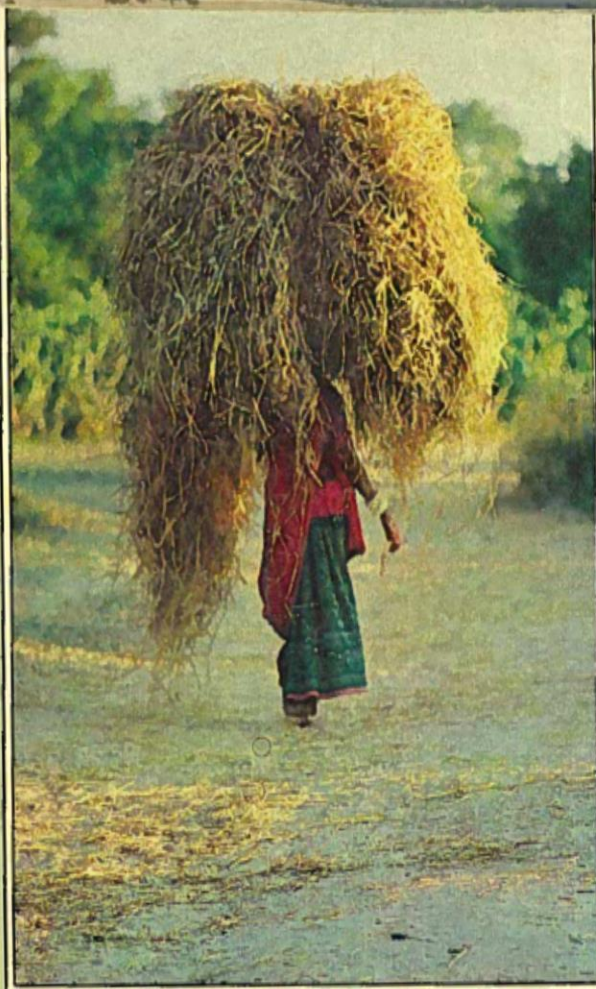


**THE GREAT
GGENE
ROBBERY**



PHOTOGRAPHS BY JAMES R. AGARWAL

COVER STORY/CLAUDE ALVARES

For strategic reasons, in the late 50s the US decided to fund research into new high yielding rice varieties. And thereby, control production of a cereal staple to billions of Asians. Within six years, the International Rice Research Institute at Manila came up with miracle seeds which it claimed would transform Asian economies.

But it did not happen as the seeds contained a gene susceptible to viral disease. There was only one solution: incorporate superior genes from the older rice strains.

In this major expose, Dr Claude Alvares reveals how the US got these genes from India. Through the machinations of scientists such as Dr M S Swaminathan, who was widely hailed as the father of the Green Revolution.

Against this backdrop, Alvares describes how the international cartel and its agents marginalised the brilliant rice specialist, Dr R H Richharia, who singlehandedly fought to preserve a precious facet of our national heritage. Only to lose to the agents of the US. Again and again.

THE GREAT GENE ROBBERY

tle grounding in genetics: they did not seem to understand that seed tested after numerous adaptive trials over many seasons, and then selected and multiplied, is radically different from seed imported in bulk from abroad. The latter, because of its mixed population, will contain seed carrying disease and susceptibility to pests. The IRRI, at that point of time, was too keen to get its seeds grown on a large scale before decisions could be reversed, to subscribe to caution of any kind.

