

Feature

Development

Development of Agriculture through Biotechnology in Asia

by M Gul Hossain, PhD

During the last two decades many Asian countries made remarkable advances in biotechnology research and development and transferred many new technologies to the farmers' field. It is a pity that Bangladesh has fallen behind.

Nepal

I had the opportunity to visit, with an international team, the tissue culture laboratory of Dr. Rajbhandari at Godavari in Nepal in 1992. We saw hundreds of tissue cultured plants growing in flasks arranged on shelves of the cosy, well illuminated laboratory. (The tissue culture technique provides the scope for rapid multiplication in the laboratory of disease free plants that yield better when grown in the field). We learnt that a number of Nepalese private entrepreneurs were engaged in the production of tissue cultured plants: potatoes, banana, chrysanthemum, rubber plant, gerbera, African violet, orchids, fodder crops. We visited some of the firms. We saw farmers transferring tissue cultured potato shoots to sand-containing trays for root production.

These days mushroom production has become popular among small farmers in the Kahmandu Valley. One private firm invested Nep Rupees 4 million in mushroom infrastructure. There were other large mushroom firms.

The Nepal Biofertilizer Programme is giving training on laboratory culture and use of Rhizobia bacterial cells (inoculum) for biofertilizer production. These bacteria fix the nitrogen rich root nodules in legume plants like mungbean, chickpea, cowpea, groundnut, soyabean, etc. The bacteria trap atmospheric nitrogen in the root nodules and supply nitrogen to the plant. A minikit programme for rhizobia inoculation had been launched by Nepal.

Sri Lanka

The Chinese farmers have used blue green algae (BGA), a kind of moss that grows in water, as a biofertilizer for centuries. BGA reduces the need for chemical fertilizers. In recent years Sri Lanka has made significant progress with BGA research. Soon it will be used as a biofertilizer.

Another source of biofertilizer is Azolla/Anabaena. Azolla is an aquatic fern and has symbiotic relationship with the bacteria called Anabaena. The symbiotic process helps fix nitrogen in the soil. Research on



Waiting for bright days

Azolla Anabaena has created interest among Sri Lankan farmers, and the application of the Azolla technology in rice fields in southwest Sri Lanka is under way.

Tissue cultured coconut and bamboo plants are available to farmers for field planting. Some tissue cultured coconut plants bear fruits in two years' time. This is a significant achievement because coconut has a long juvenile stage. The Ceylon Tobacco Company uses the tissue culture technique for production of orchids, foliage and indoor plants, and some tree species for rapid propagation for reforestation.

Thailand

Tissue culture is now a big business in Thailand. There are many government and private organizations engaged in the businesses. Plants include forestry species, horticulture, field crops to medicinal plants and cut flowers.

Nuclear Polyhedrosis Virus (NPV), a biopesticide that control Heliothis armigera (a worm which causes damage to cotton ball, tomato, citrus, asparagus) and Spodoptera exigua (which damages onions) has been marketed by the private sector in Thailand. Also a nematode (Neoplactana carpocapsae), a soil borne worm, is being marketed as a biopesticide by a private company. This nematode controls the

caterpillar (Cossus sp) that eats up the plant bark.

Thailand is a big mushroom producer, about \$ 40 million worth a year. Thailand also produces about 200 tonnes of Rhizobia biofertilizer that is used for about one million hectares of legume crops. The Thai government encourages the private sector to produce Rhizobia inoculum and biofertilizer, and a few private companies have started the business. Research on blue green algae (BGA) as biofertilizer have progressed in Thailand to an extent where the private sector has started BGA production.

Vietnam

Production of haploid plants (with one set of chromosomes instead of normal two sets), through the use of another pollen culture in the laboratory, are in large scale use for crop improvement in Vietnam. The technique has shortened the rice variety development time to 4 years from 8-9 years required with conventional breeding.

Vietnam produces virus free potato, through tissue culture in large scales. Within a short period of time Vietnam has attained the status of mushroom exporter. Vietnam also produces biopesticides, about 100 tonnes a year using the bacteria, Bacillus thuringiensis (Bt). This bacteria produces chemicals (insecticidal crystalline

proteins and protease inhibitors) that are toxic to insects.

Indonesia

Rhizobia biofertilizer for soyabean production has been commercialized in Indonesia. Mycorrhiza, a fungus associated with roots of many plants, helps in nitrogen fixation in the soil. Indonesia is now in a stage of marketing micorrhiza-based biofertilizer. Some micorrhiza fungi have been discovered that serve dual functions: as a biofertilizer and as a protection against wilt diseases in plants caused by some bacteria and fungi.

