work that quickly. Hawkes had gone to Peru as part of a USAID-North Carolina State University-Peru joint mission on potatoes. This had been set up in the mid-1960s and it was slowly being transformed into what would become the International Potato Center (CIP) in 1971. The soon-to-be director general of CIP, Dick Sawyer, was looking for funding and he'd been to the UK to talk with the people at what was later to become DfID (Department for International Development). He wanted somebody like me to go to Peru for one year to take over the management of the germplasm collection while he sent a young Peruvian to Birmingham for training.

What got in the way of me going immediately was the CGIAR (Consultative Group on International Agricultural Research). Because, in 1971, discussions were taking place to form what would become the CGIAR later in 1972 and DfID was still debating whether it should join this entity or whether it should continue to give funding on a bilateral basis. So, being delayed for 15 months, I started a PhD at the University of Birmingham funded by the UK government and eventually headed to Peru in January 1973.

I had the best of both worlds in many ways—I was employed by the International Potato Center and, at the same time, I was there doing my PhD in a country that I'd always wanted to visit. It was a marvelous time. I was 24 years old and, as they say, "the world is

your oyster." My fiancée, now my wife, Stephanie, joined me in mid-1973 and we were married in Lima in October. I had responsibility for germplasm collecting and carrying out research on one section of the germplasm collection that CIP was maintaining.

Next stops: Central America and back in the UK

We went back to Birmingham in mid-1975, where I spent time writing and defending my thesis. I was making plans to go back to CIP, which had decided to send me to Central America to set up a program at Turrialba, Costa Rica, where there was a regional center called CATIE (Tropical Agricultural Research and Higher Education Center). CATIE hosted me for nearly 5 years, during which time I looked at the adaptation of potatoes to tropical conditions and got involved in a lot of plant pathology work. Bacterial wilt had become a very serious problem for potato cultivation in that environment, so I spent 3–4 years working on that disease.

At the end of 1980, I went back to Lima. A teaching position had become vacant at the University of Birmingham. Sawyer encouraged me to apply. I did, got the job, and returned to the UK in April 1981, where I set up a teaching program, mainly graduate teaching on genetic resources. I also set up fairly active research programs on potatoes and legume species. I had a good crop of PhD students who came through. It was an interesting time.

Thank you, Margaret Thatcher

I started to become restless toward the end of the 1980s, due in no small part to Margaret Thatcher and her government. In a sense, you can blame the fact that I came to IRRI on Margaret Thatcher. Her government was imposing a lot of measures on the university system. I was getting very uncomfortable with this and I started to question my role within the university system. I enjoyed the teaching, but advancement within the university system didn't necessarily take into account one's complete contribution.

So, one day out of the blue, an advertisement landed on my desk. I don't know who it came from—friend or foe. It was for the position of head of the newly set up Genetic Resources Center at IRRI. I put in an application in September 1990. I was called for an interview in the first week of January 1991. I was offered the job and I accepted and came here in July 1991. I came on my own and left the family back in the UK. I got myself settled in and then, toward the end of December 1991, the family joined me.

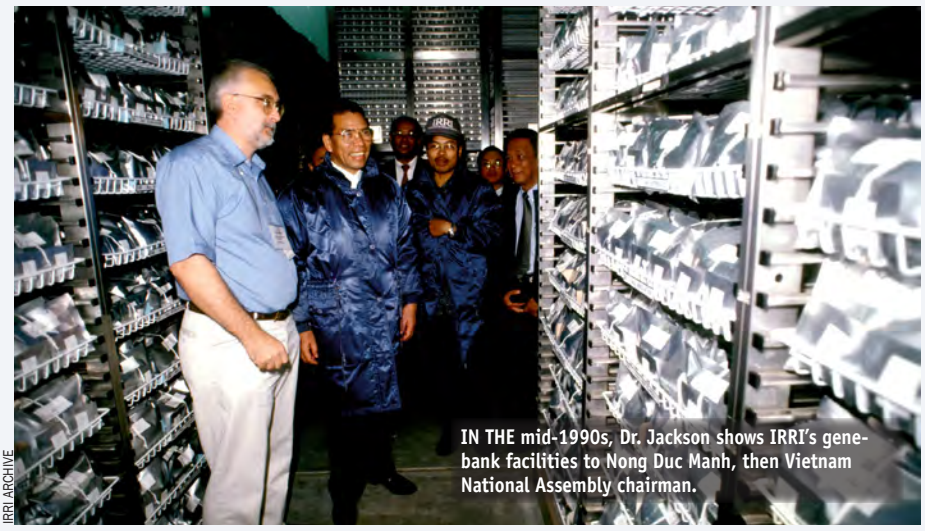
Building a top-class genetic resources program

