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Biotechnology policies and programmes in Viet Nam

Report on discussions with national authorities and scientists

18-23 March 1988

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INTRODUCTION

The Socialist Republic of Viet Nam has a population of 65 million people and a land mass of 85 million hectares. It lies entirely within the tropics extending south along the fertile coastal plain of Indochina from the Tropic of Cancer to 9°N. Mountains rise to the west of the narrow coastal plain. It includes the great deltas of the Mekong and Red Rivers. It has a rich tropical vegetation with production of two or three harvests of rice per year, sometimes with a winter crop, for example, of potatoes or tobacco. Vietnamese exports include rice, rubber, coffee, tea, fruit, vegetables, coconut, alcohol, shrimp and coal. The infrastructure of Viet Nam suffered greatly from the effects of the long wars of independence and from subsequent economic and social isolation. Cultural and economic relations are strongest with the nations of Eastern Europe, Cuba, Japan and Sweden.

Following the assignment to "discuss with national authorities and scientists possible policies and programmes to be developed in the field of biotechnology in Viet Nam, prepare an outline of such policies, assist Viet Nam in biotechnology and training and in the building of an affiliated centre to ICGEB and advise on follw-up actions", I visited Viet Nam between the 18th and 23rd of March 1988.

The National Centre for Scientific Research (NCSR) was responsible for my programme. I was briefed on arrival by the President of the NCSR, Professor Nguyen van Hieu, the Director of the Institute of Biology, NCSR, Professor Le Xuan Tu and Nguyen Trung, Director of the Department of Economic Cooperation, Ministry of Foreign Affairs. I was accompanied during my visit by Professor Le Xuan Tu and Tran Nguyen Hinn, International Cooperation Department of the NCSR.

A draft proposal for the Development of Tropical Biotechnology in Viet Nam had been prepared and this formed the basis for discussions with scientists and national authorities.

I was honoured to meet the Foreign Minister, Nguyen Co Thach, the Vice-Chairman of the Council of Ministers, General Vo Nguyen Giap, and the President of the State Committee on Science and Technology, Professor Dang Huu. Each expressed considerable interest in the role of biotechnology in the development of medicine, agriculture and industry, and in the value of close cooperation with UNIDO and the ICGEB.

I would like to express my appreciation for the hospitality and courtesy which was shown to me by all the officials and scientists who participated in the discussions.

Viet Nam is a tropical country with a rich and varied vegetation. The majority (80%) of the 65 million people are farmers. Due to the size of the population and the mountainous interior there is only 0.1 hectare of arable land per person. Moreover the population has been growing rapidly - by more than 12 million since 1975. It was reported that Viet Nam faced a shortfall in rice production of 3 million tons in 1980 against a requirement of 17 million. This was partly the result of severe typhoons. In spite of its rich potential Viet Nam is a very poor country.

If economic and social development are to be accelerated it is essential that agricultural production be increased significantly, not only to supply sufficient food for local needs and raw materials for industry, but also to contribute to foreign trade. In principle Viet Nam should be able to export much larger quantities of tropical produce, and to support major processing industries. Agriculture is the main economic concern of the Vietnamese government.

Health is certainly the main social concern in Viet Nam. Malaria, enteritis and hepatitis B are endemic. There is a widely dispersed public health system and infant mortality has fallen sharply to a reported 49 per 1000. Life expectancy has risen from 43 in 1960 to 65 in 1987. However, Viet Nam is virtually completely dependent on the importation of vaccines, drugs, diagnostic reagents and other medical materials.

Industrial development was severely set back during the Viet Nam war and there was further destruction during the war in 1979. The result is that most industry is conducted on a small scale.

The overall trade balance is negative. In 1984, Exports, mostly handicrafts and light industrial goods, were worth $430 million and Imports were $838 million. There is a substantial foreign debt to western countries. In 1983 it was estimated by the IMF to be $3.2 billion entailing the enormous problem of debt service. It is virtually impossible to obtain foreign currency in Viet Nam. Senior scientists who

are invited to visit Hanoi but rarely able to attend as funds are not available for travel.

There is a country-wide education system. It is estimated that primary school enrolment is 90% and literacy is estimated as 87%.