Indonesia has marketed the BT-based biopesticide, 'Thuricide', for the control of larvae of a good number caterpillars, maggots and grubs. Indonesia exports mushroom, both dried and canned. The spawns (seeds) of mushrooms are cultured and supplied to growers by private firms.

India and China

Biotechnologies in India have made such an impact that there are more than a dozen companies, each with multi million rupee investment in biotechnologies. In China the direct productive value of biotechnologies in 1990 was \$ 66 million and the indirect productive value was \$ 300 million. In the year 2000 AD these values will rise to \$ 330 million and \$ 900 million respectively. The ratio between investment in biotechnologies to their direct productive value in China was 1:4.5 before 1990. This is expected to rise to 1:7.5 during 1990-2000 AD.

Bangladesh

Protocols of tissue culture for rice, potato, banana, lentil, peanut, wheat, some ornamental and tree plants have been developed in Bangladesh. But none of the products has yet reached the farmers. Bangladesh has developed the capacity for production of Rhizobia biofertilizer, but its commercialization has stumbled. The Mushroom Culture Centre at Savar, which made a good start, appears to have come to a standstill.

We are yet to establish suitable facilities for research on genetic engineering. The few biotechnologists that we have are grossly handicapped; some have already left the country. A serious effort is required to save Bangladesh from becoming a "technological black-hole" and from further dependence on other countries for food, fibre and forest products. The writer is associated with BARC.

Why the Dramatic Change in the Population of Bangladesh?

by Peter Stalker

BANGLADESH already has virtually the highest population density in the world — 718 people per square kilometre — and the population will double within the next 35 years. Restraining population growth has, therefore, been one of the Government's highest priorities. So far it has been remarkably successful. Population growth has slowed: between 1974-84 and the early 1990s, the average annual growth rate fell from 2.8% to 2.2%. Fertility has fallen steeply: between 1975 and 1990, the average number of births per woman dropped from 7.0 to 4.6. Even more remarkably, between 1971 and 1990, contraceptive prevalence increased from 3% to 40%.

Why the dramatic change? Little else seems to have altered significantly over this period — few of the increases in wealth or security that usually herald a demographic transition. The cause seems to lie further back. At the beginning of this century, the total fertility rate was 7 births per woman, but on average only 2.8 children survived to maturity, so families thus remained small. But by the early 1960s the picture had been transformed: out of the 7 children born, 5.1 were surviving, so family sizes were expanding. When, from the 1970s onwards, the Government put more emphasis on family planning millions of parents seized the opportunity.

Can this apparent momentum be sustained? At first sight the answer might seem to be 'no'. After all, infant mortality levels remain high, so parents can still expect similar numbers of children to die. Nor have families become noticeably richer or better educated in the last two decades. All of which suggests that the 'easy' population targets have already been reached and that reducing family sizes still further will be much more difficult.

There are still good reasons why people might want large families. Children bring satisfaction and joy to poor parents but they also bring practical benefits — especially in terms of lawlessness in the rural areas, strong sons offer reassurance. With very little support forthcoming from the police or other institutions, families have to fall back on their own resources. Security is also to be considered in the long term: parents worry about who will support them in their old age — a pressing concern for women who generally marry older men and find themselves widowed or deserted at an early age. In both the long and

short terms a robust family may be the only protection against disaster or destitution.

Parents may also want children because of the work they can do and the income they can bring. Children in poor families are expected to pull their weight: at times of scarcity everyone has to lend a hand. But whether most parents have children in order that they might work is much less certain. Those parents who do think about the costs of raising and educating children might find that they represent a net loss, at least until early adulthood — an extended time-frame for families struggling for day-to-day survival.

These and other factors come into play when parents consider how many children they should have. In 1989, surveys showed that parents on average wanted only 2.9 children — this may be close to family sizes in Bengal at the beginning of this century. The suggestion that there is some inherent drive to large families

and benefits may be so evenly balanced that this is not a crucial issue for many parents: their decision is a fragile one, it can easily go either way.

One factor which could tip the scales towards larger families is son preference. The ideal family may have three children, but if this has to consist of a minimum of two sons then by the law of averages this will keep the fertility rate permanently above 4. The evidence on this, however, is not decisive — though it has been found that parents with-out sons are indeed much less likely to practice contraception.

Given that the decision is evenly balanced, what can be done to influence it? The most effective way is to reduce the obstacles to family planning. Many of these are social and cultural. Couples may be embarrassed even to talk about contraception — particularly if the discussion will cause any disharmony within the extended family. Then there is

or condoms or be concerned that a particular method will affect their health.

