RICE: The 'Quiet' Tie That 'Binds' ASEAN

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In the Beginning

In the late 1960s and in the 1970s to 1980s, when we were first travelling to each other's countries, there was a little bit of strangeness not knowing how to be a Southeast Asian until we saw each other more closely and recognised the similarities and familiarities, then, too, the funny cultural differences. Sometimes I am mistaken for a Thai or an Indonesian and I wondered why until I saw what they look like. They are beautiful and are all coloured 'light brown'. As we got to know each other better and had meals together, one fact stood out – that we all eat rice and we acknowledged that we all produce rice. The bowl of rice at the dining table, the mounds of rice wrapped in banana or coconut leaves brought along on trips to the countryside, and the different kinds of rice cakes offered to us on our farm and household visits all point to the daily primacy of rice.

I remember on one trip, I fainted at Jakarta airport. Because I was wearing a Batik dress, the authorities thought I am Indonesian so they spoke to me in Bahasa and because I could not reply, they thought I was 'out of my wits' and they panicked. But they took care of me. That was my first experience of Southeast 'Asianisation'. I am with people of my own kind I can identify with.

The Rice Research for Development Projects

On successive trips to all the Southeast Asian countries except Brunei Darussalam, my initial impression that in every country rice is eaten as the staple food was strongly and happily reinforced and further supported when I participated in rice research for development projects set up through the International Rice Research Institute (IRRI).

* The author acknowledges the indispensable assistance of Noel Nathaniel Fonseca of the IRRI Library and Documentation Center in the preparation of this paper.

After the establishment of the IRRI in 1960, there were immediate efforts to involve all rice-growing countries, particularly in Asia, in its research and development programmes both as active participants in the development and implementation of its mission and as contributors to and recipients of the knowledge it generated; the technologies it developed; and the policy dialogues it conducted. Needless to say, countries participated in groups, seldom singly, hence there developed a getting-to-know each other atmosphere, before friendships started, between and amongst Southeast Asian participants. This is the beginning of the so-called 'regional identity' in the rice sector. Even during that period when Burma was still a little bit participation-shy, there were rice scientists posted in the country and Burmese trainees came for training to the Institute at Los Baños.

The rice projects are not just research projects. They are a means for developing a network of working relationships amongst scientists who are concerned with similar problems. Workshops provided an avenue for personal and professional contact and for the discussion of similar problems through sharing experiences, expertise, and advice. The aim is to develop partnerships to improve the rice situation, through better varieties and best ways of managing the crop; crafting relevant rice policies; and even rediscovering heirloom varieties, which are being re-valued for their traditional characteristics. The further aim is to continue to develop research and development capacity, especially at a time when agriculture seems to be losing its primary importance for each country.

The rhythm of life in rural communities where rice is grown is very much influenced by the rice-growing season whether it is once a year, twice a year, or thrice or five times in 2 years; whether it is grown in the lowlands, in the uplands, in the coastal areas; whether it is irrigated or rain-fed; whether it is submergent, saline, drought-prone, or deep-water. Rice must be grown or else it has to be imported for RICE is FOOD. It has been said that 'any ASEAN who can get along without rice for one week does not belong'.

The region's dependence on rice is like no other region's dependence on a cereal item. Because of this dependence, rice has an emotional and highly political significance, particularly if its state nears disappearance or if the wherewithal to obtain it becomes problematic. This can occur at the national or household level. Nationally, political leaders would never allow this to happen. At the household level, poverty always stokes the rice supply and the poor may or may not be rice-growers. Although the poor grow rice for subsistence, when great needs arise, they sell their supply at harvest time only to buy it later when the harvest runs out and the rice price may be higher.

> 'Southeast Asia is more heavily dependent on rice than the rest of the Asia – rice's share in cereal production declined only slightly (by 4 percentage points) from 95% to 91% between 1961 and 2011' (Bhandari, Humnath, and Mohanty, forthcoming: 110).

Hamilton (2003: 552) observed that 'rice may be the key to unity in a culturally diverse Asia'. For many Asians, meals are incomplete unless they contain rice, as it 'uniquely sustains the human body in a way no other food can'.

Rice Research and Development Training for ASEAN Countries

Almost as soon as IRRI was inaugurated, training activities started in 1962–1965, as shown in Tables 1 and 2. As had been expected, the Philippines as host of IRRI registered most trainees, which led to the establishment in 1985 of the Philippine Rice Research Institute and the development and strengthening of the National Agricultural Research and Extension Systems (NARES) in Asian countries. The inclusion of MSc and PhD training and the deployment of teams of rice scientists in Cambodia, the Lao PDR, Indonesia, Myanmar, Viet Nam, and the Philippines added much in this regard. By the 1990s, in-country training had been promoted to 'reduce the cost and increase efficiency and effectiveness'. This enabled IRRI scientists and local partners to train more people in each country as well as adapt training courses and materials to local conditions' (Molina et al., 2012: 37, 48–49, 51).

It is also interesting that the rice production training course that started in 1964 has been a regular training programme at IRRI up until the present. Its principal objective is to raise both the theoretical and practical technical competence of those who are supposed to help farmers learn new practices. The 1996 IRRI Annual Report said: 'It is difficult for one to teach what he does not know'. One of the early realisations was that in the typical extension service very rarely do the staff know how to grow rice (IRRA, 1966).

According to Barker and Dawe (2001: 45–78), 'Today it is impossible to go anywhere in the rice-growing world and not find people that have been to Los Baños. The house that Chandler built has rooms all over the rice-growing world. This is the legacy of Bob Chandler'.