THE NATIONAL CENTRE FOR SCIENTIFIC RESEARCH OF VIET NAM

During a short visit it was only possible to assess the biotechnology activities at the National Centre for Scientific Research (NCSR) in Hanoi.

I am most grateful to Professor Nguyen Van Hieu, President of the Institute, who was kind enough to talk with me on several occasions. Professor Le Xuan Tu, Director of the Institute of Biology, accompanied me throughout my visit. He was a fund of information and a most hospitable host. Many other members of the staff of the NCSR were very helpful in describing their research in detail. Their names are given at the end of the report.

This Centre, established in May 1975, is housed in several large buildings. It is the largest centre for research in the Natural Sciences in the country, and also has responsibility for certain areas of technology. The immediate objects of research are related economic progress. It is first and foremost required to investigate "scientific problems which have very important roles in the economy". Apart from conducting experimental work the centre is also expected to collect and analyse information likely to be of economic benefit. And it is required to conduct experiemnts on fundamental scientific problems as the basis for the "scientific development of the whole country".

The President is Professor Nguyen Van Hieu, Academician of the Academy of Sciences of the Soviet Union, who was awarded the Lenin Prize in 1986

The Centre is divided into areas each under the supervision of a Scientific Board. These are in:

Mathematics and Cybernetics,
Physics,
Mechanics,
Chemistry,
Biology,
Earth Sciences.

The Centre has bilateral cooperation agreements with the Academies of Science of the Soviet Union, Hungary, Poland, Czechoslovakia, German Democratic Republic, Cuba, Laos, Afghanistan, and the National Centre for Scientific Research of France (CNRS). It has an affiliation with the Third World Academy of Science, and cooperates with various UN organisations including UNDP, UNESCO, FAO, UNIDO, UNU and IFS.

At the end of 1986 the Centre had 2700 cadres, 1400 researchers, 400 doctors (essentially equivalent to Ph.D.s) and 100 professors. The ratio of unskilled to skilled staff is high by international standards.

The NCSR of Viet Nam has very large responsibilities for the conduct of scientific research both basic and applied essentialy covering all areas of science except medicine and agriculture. Even in these two areas it is plain that the NCSR has significant activities and has a significant part to play.

The facilities are not nearly adequate for such huge responsibilities. Given the generally very difficult economic circumstances the buildings are well-maintained. But they are not well-serviced. Power supplies are frequently interrupted. There is very little equipment. Supplies of fine chemicals, enzymes and many other reagents are virtually non-existent. Journals and books are nearly unobtainable. Experiments must be conducted in the most limited way, demanding incredible ingenuity, tenacity, persistence and devotion by the staff. Any useful science conducted in these circumstances must be considered a truly noble achievement.

In contrast to the facilities, the Staff of the NCSR whom I met were of high quality. Mnay had studied abroad, usually in the COMECON countries. Among the biologists many had studied at Szeged in Hungary. A few had worked in Czechoslovakia, France or the Netherlands. It seemed there was an excellent group of laser physicists. This was the stuff of a tragedy - very good people whose skills could not be properly used in the circumstances.

BIOTECHNOLOGY AT THE NCSR

Biotechnology at the NCSR is supervised by the Board of Biology and is conducted in a number of units. The main centre of activities is the Institute of Biology. Other activities in the NCSR relevant to biotechnology are at the Centre of Ecology and Natural Resources, the Centre for Human and Animal Physiology and Biochemistry, the Centre for Experimental Biology, Ho Chi Minh City, the Botanical Museum, the Centre of Biological Research at Dalat, and the Marine Institute in Nha Trang

Plant biotechnology at the NCSR

There is an experienced group of Plant Biotechnologists at the NCSR. Several members of the group have studied abroad, especially at Szeged in Hungary, an institute which has a substantial international reputation in the field of plant sciences. The topics under investigation included:

Plant tissue culture of many species;

Generation and analysis of plant cybrids of Nicotiana and Salpiglossis;

Micropropogation of Agave;

Tissue culture of Panax pseudoginseng;

Micropropogation of the potato;

Production of giberellin - use in germination of rice;

Nitrogen fixation by Azolla;

Azospirillum as a source of biomass and nutritional supplements.