I joined IRRI when I was in my early 40s and this really represented quite a challenge. It was both with excitement and some trepidation that we made the decision to move to Asia. It was also a concern because we had two daughters, at that time, who were 13 and 9 years old. We were taking them out of the education system in the UK and then were faced with putting them into really, I would say, an "alien" education system in an international school. As things turned out, that was not a problem and they both benefited enormously from the experience of living abroad, from attending international schools, and having a big circle of friends from wherever. I think that's really one of the positives that we take away from our years abroad—that multicultural experience for all of us.

The position had been advertised to bring together what, at that time, was called the International Rice Germplasm Center, which was the genebank; the International Network for Genetic Evaluation of Rice (INGER); and the Seed Health Unit, all into one entity to be known as the Genetic Resources Center. That was what I was interviewed for. Between the interview in January 1991 and arriving in July 1991, a decision had been made to take the Seed Health Unit out of the equation, which I think was a very wise move because, with both the genebank and INGER, you're managing seeds, you're distributing seeds, and receiving seeds. The Seed Health Unit ensures that things are done correctly. You don't want to be in a situation of being both gamekeeper and poacher, as it were, in the management of seeds.

We were given the opportunity, very excitingly, to renovate our facilities. There was a big renovation of facilities in the Institute under way during the early 1990s and I was able to persuade IRRI management to include the genebank in this renovation. For almost everything that the genebank did, we had a serious look at and the staff responded. And, in responding and in participating and taking ownership of what they did, we were able, at the same time, to get the majority of the staff positions upgraded, allowing the people to take responsibility and accept accountability.

Within about 4 years, we had what was clearly a top-class genetic resources program that was built on the very solid foundations of my predecessor, T.T. Chang, for whom the GRC was named in 2007. So, when we had a genebank review in 1996, it was clear that the IRRI Genebank came out way ahead of the other genebanks in the CGIAR. That good, positive review was due, in no small part, to the excellent staff in the Genetic Resources Center on the genebank side.



IRRI ARCHIVE

IN THE mid-1990s, Dr. Jackson shows IRRI's genebank facilities to Nong Duc Manh, then Vietnam National Assembly chairman.

GRAHAM MCLAREN

IN FEBRUARY 2010, Dr. Jackson completed his 355th and last scuba dive in the Philippines at Anilao on the Batangas coast.

Career changes while staying pretty much in place

I've been fortunate that I've actually had five careers, but I've only worked in three places. I had two careers at CIP, in Lima and the regional program; my career in Birmingham; and two careers at IRRI. When I joined IRRI, I said to myself, 10 years, that'll be about the right length of time. But, it is almost 19 years now and I'm still here!

In early 2001, Director General Ron Cantrell said to me: "You know, if a donor were to come to IRRI tomorrow and offer us US$5 million, I couldn't refuse it, but I'd have no idea how it would fit into the scheme of things. We really do not have much of an idea on what money we're raising and where and how it is being spent, etc. We really do need to bring some order to this whole process and we'd like you to set up a new unit at the director level." So, we came to an agreement and, on 1 May 2001, I started as Director for Program Planning and Communications (DPPC) and that's what I've been doing for the last 9 years.

In many respects, my new position was very different from running a genebank, but, in some ways, it was not. In order for a genebank to operate, you have to make sure that all the different elements, all the different processes, and the flows of information are integrated and work together. In the genebank, you manage seed samples, which we call accessions. Well, managing donor relations, managing projects, managing contracts, etc., are a little bit like running the genebank. Instead of seed packets, we have grants, we have projects, we have contracts, and all the information that flows between them. One of the important things that I think I brought to the genebank and to the DPPC was a systematic way of doing business.