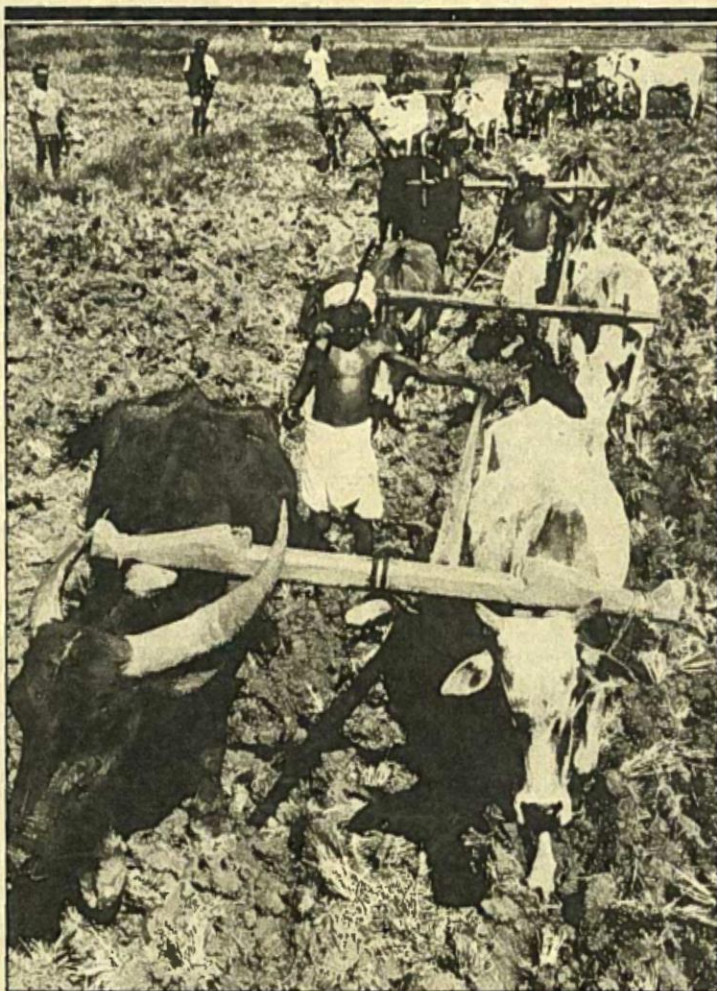
It was also the tremendous leverage that the Americans maintained over the Indian science establishment that enabled the IRRI to ride roughshod over the protests of Indian scientists. Though the country was allegedly non-aligned in politics, most of its policies in science and economics were largely under the control of Americans.

Thus, the community development programme originated with Albert Myers. Douglas Emswinger of the Ford Foundation one day boasted that he had better access to Pandit Nehru than any of the latter's cabinet colleagues. Dr Richharia first came to know of his appointment to the director's post at the CRRI from an American, Prof. Claim. Dr Robert Chandler, director of the IRRI, reported directly to Agriculture Minister, C. Subramaniam.

Chandler in his recent account of the IRRI, *An Adventure in Applied Science*, has admitted that he had never seen a rice plant when he took over as director of the IRRI. Yet, it was at his instigation, and because he had been castigated once by Dr Richharia for bringing rice seed into the country without a quarantine certificate, thus violating the country's laws, that the government decided to retire Dr Richharia, at that time one of the world's leading rice specialists.

Once IR-8 and TN-1 had become fairly established within India and all rice research oriented solely in the direction of semi-dwarfs, using these parents, the IRRI would naturally retain the lead, with large doses of political clout and advertising to make up for shortfalls in science. Rice scientists from Asia, if they wished to make a career, would have to support the IRRI research direction.

One additional, significant factor that seems to have made an impact on the government at the time, was the disastrous harvests of 1965 and 1966. What weighed with the Government of India (and also former President Marcos of the Philippines)



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in choosing to uncritically deploy IRRI technology, was that the latter, for the first time, offered an almost automatic method of raising food that would place it within the control of the administration, taking it out of the hands of the peasants. If the government concentrated its resources in a few, well-endowed areas, using the HYV package, it could produce a sizeable output of food that would be independent of the whims of the monsoons. Again, the very method of agriculture, based on expensive inputs, required credit, and this assured the government that a good proportion of the grain thus produced would end up in the market, in the hands of government procurement agencies, and could then be used to keep prices stable in the cities.

Two major developments totally ruined the prospect of a promised land overflowing with rice and honey. The first was economic: the oil price hike of 1973 effectively limited a fertiliser-based agricultural strategy. It would make Green Revolution inputs so expensive that they would have to be subsidised by

governments, if farmers were not to give up using them forever. The second major problem, also irreversible, arrived in the form of disease and insects. The growing of varieties with a narrow genetic base (all with the same dwarfing gene, *dee-gee-wogen*), upset insect ecology and invented entire generations of pests.