Table 1: Country-wise Distribution of Rice Production Training Participation by Years, 1962–2010

	1962–1965	1966–1970	1971–1975	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	Total	No. of Females	% Females
Brunei	0	0	0	0	0	1	0	0	0	0	1	0	0
Cambodia	1	0	5	0	0	45	89	54	41	9	244	34	14
Indonesia	1	21	79	268	200	108	95	63	117	38	990	168	17
Lao PDR	0	7	13	0	3	22	58	38	72	18	231	33	14
Malaysia	1	7	4	60	63	35	8	11	42	2	233	31	13
Myanmar	0	7	20	45	119	44	22	21	69	34	381	128	34
Philippines	46	116	69	131	308	180	184	100	454	399	1,987	830	42
Singapore	0	0	0	0	0	0	0	1	1	1	3	1	33
Thailand	17	24	62	175	205	168	95	53	37	29	865	233	27
Viet Nam	4	16	9	5	96	130	131	124	140	55	710	218	31

Lao PDR = Lao People's Democratic Republic.

Source: Molina et al. (2012: 48–49, 51).

Table 2: Country-wise Distribution of IRRI Participants by Type of Training Attended, 1962–2010

Country	MSc	PhD	Fellow	Intern/ OJT	Short Course	Total	Number Females	% Females
Brunei	0	0	0	0	1	1	0	0
Cambodia	2	6	0	26	210	244	34	14
Indonesia	39	32	2	119	798	990	168	17
Lao PDR	6	3	0	49	173	231	33	14
Malaysia	3	3	0	27	200	233	31	13
Myanmar	36	11	0	26	308	381	128	34
Philippines	197	93	0	188	1,509	1,987	830	42
Singapore	0	1	0	0	2	3	1	33
Thailand	73	30	0	88	674	865	233	27
Viet Nam	53	28	0	172	457	710	218	31

IRRI = International Rice Research Institute; Lao PDR = Lao People's Democratic Republic; OJT = on the job training.

Source: Molina et al. (2012: 37).

In a personal communication with David Hopper, Borlaug and Dowswell said: 'The trainees became IRRI's best ambassadors to the farmer and the agricultural science community throughout the region. On the return of each to their home institutions, they brought back genetic material more than double traditional "best yields". It was not just a revolution in rice production; for many in Asia, it was also a revolution in teaching applied agricultural practices' (Molina et al., 2012: 37).

The near non-participation of Brunei in the training programmes may be explained by the fact that the country probably is in a different situation compared with others in the Association of Southeast Asian Nations (ASEAN). The Human Development Report 2015 shows that Brunei belongs to the Very High Human Development Index (HDI) 1990–2014. It ranks no. 31 amongst 187 countries where its Human Development Index for 2014 is 0.856, where the highest reported HDI is Norway at 0.944, and Singapore is at no. 11. Brunei's life expectancy at birth is 78.8; its gross national income per capita is $72,570; and its mean years of schooling is 8.8. But it is rice consumer no. 21 at 73.2 kg per capita/year. Table 3 shows the Human Development ranking of ASEAN countries. The latest news (from V. Bruce J. Tolentino, Deputy Director–General of IRRI) about Brunei is its fresh push toward self-sufficiency and improved quality of rice. It currently chairs the ASEAN Technical Working Group on Agricultural Research and Development.

The ASEAN plus three (Japan, China, Korea) is considering an ASEAN-wide capacity development to build a new generation of ASEAN rice scientists. No matter how large the previous set of rice scientists, some have passed away and others have retired, hence the continuing need to train new crews of researchers and extension workers. As of 2014, ASEAN does not yet have a set of indicators that can help the region measure the degree of improvement of the region's resiliency with respect to food and energy shocks and to natural disasters. The Economic Research Institute for ASEAN and East Asia (ERIA) proposes that 'ASEAN develop the set indicators and monitors them regularly like every 2 years'. It proposes further that ASEAN agrees on a percentage degree of improvement of the indicator values over the period up to 2030. The proposal is as follows:

> *Adopt or adapt the Rice Bowl Index for ASEAN, as the measure of food systems robustness and food security in each AMS.* The Rice Bowl Index, developed by Syngenta and covering farm level, demand, trade and policy and environment factors, has been operationalised and results are available for a number of AMSs. The index, or an 'ASEANised' version, can be used for all AMSs (Intal, 2014: 62).

It is interesting that ASEAN, which is composed of member countries who are significant rice consumers, producers, exporters, and importers, do not seem to have RICE high on their agenda.

Table 3: Human Development Index and Its Components for the ASEAN Countries

HDI Rank	HDI Value (2014)	Life Expectancy at birth (years) 2014	Mean Years of Schooling (years) 2014	Gross National Income (GNI) per capita 2011 PPP $
Very High Human Development				
No. 11 Singapore	0.920	83.0	10.6	76,628
No. 31 Brunei Darussalam	0.856	78.8	8.8	72,570
High Human Development				
No. 62 Malaysia	0.779	74.7	10.0	22,762
No. 93 Thailand	0.726	74.4	7.9	13,323
Medium High Development				
No. 110 Indonesia	0.684	72.9	7.6	7,643
No. 115 Philippines	0.668	68.2	8.9	7,915
No. 116 Viet Nam	0.666	75.8	7.5	5,092
No. 141 Lao PDR	0.575	66.2	5.0	4,680
No. 143 Cambodia	0.555	68.4	4.4	2,949
Low Human Development				
No. 148 Myanmar	0.536	65.9	4.1	4,608

ASEAN = Association of Southeast Asian Nations; HDI = Human Development Index; Lao PDR = Lao People's Democratic Republic; PPP = purchasing power parity.