Balancing work with private time

Working at IRRI is quite an intense experience. Some colleagues wonder how I've been able to manage this sort of life-work balance. I think that it is extremely important that anybody who comes to work at IRRI maintain a good balance between their work and their social life. And, I also intensely believe it's very important to have a private life. I remember when I came to IRRI in 1991, I told then Director General Klaus Lampe, "From 8 to 5, I'm IRRI's. After 5 o'clock in the afternoon and before 8 o'clock in the morning, that's my time." I share my time with the Institute on my terms and have maintained that over the time I'd been here and I kept a private life, which I think has kept this balance very important.

So, what to do [during non-IRRI time]? Well, I had never thought in my life that I would ever go scuba diving. But, with the coast so close, we would go down and have a look. I had never actually been snorkeling before we came to the Philippines. My first snorkeling experience was wonderful; I don't need to do anything else but snorkel for the rest of my time. Then, [daughter] Hannah took a dive course. In the early 1990s, there were large groups of IRRI staff who took the dive course together. And so in 1993, I thought I would give it a try and I haven't looked back. I've been diving there for 17 years and it's been a tremendous experience.

Leaving things better than they were found

I was joking with somebody a few weeks ago about when it's my time at the IRRI Guesthouse for the "hail and farewell." I was asked, "What do you want on your plaque?" I said, "Well, I can't particularly appreciate these long statements that go on forever about everything you did." I would like, if it were possible, for people to remember my contributions at IRRI in the following way: "He left things better than he found them."

In the genebank, we made significant changes in the ways that we manage rice germplasm in the field and in the screenhouse, in processing prior to the material going into the genebank, in our data management systems, etc. We built a series of operations that I think are world class and that the Institute should be proud of. I'm certainly proud of it. I think it was a good basis for my successor Ruaraidh Sackville Hamilton to come in and build on, much like I built on the foundation that T.T. Chang had established. Much of what we built in the 1990s is still in place.

And it goes without saying that the stability that we have brought to donor relations and fund-raising here at IRRI has put us ahead of the game—compared to many other institutions. And, yes, it will be with a sense of satisfaction, when I do finally come to leave the Institute in a few weeks time, that we put in place some solid foundations for which the Institute can continue to grow.

I will leave IRRI feeling that I made a contribution, feeling that I've left some things better than I found them, and having made some great friends in the process. I feel better for having worked at IRRI and I hope IRRI also appreciates the contributions that I've made.

Go to www.irri.org/publications/today/Jackson.asp for the full transcript of Dr. Jackson's far-ranging interview in which he discusses his frustrations in a complex organization, perspectives on five IRRI directors general, improving relationships with donors, looking to philanthropy for new funding sources, the "overrated" doomsday vault, IRRI's greatest challenges, a prolific publishing career, skiffling on the wall of the Beatles Museum, organizing some of IRRI's key 50th anniversary events, and playing Santa Claus.

G. HETTEL/J. IBABAO (12)

It's like playing roulette—and you get paid for it!

A pioneer interview potpourri of opinions, ideas, and anecdotes

My contribution to IRRI's 50th anniversary celebration has been an extraordinary experience as I have logged more than 100 hours in 54 videotaped interviews, to date, with IRRI's pioneers. These exceptional personalities have ranged from researchers who first roamed the rice plots with IRRI's first director general, Robert F. Chandler, Jr., to others recently retired, to researchers' spouses and children, to our research partners, and to our clients themselves, the farmers. *Rice Today* has published 10 of these illuminating dialogues in the magazine (and in their entirety on the Web with video) plus one installment that provided a cross-section of opinions regarding IRRI's greatest upcoming challenges.

The final chapter in this 12-part series features a selection of opinions, ideas, and anecdotes, which cover relevant commentary on current events, children growing up at IRRI and views on their fathers, and even a discrepancy or two.