Bangladesh's population programme has been relatively successful so far because it has addressed all of these concerns simultaneously. Cultural objections have been met, for example, by offering counselling to couples and also orientation courses to religious leaders. Difficulties of travel have been reduced by outreach services which have contacted women in their homes. Cost objections have been overcome by distributing free supplies for the reversible contraceptive methods as well as offering financial compensation for sterilization. Health worries have been addressed by offering a diversity of methods to those who might have doubts about any specific method.

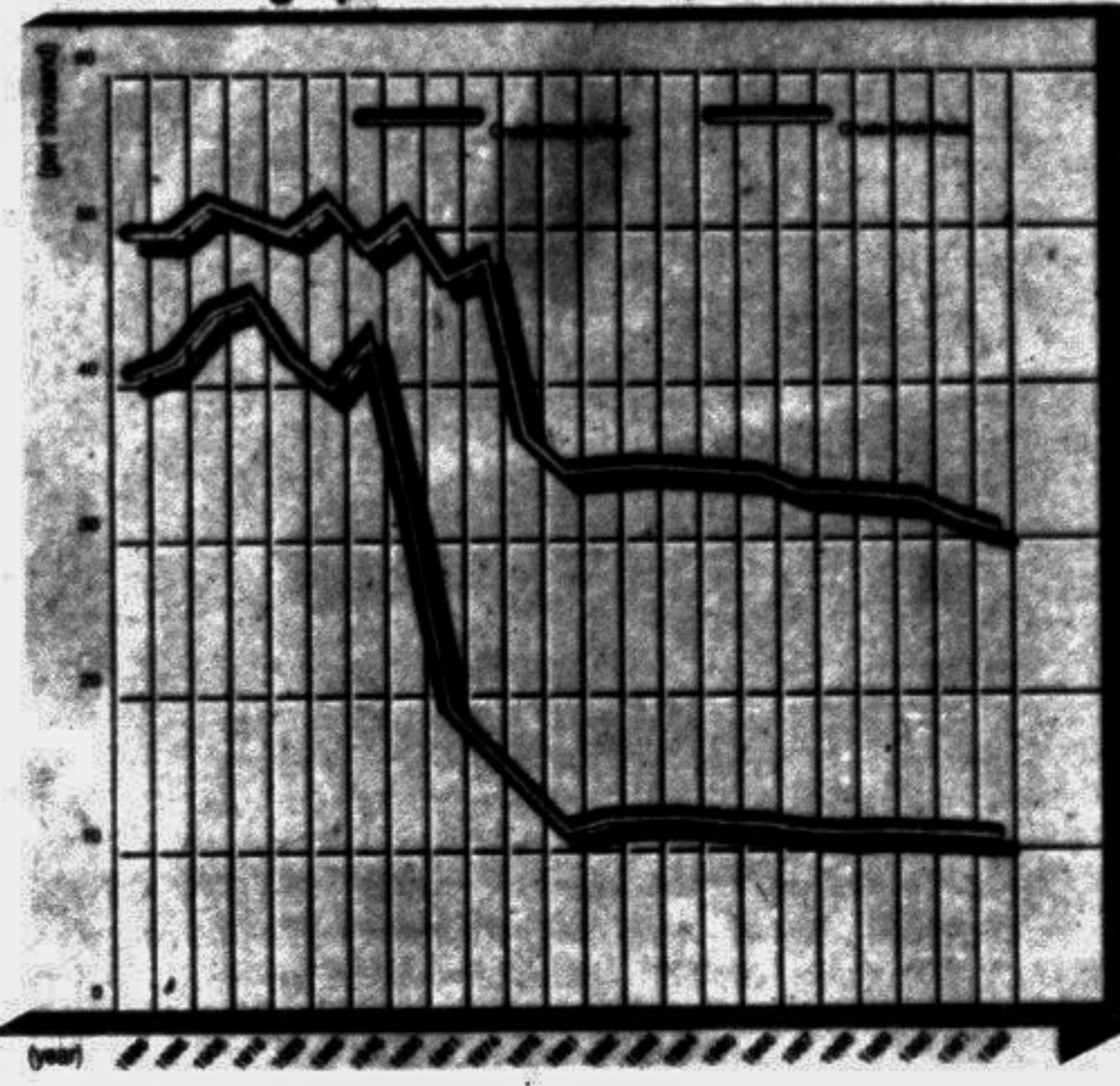
But if this success is to be sustained, the programme will have to become much more efficient. The programme suffers many of the bureaucratic and staffing impediments of other government departments. Delivery services are disjointed and the costs are high. Current expenditure on population is around \$1.50 per capita, a rate of expenditure which might be difficult to sustain. To increase prevalence from 40% to 50% would mean covering about 12 million contraceptive users — at an estimated cost of around \$30 million per year.