Note: The Human Development Index (HDI) is a composite index measuring average achievement in three basic dimensions of human development – a long and healthy life, knowledge, and a decent standard of living.

Source: United Nations Development Programme (UNDP), Human Development Report 2015: Work for Human Development: Table 1 Human Development Index and Its Components, pp. 208–11.

Early Patterns of Adoption

Sometime in 1971, when the world had taken note of the 'green revolution', a project on Patterns of Adoption was undertaken – it included 21 irrigated rice villages in Malaysia, Thailand, Indonesia, and the Philippines. The most general finding was that Asian farmers are not resistant to change. They responded to innovations with measures to temper risk. Irrigation by whatever means has influenced the rate of adoption of modern rice varieties. Another approach taken was to plant more than one variety for each crop season, thus providing insurance against the possible failure of the new seeds. It was likewise noted that farmers who grew the modern varieties had better results with local varieties than did those farmers who grew only local varieties, suggesting that adopters probably have superior managerial skills. While the 'early-adopter-large-farmer'

used partial adoption as a means of reducing risk, the smaller farmers had a 'wait-and-see' attitude. With demonstrated results from the larger farms, the small farmers were then willing to go all the way with the new seeds. In the Philippines, share tenancy and small farm size have not deterred the adoption of modern varieties. Research sites in Thailand and Pakistan reported low rates of adoption because both countries are rice exporters and are therefore quite protective of their fine quality rice. In most places the role of agricultural extension services was clearly recognised and the need for them was expressed definitely in several countries (IRRI, 1975).

Sharing Germplasm across Countries

One blessing of belonging to a global rice partnership is the access to germplasm from other countries. The International Network for Genetic Evaluation of Rice (INGER), which has been truly successful in such sharing, was founded by IRRI in 1975. Overall, more than 1,120 of its tested lines were released as varieties in 74 countries and its impact is even more pronounced in smaller and newer breeding programmes. According to Glenn Gregorio, former plant breeder at IRRI, '[v]arietal releases directly or indirectly traceable to INGER are 73% for Nepal, 72% for Myanmar, 61% for Indonesia, and 51% for Cambodia' (Hettel, 2015: 3). 'This is cultural diversity through genetic diversity... INGER is a beautiful illustration of humanity working together for our common future in a world filled with social conflicts, tribal wars, and fierce competition over the control of natural resources' (Hettel, 2015: 4). The pattern now is: sharing with permission.

Table 4 shows the percent contribution of IRRI to released varieties, by country. The Philippines, Cambodia, Myanmar, and Viet Nam showed the highest contribution of IRRI to released varieties. Indonesia, the Philippines, the Lao PDR, Viet Nam, and Malaysia also showed the use of IRRI materials in the ancestry of their released varieties.

Rice Consumption in ASEAN

In a list of the countries of the world that consume rice, at the top is Bangladesh with 171.7 kg/capita/year. Numbers 2 to 8 are: the Lao PDR, 162.3; Cambodia, 159.2; Viet Nam, 144.6; Indonesia, 134.6; Myanmar, 132.8; the Philippines, 119.4; Thailand, 114.6. Number 17 is Malaysia, 79.9 and number 21 is Brunei, 73.2 kg/capita/year. Although Singapore is not in this list, it is a rice-consuming country too and the very high consumption of the other seven suggests the importance of rice in their lives and where poverty is still a problem – RICE means food.

Table 4: Contribution (%) of IRRI Materials to Released Varieties, By Country in ASEAN

Countries	IRRI Cross	IRRI Materials in Ancestry
Cambodia	24	7
Indonesia	10	58
Lao People's Democratic Republic	5	38
Malaysia	12	36
Myanmar	24	21
Philippines	27	43
Thailand	0	16
Viet Nam	21	32

ASEAN = Association of Southeast Asian Nations; IRRI = International Rice Research Institute.

Source: IRRI and the Philippines, 8 February 2007, International Rice Research Institute.

Table 5: Estimated Rice Consumption from FAOSTAT Food Supply Quantity Data (milled rice supply per capita per year [FAOSTAT])

Country	Rice (Milled Equivalent Food Supply Quantity [kg/capita/year])	Year
Bangladesh	171.7	2013
Lao People's Democratic Republic	162.3	2011
Cambodia	159.2	2011
Viet Nam	144.6	2013
Indonesia	134.6	2013
Myanmar	132.8	2013
Philippines	119.4	2013
Thailand	114.6	2013
Sri Lanka	109.7	2013
Madagascar	102.5	2013
Sierra Leone	98.1	2011
Guinea	96.3	2011
Guinea Bissau	91.5	2011
Liberia	90.5	2011
Nepal	87.8	2013
Republic of Korea	85.6	2011
Malaysia	79.9	2011
China, Mainland	78.2	2013
Guyana	76.7	2011
Democratic People's Republic of Korea	74.2	2013
Brunei	73.2	2011

Source: Courtesy of Andy Nelson (former Geographer, Social Science Division, IRRI).

Although the Lao PDR, Cambodia, Myanmar, and Viet Nam may not 'shine' brightly in the Human Development Index, they score highly in RICE. The Philippines has a reputation for being the biggest rice importer; a fact it is not proud of. Perhaps the Philippine weakness is its high population growth rate; it does not have a functioning population programme. The estimated population growth rates for 2014 were: Brunei 1.650; Cambodia 1.630; Indonesia 0.950; the Lao PDR 1.590; Malaysia 1.470; Myanmar 1.030; Thailand 0.350; Viet Nam 1.00; the Philippines 1.810; and Singapore 1.920 (CIA World Fact Book). Singapore's higher population growth rate is due to migration.