The quality of the work in plant tissue culture and micropropagation was quite impressive, and was clearly related to economic objectives. The scientists had been well-trained with significant experience in modern methods of tissue culture and plant molecular biology. Several have been publishing their work in international scientific journals, including one extremely interesting paper on cybrids carried out in collaboration with colleagues at Szeged which included a clear analysis of plant mitochondrial DNA using restriction enzymes

I found four of the projects which are being carried out in Hanoi to be quite promising, and I think it would be most valuable to have these assesed in more detail by experts in plant molecular biotechnology.

(1) Micropropogation of potatoes is a method of producing virus-free stocks - potato virus X (PVX) and other viruses are said to be serious causes of disease in Southeast Asia. There is collaboration with an agricultural research institute in the development of a production system using in vitro tuberisation

(i) Agave, from which sisal is made, is an important crop. It is said to be one of the most desirable crops which can be used to reclaim lands wasted in the war or destabilised by deforestation. It was reported to me that 15 million hectares, more than 1/6th of the country, needs to be replanted. 4000 agave are required per hectare. Yet this plant only seeds after 20-25 years. It does give off 5-6 stolons per year which can be used in vegetative reproduction, but this is a slow process. Fortunately, scientists at the NCSR have developed tissue culture methods of vegetative reproduction. At present they have plans to plant 100 ha. per year. If their procedure is scied up they should be able to meet the present requirements thus reclaiming the land and providing an important raw material for industry. It was noted that agave also has potential as a source of plant steroids for the pharmaceutical industry.

(ii). Panax pseudoginseng is known to contain pharmaceutically active compounds. Various extracts have a sedative effect, a stimulatory effect and can stem blood flow. The plant has been put into tissue culture at the NCSR, and most interestingly, extracts of the callus have been shown to produce the same effects. The process is being developed to pilot scale at Pharmaceutical Factory Number 1.

(iv). An outstanding scientific project had been carried out on the production of plant cybrids. (Cybrids are hybrids produced with the nuclear genome of one plant combined with the cytoplasmic genomes - mitochondrial and chloroplast - of another). Although it is doubtful if such cybrids will be very valuable if the two parents are derived from very different genera, the techniques may well turn out to be useful in hybridising closely related species which cannot be hybridised by conventional methods. At any rate this project was of the highest scientific calibre, and certainly was fulfilling the objective of introducing high quality basic science to Viet Nam.

Microbiological biotechnology.

Several researchers were working on applied projects in microbiology. The projects included:

Phage-resistance in a strain of Brevibacterium used in the production of monosodium glutamate;

Giberellin production by Fusarium;

Antibiotic production, streptomycin by S. griseus,

Antibiotic production, bacitracin production by Bacillus licheniformis,

Industrial enzyme production; alpha-amylase

Lactic acid bacteria for preservation of fish.

Microbial spoilage of petroleum in storage;

Dextran production by Leuconostoc mesenteroides.

Once again these projects, being carried out in extremely difficult circumstances and all at early stages of development, were impressive. A number of scientists had had excellent experience, one especially at the Institut Pasteur in Paris, and others in Czechoslovakia and the Soviet Union. Several had good knowledge of microbial and molecular genetics, including methods of genetic engineering. Some had published valuable papers in international journals. Unfortunately, because of the shortage of hard currency, and the poor communications, it was obviously impossible for these scientists to carry on their work at anything like the necessary level after they returned from their training abroad.

All of the projects listed above were relevant, promising and interesting. In every case there is good experience in laboratories abroad. However the Vietnamese scientists cannot make full use their knowledge of due to their isolation and lack of facilities. Microbial biotechnology cannot thrive in these circumstances.

It is absolutely plain that little of the work currently under way will have economic value unless the conditions of the scientists are radically changed.