The second major condition for progress is an improvement in the status of women — both to reduce desired family size and to increase the use of contraceptives. Giving women a stronger position, inside and outside the family, will reduce the pressure on them to have children early in marriage. And increasing their levels of education makes them much more confident about using contraceptive methods. In 1984-86, for example, the total fertility rate for women with secondary or higher education was 3.3 while for women with no schooling at all it was 4.4. Family planning programmes cannot, however, be confined to women. Until men take more responsibility for contraception family sizes are likely to remain unnecessarily high.

Bangladesh's demographic future is still fraught with difficulties: in the next 35 years the country will have to cope with an inevitable doubling of population. But there is still cause for optimism: the gains can be consolidated and in the longer term the population could be stabilized.

The writer, a consultant for various UN agencies, is the author of 'A Fork in the Path: Human Development Choices for Bangladesh'.

The Demographic Transition



Source: BBS data

In Bangladesh could therefore be wrong. The expansion in the second half of this century may have been something of an aberration: families could traditionally have been small and they could be small in the future.

But not yet. Parents may want few children but the total fertility rate is still 4.6. Even allowing for a high mortality rate this will produce larger families than desired. Why the gap between preference and practice? It could be that while parents, and particularly women, might prefer small families, this conviction is not firmly held. Perceived costs

the confined role of women: those in purdah and unable to move freely outside the household will have their contraceptive choices restricted.

Societies which are culturally and religiously conservative have often been resistant to family planning. Chittagong, for example, which is economically more advanced than other divisions, but culturally more conservative, has both higher preferred family sizes and lower levels of contraception.

Finally, there are obstacles related to specific contraceptive methods. Couples may worry about the costs of pills

THE Russian government's "voucher privatisation" operation will be remembered as the weirdest experiment ever conducted in the name of economic reform.

By June, 80 per cent of eligible citizens had participated in the operation, which was supposed to make everyone a property owner. But the official figure says nothing of the scheme's many absurdities and abuses.

Last October it became known that the St Petersburg shipyard Baltiysky Zavod had been sold for \$150,000, and the huge Yekaterinburg Uralmash engineering complex put on the market for two-and-a-half times the price of a babyfood shop.

Since then the most glaring example has been that of Russia's largest car manufacturer, the Lada-maker GAZ, snapped up by a front of 15 firms which accumulated 1.5 million vouchers for the purpose. Elsewhere, company managers were able to close purchasing bureaux before the appointed date in order to prevent enterprises being acquired by "outside" investors.

When privatisation was being prepared in 1991, Anatoli Chubais, chairman of the Committee for State Property, wanted it to be by direct sales. The government and President obliged him to accept a preliminary period of nerodnaya privatisatsiya (people's privatisation), for political and ideological reasons.

A campaign was launched, financed by a United States pressure group for democracy and free enterprise, to explain privatisation. In popular imagination, privatisation became identified with the issue of vouchers. If people were tickled by the notion of proprietorship, "disappointment" soon came with the devaluation of vouchers by rising prices and monetary inflation at a rate the government had never foreseen.

Strapped for cash for living, many sold their vouchers to the tourists lining every Moscow underground railway station. Those who held on to them found that by the time the scheme ended the original value of 10,000 roubles (two week's average salary) had

Cash Replaces Vouchers as the State Goes up for Auction

Andrew Wilson writes from Moscow

Russia's sale of the century

Between December 1992 and February 1994 -



Source: World Bank

● 9,500 large-scale enterprises employing 11 million people privatised

● 40 million new shareholders created

● Level of industrial workers in privatised firms reaches 75%

dwindled to the price of nine kilos of tomatoes. One Russian sold his own and his parents' vouchers to buy a pair of shoes.

In the worst cases, owners were persuaded to put their vouchers into shady "voucher funds" which evaporated or went into bankruptcy without paying a kopeck of interest. Not all funds were of this kind. But of the 650 that came into existence only 100 or so will be left when the scheme ends, the survivors being funds that have discovered new forms of activity, such as the "Republika" fund, now Number 2 in the Russian share market, with a capital of 2.5 billion roubles.