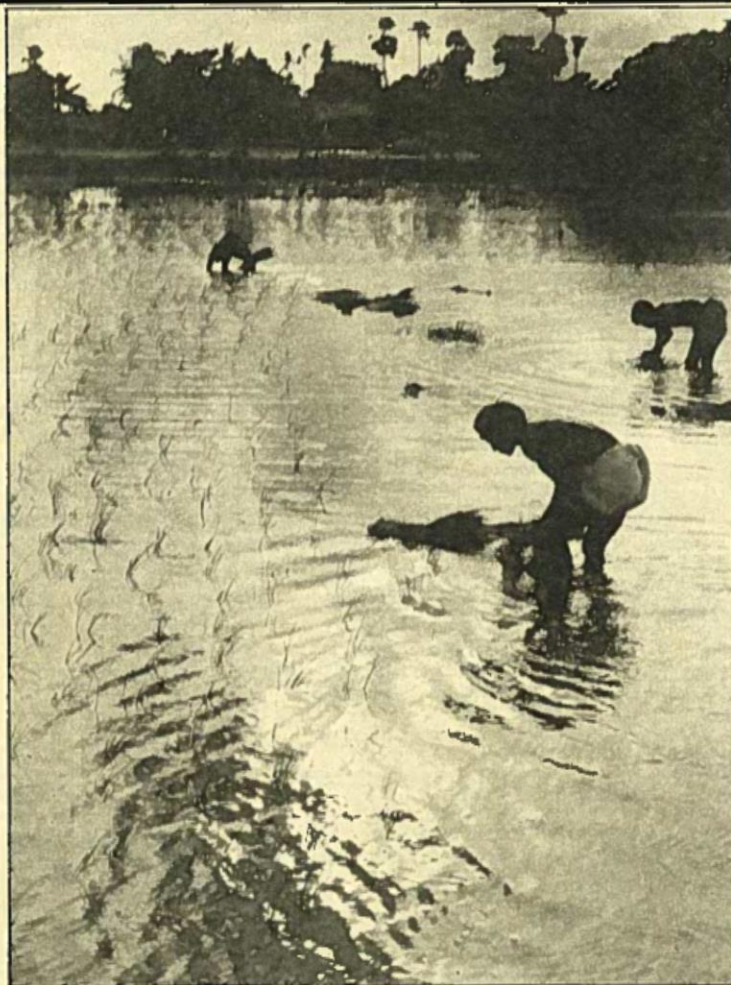
Dr Swaminathan has himself made quite a shameless summary of the fate of IRRI varieties, in a recent issue of *Mazingira*. He writes:

"It is difficult to develop a variety that has a useful life of more than five to six years in tropical environments unless genes for horizontal (more stable) resistance are identified and incorporated. Year-round rice cultivation causes disease and insect organisms to occur in overlapping generations and increases the chance of new races or biotypes developing; thus new pest problems continuously arise. Variety IR-8, released in 1966, suffered from serious attacks of bacterial blight (BB) in 1968 and 1969. In 1970 and 1971, outbreaks of rice tungro virus (RTV) destroyed IR-8

yields throughout the Philippines. The IR-20 variety, released in 1969, and BB resistance and RTV tolerance, and it replaced IR-8 in 1971 and 1972. However, outbreaks of brown plant hopper (BPH) and grassy stunt virus (GSV) in 1973 destroyed IR-20 in most Philippine provinces. Variety IR-26, with BPH resistance, was released in 1973 and became the dominant Philippine variety in 1974 and 1975. In 1976, a new BPH biotype attacked it and IR-36 was released; it had a different gene for resistance to the new BPH biotype and replaced IR-26 within one year. It is now the dominant variety in the Philippines. Its resistance to BPH has held till recently, but it is now being threatened by ragged stunt and wilted stunt (both new diseases), as well as by another new biotype of BPH (No. 3)."

In India, the situation was equally horrifying. All of Dr Richharia's predictions had come true. "The introduction of high-yielding varieties", noted a task force of eminent rice breeders, "has brought about a

The International Rice Research Institute's covetous gaze fell on Dr Richharia's 19,000 varieties. Not only had he uncovered a fascinating world of traditional rices, better than the IRRI varieties, his extension work among the farmers would soon pose a direct challenge to the IRRI itself.



marked change in the status of insect pests like gall midge, brown planthopper, leaf folder, whorl maggot, etc. Most of the HYVs released so far are susceptible to major pests with a crop loss of 30 to 100 per cent... Most of the HYVs are the derivatives of TN-1 or IR-8 and therefore, have the dwarfing gene known as *dee-gee-wo-gen*. The narrow genetic base has created alarming uniformity, causing vulnerability to diseases and pests. Most of the released varieties are not suitable for typical uplands and lowlands which together constitute about 75 per cent of the total rice area of the country."