BIOTECHNOLOGY OUTSIDE THE NCSR

There are valuable biotechnology research capabilities in the medical and agricultural sectors, and in the Universities and Polytechics. These include the Centre for Applied Microbiology at Hanoi University, the Centre for Biotechnology at the Hanoi Polytechnical College. Time did not permit an assessment of these, or of the parts of the NCSR which are apart from the main campus

NATIONAL SCIENTIFIC POLICY

It was a great honour to discuss the future of biotechnology in Viet Nam with the Foreign Minister, Nguyen Co Thach. He expressed a profound interest in biotechnology as a method which might speed up the social and economic development of the people of Viet Nam. He strongly approved of the idea of the International Centre for Genetic Engineering

and Biotechnology and undertook to consider how Viet Nam might play a greater role in the ICGEB. It was clear that the Government was constrained severely in its ability to fund the ICGEB but the Foreign Minister did emphasise that all the formal approvals, including ratification of the Statutes, would be completed as soon as possible. The Government of Viet Nam wishes to establish closer links with the international scientific community. It is plain that the United Nations organisations will provide a useful mechanism for broadening the number of opportunities for training and collaborative research.

Professor Dang Huu, President of the State Committee for Science and Technology, is responsible for developing and promulgating the Government policy on science and technology. He described how the State was strongly committed to biotechnology as a means of increasing agricultural production, providing better medical care and easing the pressure on the environment. He drew attention to the limitations on trained manpower and equipment. He believed that it was essential to select people for training in particular fields, and expressed a great interest in the facilities offered by UNIDO and the ICGEB. He noted the opportunities for training, for the provision of information, for consultations and for joint projects. In particular he emphasised that Viet Nam would welcome a UNIDO expert team which would review the main activities in Vietnamese biotechnology and consider prospects for the future. He commented on the possibility of a national centre for biotechnology. The location of this centre could not yet be decided but it should at any rate be affiliated with the ICGEB. He acknowledged the research being done at the NCSR and referred to other work being carried out at the University of Hanoi and the Hanoi Polytechnical Institute.

It was a special privilege to have the chance discuss biotechnology with General Vo Nguyen Giap, Vice-Chairman of the Council of Ministers. As with other members of the Government and the Party, General Giap was most interested in the potential of biotechnology. The question of how Viet Nam should support biotechnology was a difficult one. It was plain that projects should be chosen on the basis of their impact on health and agriculture.

All authorities in Viet Nam are agreed on the desirability of more scientific research. However there is no way in which it can take priority over providing the immediate necessities of food and medical care, and industrial and agricultural development using wellknown technologies. If science is to be fostered it will need to have considerable foreign and international support

CENTRE FOR TROPICAL BIOTECHNOLOGY

A proposal to establish a Centre for Tropical Biotechnology had been prepared by members of the National Centre for Scientific Research. This was discussed in some detail with Professor Le Xuan Tu. A document which described the objectives and establishment of the centre was presented and developed further. A draft of this document is attached (Appendix II). Professor Tu was enabled to attend the meeting of the scientific experts at the ICGEB in March and discussed the document with Professor Gunsalus.

Though it needs to be developed further the proposal has considerable merit. If properly designed and adequately financed through international cooperation the Centre for Tropical Biotechnology could revitalise biological science in Viet Nam and make a substantial contribution to economic and social development in the tropical countries of Southeast Asia.

Biological science in Viet Nam is under-resourced. What resources exist are dispersed between too many projects. Many of the projects are not truly novel but instead represent valiant attempts to reproduce, under very difficult conditions in Viet Nam, projects which have been completed, sometimes decades ago, in other countries. Many projects suffer from the fact that they are being carried on by very small teams which do not have the experience to take the projects to completion. It is one thing to isolate a new strain of bacteria producing an antibiotic, but it is quite another to develop a process for manufacturing, preparing and packaging this antibiotic on a large scale.

The objectives of the Centre for Tropical Biotechnology are essentially "to develop and apply modern biotechnological methods suitable for the tropical conditions of Viet Nam; to use these methods and results obtained by their application in the provision of economically and socially valuable materials and services; to provide training for other scientists to facilitate wider application of biotechnology; to conduct joint research projects with other countries which face similar problems; to support and cooperate with the ICGEB in order to achieve these ends".

The Centre would conduct a National Biotechnology Programme which would be directed at solving major problems in health, agriculture and industry. It would be a resource centre for all biologists in Viet Nam, cooperating with medical and agricultural researchers in other institutions, providing for example a good library, specialist equipment such as a DNA synthesiser, protein synthesiser, amino acid analyser,

electron microscope, high speed centrifuges, and specialist advice on the main methods of modern biotechnology

The Centre would collaborate with the ICGEB and would seek recognition as an Affiliated Centre. It would seek to collaborate with similar institutions in Southeast Asia and other tropical countries.