A news item of 26 June 2010 describes it all:

> RP rice imports to hit 2.5 M tons – This volume exceeds the 2.4 M tons imported in 2008, when the price of the commodity reached an all-time high of $1,080 a ton. The Philippines brought in 1.7 M tons of rice in 2009. In November and December last year (2009) the Philippines tendered 2.05 M tons of white rice from abroad for 2010 supply. However rising prices forced the National Food Authority to buy only 1.82 N tons for delivery until June this year (2010). The same news item reminded the readers that the Philippines is the 'world's biggest importer of rice (Olchandra, 2010: B-1).

The Rice Research for Development Approach

Scientists in Residence

During the early years, in addition to the training programme, the 1973 IRRI Annual Report said: 'A third of our staff is with our "outreach projects" in Bangladesh, Egypt, India, Indonesia, Philippines, Sri Lanka, and South Vietnam. We are participating, at the request of the host governments, to strengthen and accelerate the national rice research programs. The scientists live and work in the countries as members of local scientific teams. We supplied improved genetic material and helped train rice scientists. Our scientists at Los Baños serve as "back stop" subject matter specialists when needed.' (IRRI, 1974: xxxiv)

Varietal Release Under Any Name

In 1975, IRRI announced a new policy on naming of rice varieties.

> ...it will no longer officially name and release rice varieties. Instead IRRI will continue its efforts on providing genetic materials, including both early and

advanced breeding lines, to rice scientists everywhere, and will continue to encourage national programs to release IRRI selections as varieties under any names.

The modification of IRRI's varietal release policy reflects today's stronger national rice improvement programs, as well as increased international collaboration through the Genetic Evaluation and Utilization (GEU) program and the International Rice Testing Program.

...More than 40 other IRRI lines have been released as varieties by national programs.

The Philippine Seed Board will continue to use the IR designation for IRRI selections released in the Philippines. (IRRI, 1976: 5)

There are only 11 rice varieties named and released by IRRI. The first rice variety released in 1966 was IR8 dubbed as 'miracle rice' by the press. This was followed by 10 other formally named and released varieties as IR5; IR20; IR22; IR24; IR26; IR28; IR29; IR30; IR32; and IR34 (IRRI, 1976).

Network of Cooperating Scientists

In 1975 also, the Annual Report said:

> We helped accelerate the exchange of ideas, methodologies, and personnel among research organizations and continued to encourage networks of cooperating scientists using common methods to achieve common goals. IRRI coordinates four such networks:
>
> - The *International Rice Testing Program* (IRTP) through which outstanding rices [sic] nominated by 15 countries were evaluated in 12 different types of nurseries at more than 450 locations in 1975;
> - The *Cropping Systems Network* through which research was conducted at 14 different sites in six Southeast Asian nations;
> - The *International Rice Agro-Economic Network* (IRAEN) through which interdisciplinary groups of scientists determined the constraints to higher yields at eight locations in six countries;
> - The *Farm Machinery Network* through which we helped evaluate the need for mechanization and encouraged the development and use of appropriate machines for farmers with small holdings in about 15 countries. (IRRI, 1976: 5)

Realisation of Those 'Left Behind'

As early as 1975, the great lack of development in the unfavourable rice areas was realised:

> The green revolution has touched the life only of one in four of the world's rice farmers... Most of these farmers live in irrigated lands.. But what about the other three farmers?... There is no green revolution for them... There are no improved varieties or technology that can significantly increase current levels of production...
>
> Amongst those that the green revolution has bypassed are the millions of farmers who depend solely on the unpredictable monsoon rains to water their crops. Some grow upland rice and manage it like wheat. Others bund their fields to hold water on land in paddies. But the monsoon rains often fail and drought sets in...
>
> Our scientists are working with counterparts in the national program to jointly incorporate the ability to tolerate each of these stresses into a multitude of new rices [sic] for farmers in these harsh environments. (IRRI, 1976: 3)

Basic Research Premises

The 1977 Annual Report mentioned two basic research premises of the research and development approach:

- Because most production-constraint problems tend to go beyond political boundaries, they can best be solved through *international* cooperation and collaboration. No single institution – international or national– can solve such problems alone.
- Within a given international or national institute, interdisciplinary inputs are essential to solve production – constraint problems. No single discipline can, by itself, solve such problems.

> In keeping with these premises, IRRI continued its interdisciplinary teams approach at home and worked with networks of cooperating scientists overseas. (IRRI, 1978: xv–xvi)
>
> We invited plant breeders from nine major rice-growing countries to come to IRRI to evaluate breeding materials in our nurseries and gave them seeds of materials they selected. (IRRI, 1978: xix)

Collection of Indigenous Varieties

Since IRRI's field collection of rice germplasm began in 1972, collaborative efforts with national agricultural research centres in South and Southeast Asia have assembled 19,216 cultivars. Collaboration with several Asian countries in assembling indigenous varieties included work in northwestern Mindanao, Philippines with the staff of the Bureau of Agricultural Extension netted 231 samples. Institutional exchanges lead to systematic transfer of rice genetic stocks to IRRI's germplasm bank (IRRI, 1978: 10).

Regional Platform for Learning

In 1997, the Irrigated Rice Research Consortium (IRRC) was established as an international platform for adaptive research for impact with a region-wide approach in seven countries in Southeast Asia but also including China, Bangladesh, and Sri Lanka. It was multidisciplinary, problem-oriented, based on regional needs and greater emphasis on research-extension networks to facilitate adoption of technologies to improve the lives of Asian farmers and communities. It involved multi-stakeholder partnerships to bridge research and extension for efficiency and achievement of impacts. In 2005–2008, the 'IRRC Country Outreach Program' or ICOP was launched to facilitate the partnership in-country, ensure technology integration, generate social learning amongst the members of the partnership, and thereby speed up the scaling up and scaling out of natural resource management technologies and processes for rice production in Asia.