Although this is the last regular installment in this series, I reserve the right to occasionally publish more in the future as I sift through the tapes and transcripts and, yes, continue to conduct more interviews because I know I've left out many key figures whose stories and matchless memories deserve to be preserved as part of the Institute's rich history and legacy. Maybe there is a book and/or video documentary in all of this—something to consider for my own retirement—some day!

Hubert Zandstra (IRRI agronomist, 1975-80; IRRI deputy director general for research, 1989-91) on the excitement of conducting research: There's nothing more exciting than being a scientist and researcher. It's like playing roulette—and you get paid for it! You know, it's incredible that you go out there, you place your bet, you put your plots in, and then you find out it works—damn it! It is so exciting!

The excitement of conducting research is not talked about enough. Scientists are perceived as being pretty dull, but, you know, it is really a very, very exciting existence. So that's a highlight. And, as I mentioned, the other highlight is that the best job in the [CGIAR] system, in my opinion, is that of director of research. It's tough to handle on the people side, interacting and dealing a lot with an incredible amount of interpersonal problems among scientists and between them and giving direction to the scientists, and so on. This can be a very tough fight, but I think it is an extremely rewarding position.

Gelia Castillo (Philippine National Scientist and long-time IRRI consultant) on her interest in rice: I was really interested in rice before IRRI was created. I don't know why—perhaps it's because it's something that we eat every day. We can't do without it and it's something that you find among both rich and poor and you can't ignore it. It's always there; no matter what happens, it's always there. If it's not there, you better find it, you know. More than that, in agriculture, rice could be grown, in the early 1960s, in 6 months. Of course, now, I think it's about 120 days. So, it's about 4 months or less and you can easily see the product within that period. But, most of all, it is a product of science that has reached the farthest corner of this country. There are not many products of science that have touched the common man as much as rice—maybe vaccines, too. So, this is terribly important to me.

Peggy Hill (daughter of IRRI co-founder Forrest "Frosty" Hill, Ford Foundation vice president of overseas development, who served for 14 years as chair of IRRI's Board of Trustees) on her father: I think back to my Dad's last years—he died October 20, 1988, just shy of his 88th birthday—he continued to be very much interested in what was going on at the [CGIAR] centers. Now, I hear a lot of discussion going on about the future challenges at the centers.

My father had three things that he saw as long-term concerns. The first was, where would they get the right kind of directors general and who were they? Initially, of course, the first several [at IRRI, for example] were Americans; most of them have been at least western

trained. In some of his conversations with the staff—Asian, American, and every other nationality, there was a feeling that at least the next director general—at the time he was still part of the selection process—probably should be another westerner. But he envisioned the need for the right kind of men—or women—to head up a growing number of institutes and he was concerned about where they were going to come from. The second thing he was concerned about was political pressure. He saw a couple of institutes being created in areas and in subject matter where he felt the return on the investment would be very low and the focus minimal because a particular geographic region had to have one. The third concern was keeping the kind of focus there was with fewer centers and directors general out in the field. As you grow bigger and become spread out more thinly, you become more bureaucratic. He had a lifetime horror of bureaucracy and what it could do to stop progress.

Sant Virmani (IRRI hybrid rice breeder, 1979-2005) on getting IRRI to commit to hybrid rice research: In 1980-82 when the hybrid rice program at IRRI was at the exploratory stage, I recall that, during the April Board of Trustees meeting, the chairman of the board normally came on the Friday before and spent the weekend. I remember Dr. Clarence C. Gray III was the chairman in 1981, and, on a Saturday morning, he took a ride around the IRRI farm to see what was going on. In those days, many scientists worked in the field even on Saturdays. I was trying to convince myself and also find the experimental evidence whether or not hybrid rice would be a practical option for tropical rice farmers. I was looking at my trials around 11 o'clock in the morning. Seeing me in the field, he [Dr. Gray] stopped. He knew Director General Nyle Brady and IRRI were exploring hybrid rice and everybody was asking IRRI about it.

I showed him the experimental hybrids in the trials that compared them to such high-yielding varieties as IR36 and IR42. He saw that there was really something to it. Then, he had lunch with Nyle Brady, mentioning what he saw in the field and that the hybrid program looked promising. After the board meeting was over, Nyle organized a meeting the following week with the scientists and we went back out to those experimental plots. I think that was the turning point when management and the board of trustees realized that this was something serious and that we should make a commitment to hybrid rice work at IRRI.