Equipping and sustaining the Centre for Tropical Biotechnology. The Government of Viet Nam faces grave problems in raising hard currency. It seems unlikely that it can obtain the kind of sums required for the establishment of the Centre without special support from abroad. A quick calculation shows that nearly $3 million are required to equip the Centre and pay for hard currency current expenses for 5 years. This would support a modest research programme, but it would be sufficient to undertake two or three projects with a reasonable chance of success, and could provide some very significant impetus to social and economic development if well chosen.

The National Biotechnology Programme. The document (Appendix II) outlines some of the areas in which biotechnology research might be conducted. This reflects to a large extent the experience of the scientists who already are working in Viet Nam. It does not fully take into account the needs of the country or the recent achievements in international biotechnology. It is moreover ambitious in the number of projects which are mentioned. The Vietnamese scientists and the Government authorities have indicated that they would welcome a larger expert mission from UNIDO which would have the task of looking more carefully at the possibilities for biotechnology research in Viet Nam.

Joint Research Programmes. The number of experienced biotechnologists in Viet Nam is small and is likely to remain that way for some time to come. Moreover the Government does not have the resources to fund all potentially interesting research programmes. Partly for these reasons, and partly because international cooperation is wellknown to enhance the conduct and effect of scientific research, every effort should be made to set up collaborations with institutions in other countries, and especially with international institutions such as the ICGEB.

Training programmes As mentioned above there are not sufficient trained biotechnologists in Viet Nam The National Programme should include schemes to support new courses in the universities and polytechnics, and new postgraduate research programmes. Gifted scholars should be nominated for study abroad financed through the resources of the United Nations University, UNESCO, FAO, WHO and UNIDO, and through bilateral agreements

CONCLUSIONS.

The Viet Nam Government has a keen interest in Biotechnology. It is now seeking ways of developing research and training programmes in Viet Nam. It has recognised the value of international cooperation and especially it has supported the foundation of the ICGEB as a means of transferring knowledge in biotechnology to developing countries. It has signed the Statutes and the authorities have said that Viet Nam intends to complete the formality and ratify them as soon as possible.

There is a small group of experienced scientists at the National Centre for Scientific Research who have participated in some excellent research in different areas of biotechnology. It has been very difficult for them to keep up with the rapidly changing field of biotechnology and they have great difficulties in continuing their own research, some of which is very promising. They have been suggesting ways by which they could contribute more to the economic and social development of their country. They have drafted a proposal to establish a Centre for Tropical Biotechnology. It is a modest proposal even by comparison with those from other developing countries, but if carefully designed and well organised it could be successful both as a centre of science and as an agent of social progress.

RECOMMENDATIONS.

1. A UNIDO Expert Mission of seven biotechnologists should investigate how biotechnology might contribute to social and economic development in Viet Nam. The team should include experts in:

Tropical plant breeding;
Plant biotechnology especially of secondary metabolites;
Plant diseases;
Infectious diseases;
Vaccines;
Diagnostics;
Microbial biotechnology.

2. A Special Training Programme should be established to provide support for Vietnamese scientists to study abroad. As an extremely poor country with a crippling foreign debt and few allies, Viet Nam should receive the most favourable treatment possible under the rules of the appropriate international organisations. If this does not happen, science in Viet Nam will languish.

3. Funding the Centre for Tropical Biotechnology. Efforts should be made to arrange for hard currency funding of the Centre for Tropical Biotechnology through the support of friendly countries.

4. Joint Research Programmes should be established between the National Centre for Scientific Research of Viet Nam and other national and international centres for biotechnology research. It would be especially appropriate to develop closer links with the ICGEB, the International Rice Research Institute at Los Banos, the International Laboratory for Research on Animal Diseases in Nairobi and the national centres in Havana and Belgrade. It would be wise to develop much closer links with Japanese laboratories and to rebuild links with the Institut Pasteur in Paris.

APPENDIX 1.