Four workgroups were armed with mature technologies that include site-specific nutrient management, alternate wetting and drying to save on water, direct seeding of rice, integrated weed management, and the IRRI superbag. All these provided farmers with a 'basket of options' for natural resource management of irrigated rice. Although these activities were led by the National Agricultural Research and Extension Systems (NARES), the programme placed a strong focus beyond the NARES level and established strategic partnerships with local governments, policymakers, extension workers, the private sector, non-government organisations, and donor agencies.

From the implementation of ICOP Programs, common themes emerged:

a. Farmer participation in the innovation process through participatory experiments for technology validation, etc. This fostered ownership for farmers treated the project as their personal achievements;
b. Multi-stakeholder partnership with community-based organisations, local non-governmental organisations; local fabricators of the technology farmers' organisations etc. In the scaling up and scaling out of technologies in the Philippines,

Indonesia, Myanmar and Viet Nam, adoption and diffusion of innovations were highly influenced by government policies. The role of local champions such as village heads, community elders, seasoned farmers, large farm owners, local technology fabricators and local government officials and staff is indispensable. Public–private partnership is a business-oriented approach in Viet Nam and Myanmar where the involvement of local fabricators of dryers was necessary for the scaling out of flatbed dryers.

c. Participatory monitoring and evaluation provides feedback for refining approaches.
d. Communicative intervention using communication channels, which aimed at changing farmers' perceptions, attitudes, and practices toward a particular technology, has proven to be effective. This was exemplified in the 3 Reductions 3 Gains Campaign in Viet Nam, which used local context in the framing of simple messages to improve farmer decision-making about insecticide use (Palis et al. [eds.], 2010).

> Since problems encountered in rice production have been taking a more regional scope, such as the outbreak of pests and diseases in Southeast Asia during 2007–10, climate change, and the 2008 food crisis, a more regionally oriented partnership approach is needed (Palis, Singleton, and Casimero, 2010: 11).

These regional activities promote social learning across countries, a greater sense of regional identity, and improved within-country partnerships amongst institutions that need to work together to achieve impact. As David Johnson said, 'working in farmers' fields' has become an added rigour for researchers; a new 'ethic' has become the way to behave across the region.

Rice for Unfavourable Environments

From the 1975 realisation of farmers 'left behind' it has taken more than 25 years for Dr David Mackill and his group using a new precision-breeding method known as marker-assisted selection to identify the gene responsible for flood tolerance; it was named SUB1A.

> He and his team were able to transfer SUB1A into widely grown modern rice varieties without affecting other characteristics—such as high yield, good grain quality, and pest and disease resistance—that made the varieties popular in the first place (Barclay, 2009: 27).
>
> By 2006, the first SUB1 varieties were ready for testing at IRRI. The researchers set up plots of what they hoped would be flood-tolerant versions of several

> varieties—IR64, Swarna, and Samba Mahsuri—next to plots of their non-SUB1 counterparts... At harvest, the SUB1 rice yielded more than twice as its neighbor... According to Dr. Mackill, the SUB1 project has shown the advantage of combining practical, applied work such as breeding and upstream, [sic] fundamental research (Barclay, 2009: 27).

In the early 2000s, the Consortium on Unfavorable Rice Environments (CURE) was launched, which eventually resulted in climate-smart rice varieties such as: submergent-tolerant (SUB1); drought tolerant; salinity-tolerant (SALTOL); or any combination of the two or three kinds of tolerance. But finding the 'most fitting' breeding lines that fit farmers' field conditions add complexity to the process. Fortunately, the wonders of science have provided for each country procedures to identify and incorporate tolerance from amongst its local breeding materials into already popular varieties, thus 'softening' the people 'acceptability' criterion. This gives the SUB1 variety from each country its distinctive character and a branding of its own. Note the different designations of SUB1 varieties with local breeding lines coming from each country: Indonesia (INPARA 5); Myanmar (Yemyoke Khana); Viet Nam OM8972; Thailand BAHNGTAEN; and Philippines NSICRC 194.

The SUB1 gene is what the new varieties have in common incorporated into each country's popular varieties for testing of field performance. After preliminary screening for submergence tolerance, the most promising varieties undergo participatory varietal trials. With the crop on the ground, farmers are invited to a Farmers' Field Day for them to observe and make selections in a process called preference analysis where different varieties are rated. Reasons for their choices are expressed. It is interesting to note that farmers bring their own plastic or paper bags to pick panicles from the harvestable crops as they go through observing the results of the trial. The participatory varietal trials give farmers a chance to see their preferred variety's performance against new promising lines while following their own cultural practices. This is a common approach using a common gene, which is followed by testing for field performance in the different countries. It is not that the local variety by and of itself works wonders, but it is the incorporation of the SUB1 gene into this local variety which 'charged the engine', so to speak.[24] The product of this process of incorporating the common gene into a popular local variety leads to national ownership of the variety.