Ron Cantrell (IRRI director general, 1998-2004) on public-/private-sector cooperation and hybrid rice: One of the things that intrigues me about hybrid rice is that it is a way for the private sector to get involved in rice. There are a lot of issues surrounding hybrid rice (see *Hybridizing the world* on page 32). There are problems that you have in rice that you don't have in sorghum, maize, and other hybrid products in terms of heterosis and production systems. But I think it would be great if rice hybrids were successful because this is clearly something that would draw in private-sector support. Then, all of a sudden, we would start having product research being done by the private sector on rice germplasm.

Merle Shepard (IRRI entomologist, 1984-88; currently professor emeritus and executive director of the Archbold Tropical Research and Education Consortium, Clemson University) on Carolina Gold: When I left IRRI in 1988, I went back home to Charleston, South Carolina, where rice first came into the United States. The major rice variety grown there on huge plantations and making huge fortunes along coastal areas of [pre-U.S. Civil War] South Carolina was called Carolina Gold (see *Carolina Gold and Carolina White rice: a genetic odyssey* on page 20). So, realizing the importance of rice in the region and the many threads associated with history, slavery, and so forth, I got interested in Carolina Gold and we started a Carolina Gold Rice Foundation. I'm the vice president and chairman of the Board of the Foundation. In August 2005, we held a major symposium [Carolina Gold Rice Symposium in Charleston], which included presentations by many people in the rice world. In addition to scientific presentations on rice, it included information on rice architecture, rice culture, rice history, and so forth. That is one of the spinoffs when you work in a culture where rice is so important.

Heidi Barker, daughter of Randy Barker (IRRI agricultural economist and head, Agricultural Economics Department, 1966-78; acting head, IRRI Social Sciences Division, 2007-08), on being a kid at IRRI: IRRI was a magical place. I think your perspective of IRRI as a child depends on what age you were because when you were 5, 6, and 7, it was so huge and you just ran free and wild out of the house; who's out playing; who's coming out to play; going to each other's houses and all that. As you got a little older, you know, 10, 11, and 12, there were incredible games at night. We all got out at night, you know, 7 o'clock after dinner, to play soccer at the tennis court or volleyball or kick the can. There was great camaraderie between the kids.

School friends from Manila asked about my dad. He was gone for many months out of the year and we couldn't tell exactly where he was at any given time, but we got a postcard once in a while. Friends expressed real concern that they thought he was really part of the CIA and we were in some sort of witness

protection program. We had no idea what he did. We really didn't.

Sons of T.T. Chang, IRRI's first geneticist, 1962-91, reflect on who their father was and what he was doing:
Dean Chang: In retrospect, we should have realized what was going on at IRRI because an entire cast of scientific all-stars were visitors. Some of the best agricultural research scientists were making pilgrimages to IRRI to view and review the work here. We always had a chance to meet them because these scientists would come to our home and sit with my father on the porch and sometimes we would be sitting right next to him when he was having a scientific discussion with, say, a Norman Borlaug, Sir Otto Frankel, Sir Ralph Riley, or other luminaries. I should have realized why these famous scientists were coming to visit IRRI all the time.

Jeff Chang: As I grow older, I find myself getting more philosophical. I've really started to appreciate what my father and all the other fathers accomplished at IRRI. I've gotten a more world view of things and have found out what the ramifications are for the world's population. Growing up, we probably didn't get a full feel for how important the work was because a lot of the scientists went about their work very quietly and very modestly. I got a sense of the importance of their work more through my classmates and their parents who worked at the Asian Development Bank or the World Health Organization. When they found out that our parents were working at IRRI, they would say, "Oh, we would like to come for a visit and talk to your parents." So, for me, it was more of an external stimulus.