The ending of the voucher phase will make way for the second stage of privatisation — "cash privatisation" which is supposed to last until the end of the year. In this stage, everything not sold in the first stage — that is, shares in the juiciest economic sectors, with the largest and most efficient enterprises, like gas and oil — will be sold by auction.

The second stage will include the remaining state share — usually 20 to 30 per cent — of enterprises privatised by vouchers.

But "cash privatisation" is as ill-designed for the creation of a healthy economy as were vouchers for a nation of small owners. The problem comes from the limited amount of capital available in a country impoverished by the flight abroad of every convertible asset.

The government hopes to attract back the often criminally acquired billions lying in foreign banks and investment funds. But there is little ground for such optimism. Why should Russian capital-holders (especially those with plenty to hide) rush to sell safe foreign assets in order to buy into privatised Russian industry amid extortionate taxes and runaway inflation?

And the banks are more likely to stay interested in financial games, in which they can turn inflation to their advantage.

A further problem of capital shortage is the run-down state of Russian industry. To start economic production it will be necessary to spend huge sums on machinery and equipment, training and reorganisation. Hardly any potential domestic buyers possess — or are willing to provide — the money for such investment.

Everyone is waiting for it to come from the government through special budgets. What the state receives from the sale of its assets it will be expected to hand back to buyers. One thus faces the absurdity of a government in quest of money ending up not as a recipient but as a donor.

For disillusioned reformers the proper course would have been to skip vouchers and carry out privatisation, with realistic valuations, as quickly as possible, at the same time using the machinery for bankruptcy and operating a programme of social security for job-lovers.

But the new law on bankruptcy has been found to

be unworkable, and no social security system is in place. The crowning folly is that cash privatisation is closed to foreign institutions, which alone have the resources for a productive long-term investment programme.

Without foreign capital the market will play games, prices will plummet for want of offers, and the best that Russia can offer will go for a song. Hence a growing but still unheeded demand to revise the privatisation law and put domestic and foreign capital on the same footing.

Opponents of foreign participation in the privatisation programme predict an explosive reaction if people see outside capital flooding in to "buy up Russia."

Although this is unlikely in regions such as Tyumen where people are used to foreign investment in the gas and oil industry, the danger arises in places where foreigners are still a rarity. There, the way is open for picketing and protests backed by "patriotic forces." But even in the backwoods, sentiment must be tempered by the need of millions to see the wheels of industry turning.

Many Russians, including Prime Minister Viktor Chermomyrdin, are convinced that without foreign investment there is no escape from the deep economic crisis. Others say, we have wasted time and resources, but we have kept our economic independence; in a year or two conditions will stabilise, the conditions that have sent capital abroad will end and we shall see it coming home.

Even the opponents of foreign competition, notably in the banking sector, know that unless domestic and foreign investors are put on an equal footing, Russians will use the protected terms of privatisation not to gear themselves for tomorrow, but to sit on their hands and continue the business of speculation. — Gemint News

The writer is a former Foreign Editor of the London Observer and was for four years the newspaper's Moscow correspondent.

Pioneering Project in Kurigram

by Aloysius Milon Khan

KURIGRAM District in northern Bangladesh is acknowledged to be one of the poorest in the country. Regular flood damage and river erosion, combined with overpopulation and land fragmentation means the District is a chronic food deficit area.

This year, a pathbreaking project designed to reverse the cycle of increasing poverty in Kurigram reached its

rural poor are unable to gain access to the credit of these banks. Thirdly, the project links many partners — Government's Department of Agricultural Extension, international agencies such as GTZ and IFAD, Bangladesh Banks and commercial banks, Bangladesh Agricultural Research Institute (BARI) and major NGO, Rangpur Dinajpur Rural Service (RDRS).

Bazlur Rahman (photo) is

The project is intended as a pathbreaking pilot. After a slow start, the clear progress shown by over 2,000 groups assisted by the projects demonstrates the potential of this novel and multi-agency approach throughout the country. Kurigram may lag behind in some areas but leads in the task of reversing the marginalisation of the rural poor, and power tiller.



Making bank loans work

halfway stage. The project is innovative in several respects. Firstly, and unusually for poverty alleviations efforts, it focuses on small farmers (owning up to 2.5 acres) as well as marginal farmers seeking to prevent and reverse their steady slide into poverty.

Second, the project's main purpose is to link these groups to credit provided by commercial banks. Traditionally the

Matching this economic improvement has been a growth in social awareness. The group members now realise the value of sending their children to school, and, thanks to an awareness course organised by RDRS, understand better what affects their health, their family and their community. The strength of the group means they can act to change things for the better.