But CURE has other problems 'up its sleeves'. Historically, upland rice research in a programmatic way started in IRRI at the beginning of the 1990s. Since then it has had a somewhat undervalued existence until, as captured by Sushil Pandey et al. (2005) in their paper entitled 'Green Landscapes and Food Secure Households, IRRI's Strategy for Upland Research', a major paradigm shift was made from 'Upland Rice' to Rice on the

'Uplands'. I recall an upland rice meeting in Thailand during that period of 'negativity', when the conclusion was: 'upland rice makes up only a small portion of rice areas', implying that its importance is negligible. A Thai social scientist remarked on the side that, whether or not the international community regards upland rice as important, rice will continue to be grown in the uplands because that is the life and subsistence of people who continue to live there. As their access to the market improves, they grow cash crops but never give up rice. Then the strategy for addressing resource management issues at the landscape level to understand interactions between fragile sloping uplands and favourable 'lowlands' based on various resource flows developed.

S. Pandey et al. (2005) cited at least six reasons why farmers grow rice in the uplands:

(1) Upland fields represent the resource base, the major land endowment of upland farmers, which contributes to household rice supply;
(2) Upland rice is normally established and harvested earlier than lowland rice, hence by growing both upland and lowland rice farmers are able to spread the labour use over a longer span.
(3) Upland rice is normally harvested a month earlier than the lowland rice in most parts of South and Southeast Asia. Even though the output of upland rice may be small, it serves the important role of supplying the family food needs during the 'hungry months' of September and October when previous year's food stocks have been exhausted and the lowland crops of the current year are yet to be harvested.
(4) In upland areas with low access to markets, the opportunity cost of family labour tends to be low due to limited gainful employment opportunities (farm or non-farm).
(5) Reliance on market-based strategies for meeting food needs can expose farmers to unacceptable levels of risk if the price of cash crops is volatile. The avoidance of this price risk is one of the major reasons for subsistence production of food grains.
(6) Production of upland rice is a way of life for many ethnic minority groups who inhabit the mountainous areas.

The entry point for CURE is to increase the productivity of the rice crop in the uplands. Performance evaluation of new rice varieties is being done in the uplands in the Lao PDR, Viet Nam, Indonesia, and the Philippines. In the meantime, heirloom varieties emerged as unique innovations. In the Cordillera Administrative Region (CAR) in the Philippines, the task is to restore heirloom (traditional) varieties for their own sake as well as for the growing market. The overall strategy is on-farm conservation through active use by the target smallholder groups. Active use is what distinguishes it from ordinary on-farm conservation. There is a scientific documentation process of identification and characterisation with farmer and consumer participation. The finished products are entered into the community registry to retain community ownership, which is key to the

retention of heirloom varieties; hence, sharing with other external communities can be done only with milled rice, not seed. Purity, authenticity, exclusivity, and special quality seem to be the desired characteristics of heirloom rice.

In the Arakan Valley of Southern Mindanao, the Philippines identified the best-performing materials for traditional upland rice such as Azucena, Dinorado, and Palaweño. To promote these varieties, a farmers' field day cum multi-seed fair was held and a community-based seed system was started. In addition, a study of traders' preferences for selection and purchase of traditional rice in the uplands was undertaken to link producers of rice in the uplands to the market. This was also the beginning of community-based seed systems in the Lao PDR, Viet Nam, Indonesia, and the Philippines (Castillo, 2013).

Closing Rice Yield Gaps

In January 2013, a project on Closing Rice Yield Gaps in Asia with Reduced Environmental Footprint (CORIGAP) was launched in major granaries of lowland irrigated rice involving IRRI scientists with research and extension partners from Thailand, Viet Nam, Myanmar, Sri Lanka, China, and Indonesia. Alexander Stuart says 'one key strategy to meet future food production is to close "yield gaps". A yield gap is defined by the Global Yield Gap Atlas (www.yieldgap.org) as the difference between "potential yield" and "actual yield"... We should only aim to close yield gaps in rice cultivation to levels that are sustainable, using best management practices such as optimizing nutrient and water use and minimizing other inputs that harm the environment and human health...' (Stuart, 2015: 42). CORIGAP has a transdisciplinary approach and a second phase of the project is being considered with timelines 2017–2020. In the meantime, different countries have adopted technologies to meet their needs. In Indonesia, the flatbed dryer (470 of them) is now locally produced in South Sumatra using indigenous materials that are easily available to keep prices affordable for farmers. The local manufacturers were trained by IRRI staff to ensure they adhere to the set standards of quality (Azucena, 2015).

In the Mekong Delta, strategies for increased production have mainly focused on intensified rice farming systems, high yielding varieties and increased use of agrochemicals. The use of pesticides has increased dramatically in the past decades. The overuse of fertilisers led to high pest and disease infections and resulted in even higher usage of pesticides. In addition, the Mekong Delta has been identified as being significantly vulnerable to climate change, which is leading to more severe water shortages in the dry season.

In Viet Nam, the CORIGAP project is committed to a triple bottom line of social, economic, and environmental targets. Particular attention is paid to unlocking the potential of contract farming as a tool for internalising sustainability in rice value chains. The Vietnamese government is currently encouraging Vietnamese rice exporters to source rice from farmers through contracts. Contract farming helps exporters in governing rice production (from soil preparation to harvest), rice quality, and value chains more effectively. Exporters provide farmers with input packages (certified seeds and chemicals) and additional services such as training and storage. In return, farmers provide exporters with a stable supply of rice. Farmers involved in contract farming are organised together as a producers' group that jointly adopts common production standards. According to a rice producer in Can Tho province, being involved in contact farming has optimised fertiliser application and minimised the use of pesticides, in addition to benefiting from more profitable markets. Exporters face increasing demand for sustainably produced rice. Rising incomes and fast urbanisation are driving up the demand for high-value produce, as well as heightening consumer concern about food safety (Demont, Ba Aminatoru, and Thoron, 2015: 6–7).