Meetings in Vietnam.

Friday 17 March 1988.

Departure from Dublin arriving in Hanoi on the afternoon of the 18 March 1988.

Friday 18 March 1988.

Meeting and discussion at dinner:

Professor Nguyen Van Hieu,
President,
National Centre for Scientific Research of Viet Nam.

Nguyen Trung,
Director of Department for Economic Cooperation,
Ministry of Foreign Affairs.

Professor Le Xuan Tu,
Director of Institute of Biology,
National Centre for Scientific Research of Viet Nam.

Saturday 19 March 1988.

(a). First visit to the National Centre for Scientific Research (NCSR).

Meeting with Professor Dang Ngoc Thanh, Head of the Board of Biology at NCSR, Vice President of the NCSR.

Seminar:

"Applications of Genetic Engineering in Health, Agriculture and Industry"

(b). Discussions with members of staff at NCSR

Dr. Le Xuan Tu, Director of the Institute of Biology

Nguyen Quang Vinh, Ph.D. (Shemiakin Institute, Moscow)
(Phage-resistance in Brevibacteria used in MSG production)

Tran Xuan Hoat, Vice Director of the Institute of Physics.
(Applications of lasers in medicine)

Hoang Tinh, (formerly of Biological Research Centre, Szeged, Hungary; nitrogen fixation by Azolla, Azospirillum as a source of biomass and nutritional supplements).

Sunday 20 March 1988.

(a). Visited the Ho Chi Minh Mausoleum and the War Museum.

(b). Discussions with Dr. Le Xuan Tu and Tran Nguyen Minh (Member of the International Cooperation Department of the NCSR) on draft of a "Proposal for the Development of Tropical Biotechnology in Viet Nam in Association with UNIDO and the ICGEB".

Monday 21 March 1988.

(a). Second visit to the NCSR.

Discussions with:

Dr. Le Xuan Tu, Director of the Institute of Biology.
(Plant tissue culture of Agave).

Dr. Le Thi Muoi, Deputy Director of Institute of Biology
(Plant tissue culture of potatoes).

Dr. Nguyen Duc Thanh, (formerly of Biological Research Centre, Szeged, Hungary; plant tissue culture of cybrids of Nicotiana and Salpiglossis).

Dr. Le Thi Xuan,
(formerly of Biological Research Centre, Szeged, Hungary; plant tissue culture of Panax pseudoginseng; production of pharmaceutical compounds form callus culture).

Tran Thanh Thu,
(trained in USSR, plant tissue culture of the potato)

Ly Kim Bang, Head of Department of Microbial Technology
(production and effects of giberellin on germination of rice and other crops)

Le Thanh Binh, Department of Microbial Technology, Institute of Biology.

Dr. Tran Van Sy, (microbial geneticist who has worked at the Institut Pasteur, Paris; production of antibiotics).

Dr. Hoang Viet, (microbial geneticist who has worked in Institute of Microbiology, Czechoslovakia; production of antibiotics).

(b). **Meeting with the Foreign Minister and Member of the Political Bureau of the Communist Party of Viet Nam, Nguyen Co Thach.**

Discussion of biotechnology in Viet Nam, and the role of the ICGEB and UNIDO in facilitating research and training and the application of biotechnology in developing countries. Discussions about the draft proposals for tropical biotechnology in Viet Nam.

(c). **Meeting with the President of the State Committee for Science and Technology, Professor Dang Huu.**

Discussion of biotechnology in Viet Nam, and the role of the ICGEB and UNIDO in facilitating research and training and the application of biotechnology in developing countries. Discussions about the draft proposals for tropical biotechnology in Viet Nam.

Tuesday 22 March 1988.

(a). **Third visit to the NCSR.**

Discussions with:

Dr. Le Xuan Tu and members of the Plant Tissue Culture Laboratory.

Dr. Nguyen Quang Vinh and Dr. Phan Van Doan on production of dextran by Leuconostoc mesenteroides; uses of dextran in medicine and ferridextran as a growth promoter in pigs).

(b) Discussions at lunch with Dr. Le Xuan Tu, Nguyen Trung, Dr. Le Thi Muoi and Tran Nguyen Minh.