The IRRI counter-strategy against the pests involved breeding of varieties, with genes for resistance to such pests, taken from wild relatives of the rice plant and its traditional cultivars. All of a sudden it seemed critical that massive efforts be made to make as complete a collection of the older varieties: many of the traditional *Indicas* were found to be important donors for resistance. Gene incorporation strategy, in other words, required vast germplasm resources, most of which were to be

found in India. Dr MS Swaminathan would be instrumental in the task of collection.

In India, again, Dr Richharia stood in the way.

After he had been retired from service at Chandler's insistence, Richharia had gone to the Orissa High Court, where for three years, alone, he fought a legal battle that ruined his family, disrupted the education of his children, and brought tremendous strains on his wife's health. The legal battle was successful, for in 1970, the Court ordered his reinstatement as director of the CRRRI. He had redeemed his honour.

In the meanwhile, the Madhya Pradesh government had appointed Dr Richharia as agricultural advisor, and the rice man set about his disrupted rice work once again, with his usual zeal, and within the space of six years, built up the infrastructure of a new rice research institute at Raipur. Here, this extraordinarily gifted and imaginative rice scientist maintained over 19,000 varieties of rice *in situ* on a shoestring budget of

Rs 20,000 per annum, with not even a microscope in his office-cum-laboratory, situated in the neighbourhood of cooperative rice mills. His assistants included two agricultural graduates and six village level workers, the latter drawing a salary of Rs 250 per month. Richharia had created, practically out of nothing, one of the most extraordinary living gene banks in the world, and provided ample proof of what Indian scientists are capable of, if they are given proper encouragement.

An attack of leaf blight that devastated the corn crop of the US in 1970, and which had resulted from the extensive planting of hybrids that shared a single source of cytoplasm, and the continuous attacks on IRRI varieties, impelled the IRRI to sponsor a Rice Genetic Conservation Workshop in 1977. Swaminathan attended it as an 'observer'. The report of that workshop begins with the statement: "The founders of IRRI showed great foresight when in 1960-61 they planned the establishment of a rice germplasm bank." Nonsense. The certified aims and objects for the Institute merely talk

of a collection of the world's literature on rice. The workshop, being held 17 years after the establishment of the IRRI, indicated that the germplasm problem was becoming important only now.

After the workshop, the IRRI's covetous gaze fell on Richharia's 19,000 varieties at the Madhya Pradesh Rice Research Institute (MPRRI). Not only had Richharia now uncovered a fascinating world of traditional rices, some of which produced between 8-9 tonnes per hectare, better than the IRRI varieties, but he had discovered dwarf plants without the susceptible dwarfing gene of the IRRI varieties. His extension work among the farmers would soon begin to pose a direct challenge to the IRRI itself.

The IRRI staff members journeyed to Raipur and asked for his material. Still moulded in the old scientific tradition, he refused because he had not studied the material himself. He was decidedly against any proposal for 'exchange', for this could only mean giving up his uncontaminated varieties for IRRI's susceptible ones.

So the IRRI did the next best thing: it got the MPRRI shut down!

The ICAR floated a scheme for agricultural development in Madhya Pradesh, particularly for rice. The World Bank contributed Rs 4 crores. The condition laid down was: close down the MPRRI, since it would lead to a 'duplication of work'. At a special meeting of the MPRRI Board, Madhya Pradesh's chief secretary who was not a trustee, was present. He had been earlier connected with the Ford Foundation. A resolution was passed closing down the Institute, and the rice germplasm passed over to the Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), whose vice-chancellor, Sukhdev Singh, also joined the IRRI board of trustees. Scientists were sent to the IRRI for training in germplasm transfer, and Richharia's team was disbanded.

This time too, they locked Dr Richharia's rooms and took away all his research papers.

On June 4, 1982, Dr MN Shrivastava, rice breeder, JNKVV, wrote to P S Srinivasan, the IRRI liaison officer, addressed it care of Ford Foundation, New Delhi, enclosing two sets of material as requested by T T Chang of the IRRI: "First set (264 accessions) is from our early duration collection and second set (170 samples) is part of those varieties which were identified to be popular with the farmers of Madhya Pradesh and Dr RH Richharia, former director of MPRRI purified them and recommended replacing originals with these purified versions."