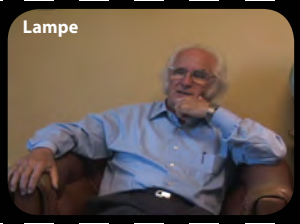
Ed Price (IRRI economist, 1975-85; currently associate vice chancellor, Texas A&M University) on farming systems technology: There are a couple of things that were very striking in the early days. One of them was that, we discovered—and were able eventually to persuade our colleagues throughout the Institute—that not always did rice technology considered alone turn out to be the best approach. We were able to show that many times IRRI technology, as developed on the farm, might not be successful on farms because of the many other conditions that impinge on rice farming. For example, the real value of an early rice variety, such as 1529, which is an early-maturing rice variety that was followed later by IR36, was not that it was higher yielding globally, which it was, but the fact that it matured early. So, there was a sacrifice of yield for timeliness. And that made rice fit much better into an entire farming system and enabled other crops to be grown in other seasons.

Colleagues sometimes see things differently: Ronnie Coffman, IRRI plant breeder (1971-81), stated in a sidebar to the Kwanchai Gomez pioneer interview [see *Figures, fake guns, and fund-raising* on pages 16-19 of *Rice Today*, Vol. 7, No. 4]: If I had to identify the person most responsible for the development of IR36 [at one time the most widely planted crop variety of any species in the world], it would probably be Kwanchai Gomez. She designed the sensitive, quadruple lattice yield trials that caused us to notice it. IR36 was an open plant type, not very attractive to the eye. Prior to the establishment of those yield trials, we would have almost certainly thrown it away. Prior to 1971, the IRRI breeding program did not replicate its yield trials, much to the chagrin of Kwanchai.

In his unpublished pioneer interview, **Gurdev Khush, IRRI rice breeder and principal scientist, 1967-2001,** stated: I have a very high regard for Kwanchai Gomez as a statistician and a scientist, but frankly there is absolutely no use of that design in selecting IR36. I knew what plant type I was looking for. I knew the height. I knew the plant architecture and growth duration. So, it was just my visual observation, the keen eye for what I was looking for. The statistical design of Kwanchai played absolutely no part in the development of IR36. **Note:** In a follow-up later that was not a part of Dr. Khush's pioneer interview, he added: Dr. Coffman's statement [Prior to 1971, the IRRI breeding program did not replicate its yield trials] is absolutely incorrect. I can show the yield trial books with proper cover so indicated and the replicated yield data in the books much before Ronnie joined IRRI.

Klaus Lampe (IRRI director general, 1988-95) on advice from his spouse, who emulated Eleanor Roosevelt: During one of the most critical days at IRRI in my time (actually during a board meeting), Annemarie sent me a little note. She was not aware that the board meeting was still going on. So, that note was brought into the meeting. It quoted Eleanor Roosevelt, who once also advised her husband [U.S. President Franklin Roosevelt] in a written note: "Do what you think is right. Do it against all odds because you will be blamed anyway and you will be right as long as you feel good in your heart."

That was helpful in that moment, I can tell you. And it was about half a year ago when I was reading in a book about the ideas of Lao Tzu. As you know, he lived 2,500 years ago. I don't know if Mrs. Roosevelt ever read Lao Tzu, but he said, at that time already, almost the same thing: "Decide carefully what you do, do it, and leave the place. That is the best avenue towards inner peace." And, when I read it, I said, "Yes, you and Eleanor are right, and I have found the avenue towards inner peace and I am almost there."



Read expanded excerpts of those presented here plus those from additional pioneer interviews that are being included over time—all with hotlinks and video clips—on the *Rice Today* Web site at **irri.org/publications/today/potpourri.asp.**

Pioneer Interviews, 2005-2010 (as of 2 July 2010)

*Unedited transcript available, **Edited transcript available, †Published in *Rice Toda*y