(c) Discussions with Lars S. Adermalm, Programme Officer, UNDP.

(d) Meeting with General Vo Nguyen Giap, Vice-Chairman of the Council of Ministers, Member of the Central Committee of the Communist Party of Viet Nam. Discussions on the ~~DC~~ possible

applications of biotechnology in Viet Nam, research and training in biotechnology, and relations with UNIDO and the ICGEB.

Wednesday 23 March 1988.

Final discussions with Dr. Le Xuan Tu.

Departure from Viet Nam.

APPENDIX II.

Proposal for the Development of Tropical Biotechnology with UNIDO and the ICGEB. Hanoi, 1988.

Document prepared by Professor Le Xuan Tu, National Centre for Scientific Research, Hanoi.

Part I

The legal grounds.

According to the paragraphs 1,2,3 and 4 of Article 9 of the Statutes of the International Center for Genetic Engineering and Biotechnology (ICGEB), Madrid, Spain, September 7-13 1983:

After intensive discussion between Prof. Dr. Nguyen Van Hieu, President of National Centre for Scientific Research of Vietnam, Prof. Dr. Le Xuan Tu, Director of the Institute of Biology and Prof. David McConnell UNIDO Consultant, who has visited Vietnam from 17-23 March 1988:

Part II

I. Background.

Recognising the importance of biotechnology and genetic engineering in the solution of problems in health, agriculture and industry, the Government of Vietnam has taken several important actions to ensure that these new technologies are quickly introduced with the main objective of solving problems which are specific to tropical countries such as Vietnam.

In particular it has strongly supported the establishment of the ICGEB and now wishes to develop stronger relationships with the ICGEB both to contribute to the work of the ICGEB and to benefit from the research and training programmes of the ICGEB and its Affiliated Centres and networks.

The Government of Vietnam has nominated the National Centre of Scientific Research to coordinate a National Biotechnology Programme This programme will include the establishment of a Centre for Tropical Biotechnology (which it is intended will become an Affiliated Centre of the ICGEB) and a National Plan for Research and Training in Biotechnology (to be drawn up in association with UNIDO)

The Centre for Tropical Biotechnology will be established in the Institute of Biology at the NCSR. This Institute is the main centre for biotechnology research with a staff of scientists most of whom have been trained abroad. Some have had direct experience of modern methods of genetic engineering and biotechnology. Already this Institute has research programmes on certain aspects of plant cell and tissue cultures, nitrogen fixation and microbial production of amino acids and single-cell protein. There is considerable interest in applying genetic engineering to some of these projects. It will be necessary to coordinate biotechnological research activities at the NCSR with the research on Health and Agriculture which is being carried out elsewhere and which could benefit from the application of the new methods of biotechnology.

Preliminary results from various laboratories are being applied already in agriculture and health. Because modern equipment is not available, the lack of chemicals and enzymes and limitation on scientific interactions with international institutions, only a few laboratory processes can be applied in practice.

Vietnam belongs to the group of tropical and subtropical countries. Therefore its efforts to establish biotechnological processes are concentrated on specific tropical and subtropical problems.

In addition to the scientific staff of the Institute of Biology, there are now in Vietnam other important institutions of biological research, including the Centre for Experimental Biology in Ho Chi Minh City, the Centre for Human and Animal Physiology and Biochemistry in Hanoi, the Centre for Ecology and Biological Resources in Hanoi, the Centre for Biotechnology at the Polytechnical College and the Centre for Applied Microbiology at Hanoi University. All of the scientists of these institutions are cooperating to overcome the common difficulties in their research activities.

The establishment of an Affiliated Centre which will be specialising in tropical biotechnology in Hanoi will be extremely important in supporting the development and application of biotechnological processes in Vietnam.

II. Objectives

In relation to biotechnology the Government of Vietnam has the following objectives.

1. To develop and apply modern biotechnological methods suitable for the tropical conditions of Vietnam

2. To use these methods and results obtained by their application in the provision of economically and socially valuable materials and services.