But with Richharia out of the fray, nature herself now jumped into the ring. It responded with the necessary mutations, and began to lay low the new pest resistant varieties, rendering even the strategy of gene

THE GREAT GENE ROBBERY

incorporation, of temporary utility. And then, in a fashion that only those with some respect for nature's awesome ways would understand, it delivered the *coup de grace*.

The distinctive success of the HYVs lay in their being short stemmed, able to stand heavy nitrogen applications without lodging, when compared with the older varieties. The incorporation of more and more genes from traditional cultivars not only passed on resistance characters, but also the tendency to lodge. Ergo, modern varieties began to lose their non-lodging character, the main advantage they had against the older cultivars. *Research Highlights for 1983*, an IRRI publication, observes:

"Modern rices produce high grain yields with large amounts of applied nitrogen. However, heavy applications increase lodging, which reduces yields. Additionally, as higher levels of insect pest and disease resistance have been bred into modern semi-dwarf varieties, lodging resist-

ance has tended to decline." The green revolution in rice had begun to involute.

What then have been the 'achievements' of such corrupt and politically naive science? (One set of all IRRI germplasm has been sent to Fort Collins, the maximum security installation in the US, without the permission of the Indian government). Has such science achieved any of its declared aims? Bharat Dogra summed it up:

"Starting from just five million hectares in 1970-71, over 18 million hectares or nearly half the area of (rice) has now been brought under the HYVs programme till 1982-83... Therefore, this crop must have received a substantial share of the benefit of the overall increase in irrigation and the increase in the overall consumption of NPK fertilisers. "However, compared to the increase in the area under HYVs and the increase in fertilisers and irrigation, the production of rice has increased to a lesser extent. During the period mentioned above (1970-71 to 1982-83), the production of rice has gone up from 42.23 million tonnes to 46.48 million tonnes. Assuming the production of non-HYVs did not experience any increase at all

and all the difference in rice production was on HYVs land, we get an increase in production of about 4 million tonnes as a result of extension of HYVs programme to nearly 13 million hectares of land. In other words, an increase of 0.31 tonnes was achieved with HYV per hectare. This is a relatively small accomplishment which could have been easily achieved even without the expensive HYV programme and its infrastructure by making better use of village-based resources."

A 33-member official working group headed by KCS Acharya, additional secretary in the ministry of agriculture, has determined that the growth rate of rice production after the Green Revolution has been less when compared with the pre-Green Revolution period.

Millions of hectares of rice are now routinely devastated by BPH and other pests—and no compensation is available to farmers who are induced to take to such 'modernised' agriculture. Such pest infestations have been introduced into the Indian environment. The IRRI officials knew what they were doing, and they did it for the cheap objective of wanting to assert IRRI primacy.

The unmonitored, hasty introduction of HYVs of seed has led to genetic erosion of tremendous proportions, as hundreds of priceless traditional varieties have been lost to mankind. It is only in the eighties that the IRRI has begun to acknowledge the true worth of the older varieties. What a curious circle of events! The IRRI inaugurated the Revolution in rice by holding in ridicule the basis of traditional agriculture—the traditional cultivar, itself the result of close trial and error experimentation by farmers over decades, and sought to displace it with its own production, the HYV. However, since the HYV was not closely adapted to any environment, it required extensive support, having attracted pest infestations on a mass scale. Protection could only come from the same traditional cultivars, which at the time of HYV propagation, had been loaded with abuse.

Is there a way out: how can such a state of science exist nearly 40 years after independence? Why does the director of the CRI continue to remain as a trustee of the IRRI, which he has been since 1979? To continue and deepen the dependence? The IRRI has no future, politically, and also as far as re-

Dr M S Swaminathan is basically Rakesh Sharma appearing 20 years before his time. While with the latter, India claimed credit for its conquest of space, riding piggyback on Soviet science, Swaminathan ensured respectability for India's agricultural science, by manipulating a rapid dissemination of the dwarf strains of Mexican wheat that Norman Borlaug and American science had evolved in Mexico. He exhibited his ability to get things done, when he by-passed all the rules, and had the wheat seed distributed without carrying out the requisite tests. The spectacular increases in wheat production on borrowed science made him famous.