- **Fazle Hasan Abed**, Board of Trustees from Bangladesh, 2001-06*
- **Krishna Alluri**, IRRI liaison scientist for Africa; coordinator, INGER-Africa, 1987-96*
- **V. Balasubramanian,** senior scientist, agronomy, 1991-2006*
- **Randy Barker**, agricultural economist, 1966-78; acting SSD head, 2007-08*
- **Heidi Barker**, daughter of **Randy Barker**, agricultural economist, 1966-78**
- **John Bennett,** senior scientist, molecular biology, 1992-2008**
- **Rick Bernsten**, agricultural economist based in Indonesia, 1978-81*
- **Nyle C. Brady,** director general, 1973-81**,†
- **James L. Brewbaker,** professor, Department of Tropical Plant and Soil Sciences, University of Hawaii, who knows and dealt with many of the pioneers listed here*
- **Ron Cantrell**, director general, 1998-2004**
- **Gelia Castillo**, Philippine National Scientist and long-time IRRI consultant**
- **Dean** and **Jeffrey Chang**, sons of the late **T.T. Chang**, founder of the International Rice Germplasm Center and IRRI's principal geneticist, 1961-91**
- **Nancy Chang**, spouse of the late **T.T. Chang**, founder of the International Rice Germplasm Center and IRRI's principal geneticist, 1961-91*
- **Ronnie Coffman**, plant breeder, 1971-81*
- **Harold Conklin**, anthropologist friend of IRRI since the 1960s**
- **S.K. De Datta**, agronomist, 1964-92*
- **Bart Duff**, agricultural economist, 1970-90*
- **Alan Early**, agricultural engineer, 1977-83*
- **Russell Freed**, plant breeder in Indonesia and Sri Lanka, 1972-80*
- **Wayne Freeman**, plant breeder (financed by Rockefeller to oversee its food programs in India), All-India Coordinated Rice Improvement Program, 1969-73*
- **Kay Golden**, spouse of the late **William Golden**, communicator and rice production specialist, 1963-68*
- **Wally Gloria**, Human Resources Development, 1984-91, secretary, Board of Trustees (in a concurrent capacity, 1996-2000) and senior legal counsel, 1992-2007*
- **Kwanchai Gomez**, head statistician, 1968-1993; liaison for coordination and planning, 1993-96; consultant, 1997-98**,†
- **Sardar Jagjit Singh Hara**, Punjabi farmer with long IRRI association*,†
- **Tom Hargrove,** editor, 1973-91*
- **Elvis "Short" Heinrichs**, entomologist, 1975-85*
- **Robert Herdt**, economist, 1973-83*
- **Peggy Hill**, daughter of IRRI co-founder Frosty Hill**
- **Mahabub Hossain**, head of Social Sciences Division, 1992-2007*
- **Michael Jackson,** head of Genetic Resources Center and Director for Program Planning and Communication, 1991-2010**,†

- **Peter Jennings**, rice breeder, 1961-67**,†
- **Stan Johnson**, agricultural economist, 1966-68*
- **Harold Kauffman**, plant pathologist, 1967-81*
- **Gurdev Khush**, rice breeder and principal scientist, 1967-2001*
- **Klaus Lampe**, director general, 1988-95 (2 interviews in UC Davis & Los Baños)*
- **Susan McCouch**, associate geneticist, 1990-94**,†
- **Carolyn Moomaw Wilhelm**, spouse of the late **James Moomaw**, agronomist, 1961-69**,†
- **Hugh Murphy**, director for administration, 1974-85*
- **K.M. Palaniswamy**, IRRI scholar (statistician), 1968-70*
- **Usha Rani Palaniswamy**, daughter of K.M. Palaniswamy, recalling her days as a child at IRRI in the late 1960s**,†
- **Alicia Antonio Perdon**, research assistant, chemistry, 1971-77
- **Ed Perdon**, assistant rice production specialist, Rice Production Training and Research, 1969-76
- **George Rothschild**, director general,1995-97*
- **Ed Price**, economist, 1975-85*
- **Walt Rockwood**, editor, 1976-82*
- **Buford Shepard**, entomologist, 1984-88**
- **Bill Smith**, editor, 1979-91*
- **M.S. Swaminathan**, director general, 1982-88*
- **Gary Toenniessen**, director, Food security, Rockefeller Foundation and long time IRRI collaborator**,†
- **Sant Virmani**, hybrid rice breeder, 1979-2005*
- **Ren Wang**, deputy director general for research, 2000-07*
- **Iwao Watanabe**, soil microbiologist, 1975-91*
- **Hubert Zandstra**, agronomist, 1975-80; deputy director general for research, 1989-91*