Smallholder rice farmers in Myanmar, particularly in the lower Ayeyarwady Delta region, a main rice trade thoroughfare, produce grains with poor quality that beget low prices. CORIGAP promoted best postharvest management practices with improved post-harvest technologies that also target improving the rice value chain; enhanced farmers' capacity to understand factors affecting quality; and facilitated their access to better markets. To foster learning, engagement, and collaboration, a Learning Alliance was established to engage and enhance collaboration amongst value chain actors. This initiated discussions amongst farmers, traders, and millers on improving trust and exploring incentive mechanisms to produce better-quality rice using technologies CORIGAP promoted (Demont, Ba Aminatoru, and Thoron, 2015: 6–7).

Rice Seeds for All Seasons and for All Reasons

Having gone through more than half a century of research, extension, and capacity development for irrigated and unfavourable rice areas, SEEDS emerged as the 'manna from heaven'. Without them, nothing can happen. Actually, the entry point for any rice project is the VARIETY, which is represented by its SEEDS whether 'promised', 'produced', or 'given'. Each country has its own system for securing, vetting, producing, and disseminating seeds (Manzanilla, 2015: 19–22).

In the Philippines, it is important that seeds of a variety being promoted should be available right away. The project should involve the potential or actual seed growers who are located within the target area to ensure good seed supply for the farmer-to-

farmer diffusion, which is a bottom-up approach. Cambodia mentioned that before out-scaling technologies, they make sure that a small group of farmers as target participants are identified to test the technology first (pretesting). After this, together with the national programme, the experts recommend the variety that can be released. Pretesting is conducted because performance differs in different locations. It would be ideal if farmers can have calamity funds to enable them to order rice seeds in advance to stabilise supplies when the need arises. This would avoid different groups ordering different varieties during calamities and not the varieties that farmers prefer to use.

Thailand has community seed producers with 7,000 centres – so this should be enough to meet seed requirements. Viet Nam reported two channels for seed multiplication and delivery: one is through the government system involving testing and seed certification. Materials provided through the local government are planted for field trials in different ecosystems. The second channel is for farmers to plant materials for seed production (certified) and is referred to as farmers' seed. Viet Nam hopes there can be exchanges of seed materials between and amongst CURE countries/communities.

Indonesia mentioned several ways to out-scale seeds: The Assessment Institute for Agricultural Technology (AIAT) conducts trials and tests the varieties of seeds in the provinces for their constraints, before AIAT provides the seeds to interested farmers. Seed growers also produce seeds. The variety then becomes a national variety; and the government subsidises the cost of seeds. The Lao PDR indicated two systems of seed dissemination. For self-seed production, participating farmers are given 5 kg/farmer; they use 1 kg for their own seed production and the rest they use for testing to produce registered seeds. For milling purposes, rice millers 'VET' the varieties. In Myanmar, it was mentioned that they need to train extension workers to disseminate new seed varieties. Farmers are quick to accept new varieties. Extension workers approach farmers and give them incentives. In this way, varieties spread from farmer to farmer. To improve seed dissemination through the extension department, the government engages non-governmental organisations, public–private partnerships, and other similar arrangements to produce more quality seeds.

Indonesia and the Lao PDR highlighted the importance of linking with middlemen, traders, and millers to get acceptance of the variety.

To the question asked as to how to access varieties developed by the national research and extension system (NARES) in a particular country, the answer was: 'It depends on whether or not NARES partners want to share'. Those interested can e-mail the Work Group leader and the scientist will proceed with the protocol and will contact the requesting party. The individual scientist, Dr Glenn Gregorio said that accessing

germplasm from partner countries is not really free but one should ask permission such as for testing varieties for next season. This goes for India, Thailand, and other countries but otherwise there is freedom of access with permission (Manzanilla, 2015).

'Seeing is believing' is a trite expression, but it still works. Robert S. Zeigler has a new twist to it; he says: 'Seeding is believing'. Rice seeds are proof of concept. They produce rice plants, which bear grains that embody the qualities a community culturally prefers for a particular season, in a specific ecosystem, over a certain length of growing period.

Naming of varieties as they come about in the respective countries bring interesting sidelights: In a CURE meeting in Viet Nam, a scientist from Myanmar reported about a farmer in the dry zone who was talking about her drought-prone variety *MokesoemaaKyaKyay*, which is a catchy name, everyone will agree, but what it means matters most. The translation is: 'A widow can pay her debts growing this rice'. Down south of the country is a farmer reporting in a farmers' trial – Yae Ngan Bo meaning hero for salinity. (Steering Committee meetings – Learning about CURE) (Manzanilla, 2015).These local names are expressions of what the varieties mean to farmers who plant them.

Rice Situation in Southeast Asia – A Brief Summary

IRRI's Handbook on Rice Policy in Asia (Tobias et al., 2012) gives us the following:

- **Brunei Darussalam** aspires to increase its self-sufficiency by 60% in 2015. It imports rice directly through the BruSiam Food Alliance, which is a joint venture between the Brunei and Thailand governments.
- **Cambodia** was a rice exporting country in the 1960s. Now it aspires to be Asia's 'rice basket' and a major milled rice-exporting country in the world. It has been exporting rough rice and milled rice to Thailand and Viet Nam for more than 2 decades. There is a joint venture in rice processing and export between Cambodian and Vietnamese companies.
- **Indonesia** is a large producing and consuming nation, but imports started to slowly decline in early 2000 due to a rice import ban. Most of the policies implemented were aimed at achieving self-sufficiency by enhancing rice production.
- **Lao PDR** achieved self-sufficiency in rice production in 2000. Glutinous rice (sticky rice) is the most popular variety grown and consumed. The major market for glutinous rice is Thailand, and it is traded informally due to mutual agreements between the two governments. It still imports long-grain rice from three major trading partners – Thailand, China, and Viet Nam.