He attempted, however, to carve a separate niche for himself when he claimed that he had developed a new wheat (Sharbati Sonora) by subjecting the Mexican parent lines of the Sonora variety to radiation. Sharbati Sonora, he said, at a popular lecture in Delhi in 1967, had as much protein and lysine as milk. In the summary of the lecture he wrote for *Food Industries*, a journal, however, his actual figure for the wheat's lysine content was 4.61 per cent (the lysine content of milk is 7-8 per cent). In three subsequent papers he continued to claim a high lysine content. In 1967, Dr Y P Gupta, an Indian Agricultural Research Institute



Dr Swaminathan with the 1971 Magsaysay award

TALL CLAIMS?

M S Swaminathan's lacklustre record

(IARI) scientist, disputed the claim and said that the figures had been manipulated. A number of researchers from abroad also stated that the lysine content of Swaminathan's wheat and that of the Mexican wheat did not differ in any significant content. Finally the Central International de Mejoramiento de Maiz y Trigo (CIM-

MYT) itself reported in 1969 that there was no significant difference, between Sonora and Sharbati Sonora.

Yet nine months after the CIM-MYT report appeared, Swaminathan once again submitted the 1967 *Food Industries* paper to a short-lived journal called *Plant Foods for Human Nutrition*, in

which he again claimed a value of two and half times the normal lysine value for Sharbati Sonora. Eight months later, he was given the Magsaysay Award, for having 'developed a wheat variety containing three per cent lysine', and which, the Magsaysay Foundation claimed, 'was now alleviating the deficiency of essential amino acids in the Indian diet so harmful particularly to brain development in young children.'

Every word of the citation was false, and the fact that the award was given within eight months of the article being re-published in an obscure journal, indicates it had been manipulated by his American friends. The award, however, was instrumental in Swaminathan being made the director general of the Indian Council for Agricultural Research (ICAR) on January 13, 1972. A few months later, the lysine scandal, which had so far remained restricted to IARI, became the subject matter of public debate with the suicide of Dr Vinod Shah, an ICAR scientist. Dr Shah, in his suicide note to Swaminathan, had made several allegations of fraud.

The suicide caused an uproar in Parliament and the government was compelled to appoint an enquiry committee headed by the late Dr P B Gajendragadkar, a former Chief Justice of the Supreme Court. The Committee ex-

search is concerned. Politically, its future was tied to former President Marcos, and Filipino farmers and scientists had already begun to demand its closure. As far as research is concerned, the IRRRI has no new ideas, and is now eagerly visiting China to learn Chinese techniques of growing hybrid rice, the next frontier in rice yield enhancement.

The CRRI has ample talent to match Chinese science. It has still vital access to hundreds of indigenous cultivars (a recent count of rice collection centres indicated that there were about 44,000 varieties, whereas the IRRRI has 70,000). What then should be done?

First, the CRRI should be upgraded to international standards, for that is the only sure guarantee of the funds it needs, and which it has been deprived of, ever since Indian politicians decided to back IRRRI science. Today, the CRRI germplasm unit does not have even a jeep to operate its collection of rice cultivars.

Second, all further export of rice germplasm to IRRRI should be banned, since germplasm is part of our national heritage, and its preservation is enjoined by the Constitution in the chapter on Fundamental Duties. Third, steps should be taken to gradually replace IRRRI varieties,

amined the charge of unjustified claims and ruled against Swaminathan.

Swaminathan's habit of making outrageous claims based on non-existent data continued during the period. In 1970, in his Dr Zakir Hussain Memorial Lecture, he claimed that a new technology for dryland farming had been developed by the IARI, and in his 1972 Sri Ram Memorial Lecture, he claimed that the IARI had achieved average bajra yields of 82 quintals per hectare. The Gendragadkar Committee, voluntarily or involuntarily, investigated the complaint that Swaminathan had claimed an average yield of 30 quintals per hectare of bajra and then proceeded to rule that it was plausible. The Sri Ram Lecture, however, clearly mentions 82 quintals as an average yield, and it could not be merely a printing error, since the figure was printed alongside a histogram that indicated 82 quintals.

In another public statement, Swaminathan claimed that the IARI had developed a new hybrid maize which was also rich in lysine. The report in the *Times of India*, March 17, 1971, under the headline, 'Protein-Rich Wonder Maize Developed' begins thus: 'A revolutionary new maize variety which is as protein rich and nourishing as milk has been developed at IARI.'