3. To provide support for the qualified and skilled scientific staff.

4. To provide training for other scientists to facilitate the wider application of biotechnology.

5. To conduct joint research projects with other countries which face similar problems.

6. To support and cooperate with the ICGEB in order to achieve these ends.

III. Preparation of the National Biotechnology Programme.

The Government of Vietnam believes that it will be necessary to design a National Biotechnology Programme. This should take notice of the needs of th country in health, agriculture and industry, and of the skills and experience of the scientists who can help to meet these needs. Three directions can be recognised at the present time in:

Genetic engineering,
Plant cell engineering and tissue culture of tropical plants,
Microbial fermentation under tropical conditions.

Some projects have already been identified following the advice of the President of the NCSR and the Director of the Institute of Biology Dr. Le Xuan Tu. These include:

3.1 Bioconversion of biomass - improvement of nutritional value of by-products of Agriculture, Forestry, Fishery by microorganisms.

3.2 Biological nitrogen fixation - isolation and improvement of nitrogen fixing microoorganisms (Blue green algae, Azospirillum, Azola)

3.3 Breeding for stress tolerance - use of plant breeding, protoplast fusion and genetic engineering to select or to breed crop plants which are tolerant to environmental stresses

3.4 In vitro plant propagation of economically important crops such as agave, coffee, rubber and citrus species.

3.5 Establishment of in vitro banks of germplasms of crops, animals and microorganisms originating from foreign countries and especially from Vietnam.

3.6 Genetic engineering of higher plants and bacteria - transformation of valuable genes into local bacteria or crops plants (genes for proteins with high content of essential amino acid into potato, nif-genes into bacteria living in the rice rhizosphere etc.

IV. Establishment of the Centre of Tropical Biotechnology.

The Government of Vietnam has already taken steps to establish the Centre for Tropical Biotechnology. It will have 3 departments:

Department of Plant Cell Biotechnology: Investigation of stress tolerance, selection and breeding, germplasm storage, in vitro propagation.

Department of Microbiological Technology: Investigation on the bioconversion of biomass, microbial nitrogen fixation.

Department of Genetic Engineering: Transformation of bacteria and higher plants.

V. Buildings and finance for the Centre of Tropical Biotechnology.

5.1 The Government of Vietnam has decided to provide a new building of 1000 m^2 to bring together the groups described above.

5.2 The Government of Vietnam will continue to provide the costs of salaries, local materials, transport and maintenance.

5.3 The Government of Vietnam will provide extra support for conference and training courses at the Centre.

5.4 The contributions by the Government of Vietnam are shown in Table 1.

5.5 The Centre seeks financial support from the ICGEB to cover other costs including special equipment, books, journals and materials. These costs are shown in Table 2.

VI. Affiliation to the ICGEB for a 5 year programme.

The Government of Vietnam intends to apply for nomination of the Centre for Tropical Biotechnology as an Affiliated Centre of the ICGEB.

VII. Summary of requests for support from UNIDO and the ICGEB

The Government of Vietnam requests:

1. Support for equipping and running the National Centre for Tropical Biotechnology.

2. Support for training Vietnamese scientists at the ICGEB and in other laboratories.

3. Support for Joint Research Programmes.

4. Consultation with a team of experts from UNIDO on the Vietnamese National Biotechnology Programme.

TABLE I. FINANCING BY VIET NAM GOVERNMENT.

		(in million dong)
1.	Laboratories 1000 sq. m.	100
2.	Supply of local materials	30 x 5
3.	Salaries	10 x 5
4.	Transport, equipment, maintenance	5 x 5
5.	Costs of exports, conference and courses	5 x 5
	TOTAL	350 million dong

TABLE II PROPOSED BUDGET FROM ICGEB

(in 1000 US $)

1.	Laboratory equipment: basic equipment	75
	Refrigeration, air conditioners	50
	Chemicals, glassware	100 x 5
	Media	25
	Electron microscrope, separation and purification equipment	150
	Scintillation counters, spectrophotometers, high speed centrifuges, electrophoresis	500
	Other equipment: balances, deep freezers, Ph-meter, shakers, fraction collectors, vacuum pumps	650
	Amino acid analyser, protein sequencer, DNA synthesiser	150
2.	Information equipment: Computer, library photocopier	100
3.	General Service. Transport cars, office machineries, conference equipment	500
	TOTAL	US $ 2,700,000