- **Malaysia** is 63% self-sufficient and aims to attain 70% food self-sufficiency by 2020 through the National Agro-Food Policy 2011–2020, which was launched to raise product value addition, reinforce supply chains, and increase technical capacity.
- **Myanmar** was the dominant rice-exporting country during the pre-World War II period when it was known as the 'Rice Bowl of Asia'. Because comprehensive state control slowly declined, it is one of the largest exporters in Southeast Asia. In 2010, the government set up the Myanmar Rice Industry Association (MRIA), a merger of three associations of traders, millers, and paddy producers, to develop strategies to increase Myanmar's rice production capacity.
- **Philippines** is the largest rice importer in the world and rice is a highly political commodity there. In 2010 it imported a total of 1.8 million tons from Viet Nam and Thailand. As part of the Food Self-Sufficiency Roadmaps 2011–2016, the government aimed to increase food self-sufficiency by raising paddy production to 22.5 million tons by 2016.
- **Singapore** has rice as a controlled good. To import, export, or carry out wholesale dealings of rice, a license is required from the Ministry of Trade and Industry.
- **Thailand** is today the largest exporter of rice in the world despite having only the world's fifth largest total land area devoted to rice production. Rice exports are mainly long-grain and jasmine rice. Intensive promotion of high-yielding varieties is now a priority in Thailand.
- **Viet Nam** had food insecurity as its main problem 25 years ago. Through an economic reform called Doi Moi, it now ranks as the second-largest exporter of rice in the world. The major rice importers from Viet Nam are the Philippines, Indonesia, and Malaysia.

Two Special Comments about Singapore and the Lao PDR

Singapore will work with the IRRI in a new rice research programme to be led by the National University of Singapore and the Temasek Life Sciences Laboratory. It will invest up to $8.2 million over the next 5 years in the programme, which will address especially how rice farming can become better adapted to climate change. It will also seek to develop new rice varieties with built-in protection against diseases and reduce the need for inputs like water. IRRI said the project positions Singapore as an important partner in the Global Rice Science Partnership.

The Lao PDR is the second largest donor to the International Rice Gene Bank at the IRRI. It has donated 15,525 accessions to the gene bank while India is the number one donor with more than 17,000 accessions. The Gene Bank does not belong to any single country – it belongs to humanity.

Reflections

RICE is the 'QUIET TIE' that BINDS ASEAN. Rice research for development in Asia, notably in Southeast Asia, in many ways predates ASEAN which was 'born in the late 1960s after a period of substantial' interstate disputes and tensions in the region (for example, the Indonesia–Malaysia *Konfrontasi*) and as such ASEAN was created as a mechanism to prevent war and manage inter-state conflicts.

> [It] assumed a degree of formality in the '1976 Treaty of Amity and Cooperation that reflects the ASEAN member states' enduring commitment against the use of force in intra-regional relations (Intal, 2015: 210).

ASEAN countries occupy the uppermost positions in the world's rice consumption. It is fortunate that its rice exporting member countries can supply those members that need to import rice. Seven of the 10 member countries are represented in the Steering Committee of the Consortium for Rice Environments (CURE). The importer–exporter status of the countries remains 'soft' in neighbourhood relations. ASEAN identification keeps the region in its ASEAN anchor so that some needs are met through joint ventures between in-country companies; zero import duties for ASEAN Trading Partners; and temporary rice export bans or short-term rice import bans such that the prospect of a tough Organization for Rice Exporting Countries (OREC) with its 'hard and fast rules' did not materialise. The ASEAN identity has, in a manner of speaking, projected 'humanity' amongst neighbours.

Rice research for development is not a 'dreaming' project. It is a 'continuing doing initiative' that has produced results in the life of rice in each country.

'ASEAN nations endorse IRRI 10-years, 3-point plan' is a news item in the April 2005 issue of *Rice Today*. A new partnership was established between IRRI and ASEAN during the 26th Anniversary Meeting of the ASEAN Ministers on Agriculture and Forestry (AMAF), which endorsed a plan presented by Myanmar that focused on three major rice production challenges facing Asia – water shortages, global warming, and inadequate human resources (*Rice Today*, 2005).

If and when something like the Rice Bowl Index is adopted, then RICE would not be so 'quiet' any more.

Rice is the top crop in seven of the 10 member countries of ASEAN. Brunei and Malaysia aspire to increase their domestic production while Singapore is contributing to the research programme. Rice continues to be the top food consumed.

The following institutions are very much engaged in research and extension activities: CARDI, NAFRI, NAFRES, DAR, ICRR, AIAT, CLRRI, NOMAFSI, URRR, VIAS, PHIL–RICE, CMRRC, RRRC, seed centres, etc.

Throughout the years, Rice Research for Development has been strongly and generously supported by philanthropic organisations, by international and national sources, and, more recently, by some rice-growing countries themselves – perhaps an indication that they are slowly starting to 'earn their keep'. Southeast Asia is a big part of half the world that eats rice. Rice science for a better world is what the International Rice Research Institute is all about. And as its Director–General, Matthew Morell, has said: 'IRRI has a mandate that is completely compelling; that is, improving a product – rice – that is not only a commodity. … We are not just on a journey of technology, but of humanity' (IRRI News, 2015). People make the difference not only in consumption but also in production; and hopefully they can trust collective action such as ASEAN for the common good as one humanity where no one should go hungry and every household can smile when the rice jar is full.

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