More than 25 years have passed in costly and wasteful flirtation with the exogene. Despite our continuing mesmerisation by Western science, for genuine development of any kind, the indigene is still the best gene.

What the IARI had not mentioned was that the maize had been developed by two Americans in 1938 and that the high lysine content was first reported in 1964 in the *American Journal of Science*. As with the other cases, the IARI findings of high protein and lysine were not reported in a professional journal, but straight off in a newspaper. The *Times* report also mentioned that rats fed on such maize gained 3.5 times more weight than those fed on old varieties. That experiment, however, had also been performed seven years ago but the IARI director went on to ruminate—'What is more interesting is that children fed on PUSA high lysine maize, are less irritable according to their mothers than milk-fed babies. If a similar effect occurs in adults the high maize would help to eradicate short tempers.'

In 1974, the *New Scientist* published a detailed report on M S Swaminathan's lysine falsehoods. Swaminathan survived the attack. Immediately after the Emergency, it was the *Statesman* in a detailed report dated May 17, 1977, that re-opened the entire debate. It was only on this occasion, for the first time since 1967, that Swaminathan admitted that the data concerning lysine was incorrect. Six years had passed since he had won the Magsaysay Award, which, if the citation was

totally wrong, was improperly conferred. Swaminathan put down the 'analytical error' to one of his subordinates. It was an unconvincing explanation, for if there had been a genuine instrument error, it should have shown in both the wheats, Sonora and Sharbati Sonora.

But there are other indicators to prove that Swaminathan was not so innocent. One is his harassment of all those scientists who had exposed his claims on lysine in the first place. Within a year, for example, of questioning the data in 1967, Dr Y P Gupta's students were taken away from him, he was denied promotions, his junior was selected to become his head, and his application for a Food and Agricultural Organisation (FAO) assignment was held back by the IARI till the due date.

It was only 15 years later that the Supreme Court of India, after passing severe strictures against Swaminathan, was able to do some justice to Y P Gupta for the wrongs that had been visited on him for doing his duty. 'Dr Gupta,' said the court, 'has been the victim of unfair treatment because he raised a voice of dissent against certain claims made by the higher-ups in ICAR in the field of research...this resulted in Dr Gupta being denied the allocation of students.' It then goes on to treat the attitude of the ICAR as

and all those having IRRRI parents, with productive indigenous varieties in the fields. This is already happening in the Philippines: farmers are exchanging old varieties with each other, disowning IRRRI seeds, aptly described as 'seeds of imperialism' and 'seeds of sabotage'.

There seems to have been some awareness at the level of the government that the rice revolution had been grounded, due to environmental and economic factors. The late Prime Minister, Mrs Gandhi, had asked Dr Richharia for a rice production increase plan. After he submitted it, he heard no more about it. After an article by Dom Moraes in this magazine on Richharia, the MP Government hastily set about attempting to find some funds to ask Richharia to resume his work. Now that proposal has been scotched by the same forces that once got the MPRII to close down.

More than 25 years have passed in this costly, wasteful, environmentally unsound, flirtation with the exogene. The sorry and sad record only serves to underline the principle—despite our continuing mesmerisation by western science—that for genuine development of any worthwhile kind, the indigene is still the best gene.

'unethical', and terms the action of the academic council, chaired by Swaminathan, as 'callous,' 'heartless' and 'shocking'.

Eventually, the Indira regime made him deputy chairman of the Planning Commission, and chairman of the Scientific Advisory Committee to the Cabinet (SACC). In 1982 he left the country to become the director general of the IRRRI for the money the job offered.

But he keeps returning every month to India, still hungry for publicity, to exercise his charm and maintain his contacts. Strangely, he has become more and more akin to the HYV of the seeds he sells. Like them, he is capable of high-yielding varieties of phrase and word. At a Gandhi seminar, he will speak on the relevance of Gandhi. At a meeting in Madras, on the necessity for combine harvesters. At another meeting on appropriate technology, he will plump for organic manures. At a talk in London, he will speak on the necessity of chemical fertilisers. He will label slum dwellers 'ecological refugees', and advertise his career as a quest for 'imparting an ecological basis to productivity improvement.' This, after presiding over, and indiscreetly furthering, one of the ecologically most devastating technologies of modern times—the HYV package of the Green Revolution.