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**TECHNOLOGY TRANSFER
AND DEVELOPMENT ISSUES
FOR DEVELOPING COUNTRIES ARISING FROM
THE URUGUAY ROUND AGREEMENTS**

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INTRODUCTION

The purpose of this study is to analyze the technology transfer and development issues for developing countries arising from the agreements concluded under the Uruguay Round of Multilateral Trade Negotiations of the General Agreement on Tariffs and Trade (hereinafter referred to as the Uruguay Round).

2. The Uruguay Round, which was launched in September, 1986 and concluded in April, 1994, marks the beginning of a new phase in international relationships in the economic, trade, investment and scientific fields. The range and complexity of the agenda and issues covered by the Uruguay Round have been unlike those addressed by any of the previous seven rounds of trade negotiations conducted under the auspices of GATT since it was established in January, 1948. Traditionally GATT was regarded as a forum for reduction of tariff and non-tariff barriers to international trade in the goods sector, and the jurisdiction of GATT was therefore assumed to be confined to 'border measures' relating to merchandise trade. The Uruguay Round makes a clean break with this traditional GATT paradigm by extending the jurisdiction of GATT to the areas of investment, intellectual property rights and services. Furthermore, the future agenda of GATT (henceforth WTO) will encompass the area of 'trade and environment' and even non-trade issues. Within the goods sector, the Uruguay Round brings within its ambit 'agriculture' and 'textiles and clothing' that had remained out of GATT disciplines and rules for decades for political reasons. The Uruguay Round has woven into a single fabric 28 major agreements and understandings - 25 in the goods sector including the agreement on Trade Related Investment Measures (TRIMS); the 26th is the agreement on Trade Related Intellectual Property Rights (TRIPS); the 27th is the General Agreement on Trade in Services (GATS); and the 28th is the agreement establishing the World Trade Organisation (WTO), which agreement strings together all the agreements and understandings as an indivisible package. These two underlying factors, namely, the enlargement of the jurisdiction of GATT to the five areas of agriculture, textiles and clothing, investment, intellectual property rights and services, and the integration of trade in goods, trade in services, protection and enforcement of intellectual property rights, and treatment of foreign investment into a single indivisible package providing for the possibility of 'cross retaliation' across sectors, are at the root of the complexity, controversies and concerns surrounding the Uruguay Round. The jurisdiction of WTO will no longer stop at national boundaries or import and export measures, but will impinge on domestic policies, laws, regulations and institutional mechanisms of member countries in areas as diverse as trade, investment, technology, services and environment.

3. The Uruguay Round agreements will have a profound impact on the acquisition of foreign technology and development of indigenous technological capabilities by developing countries. On a wider plane, the fundamental objective of the Uruguay Round being the liberalised access to markets around the world for goods, services, investment and technology, the competition in the international market place including the domestic markets of developing countries will intensify and such competition will increasingly be driven by technological superiority. For example, without modernisation and technological upgradation, developing countries may not be able to reap the full benefits of the opportunities created for them in the areas of textiles and clothing, computer software or even agriculture. In the ultimate analysis, the challenge posed by the Uruguay Round to any developing country is the challenge to its ability and willingness to compete in world markets (including defending its own domestic market from foreign competition). The importance of technology as a fundamental factor for developing and sustaining competitive capabilities can hardly be over-emphasized.

4. More specifically, certain agreements of the Uruguay Round such as TRIPS, TRIMS, Agreement on Technical Barriers to Trade, Agreement on the Application of Sanitary and Phyto-sanitary Measures and GATS, as well as the emerging linkage between trade and environment will impinge directly and indirectly on the technology policies, laws, regulations and institutional framework of developing

countries. The availability and cost of foreign technology and the terms and conditions on which it is available, as well as the development of domestic technological capabilities, will be markedly influenced by the agreements of the Uruguay Round. Developing countries would need to cope with two major trends gathering momentum not only from the Uruguay Round agreements but also from other international, regional or bilateral pressures. These are: the protection and enforcement of intellectual property rights including such rights in newer areas, and the observance of environmentally safe technologies and standards.

5. Against this background, the study seeks to analyze the following areas: an overview of the scope, objectives and features of the Uruguay Round; core provisions of selected agreements of the Uruguay Round, namely, TRIPS, TRIMS, Agreement on Technical Barriers to Trade, Agreement on the Application of Sanitary and Phyto-sanitary measures, and GATS; and implications of these agreements for technology acquisition and development policies of developing countries. In the light of such analysis, the study attempts to suggest policy options for developing countries to gain from and cope with the opportunities and challenges posed by the Uruguay Round agreements. As is to be expected, the TRIPS agreement has received predominant attention and coverage in the study as it is the most critical and controversial of the Uruguay Round agreements bearing on the technology acquisition and development policies of developing countries.

I. OVERVIEW OF URUGUAY ROUND NEGOTIATIONS

6. There are three fundamental features that distinguish the Uruguay Round from the previous rounds of trade negotiations conducted under GATT. First is the enlargement of the trade agenda beyond merchandise trade. The General Agreement was originally conceived as a multilateral instrument to liberalise world trade in goods and place it on a secure basis. The focus of attention till the Uruguay Round was therefore the elimination of tariff and non-tariff barriers to international merchandise trade. The Uruguay Round has altered this situation radically. Besides bringing in 'agriculture' and 'textiles and clothing' within the ambit of GATT rules and disciplines, the Round has extended the scope and jurisdiction of GATT to three new areas, namely, investment, intellectual property rights and services. In fact, the extension of GATT's jurisdiction to the new areas, in which the developed, but not the developing countries, were interested would not have been possible without bringing agriculture and textiles and clothing (in which many developing countries were interested) within the GATT fold. It must be noted that the Uruguay Round has only signalled the beginning of the process of extending the trade agenda. Environment and labour standards have already been listed as new issues to be addressed by the WTO and the process of linking international trade to "new -new" issues, whether trade or non-trade related, is likely to intensify in the coming years. Developing countries have cause for concern that such new issues may become the new forms of non-tariff barriers to their exports.

7. Secondly, the Uruguay Round ushers in a multilateral trading regime whereunder the norms and standards, rules and disciplines, obligations and commitments are more or less the same for all member countries regardless of the stage of their economic development. The TRIPS agreement is a classical example of this approach. The concessions or relaxations allowed for developing countries in most of the agreements of the Uruguay Round are essentially time related, meaning thereby that while they may have a longer transition period for adjustment, they will have to abide by the same rules and disciplines applicable to the developed countries at the end of the prescribed transition period. Substantive and special concessions in favour of developing countries are either non-existent or of a limited magnitude in most of the Uruguay Round agreements. The future is likely to witness a further intensification of this process of all countries being required to abide by uniform rules, disciplines, commitments and concessions.

8. Thirdly, the Uruguay Round virtually signifies the end of the era of non-reciprocity in international economic and trade relations. In a way, this is also reflected in the aforementioned feature of all countries being obliged to follow common rules and disciplines regardless of their level of economic development. The central philosophy of the Uruguay Round would appear to be that market access must be given if market access is to be gained. Notwithstanding the exhortation in the Uruguay Round mandate that developing countries should not be required to undertake reciprocal concessions or commitments inconsistent with their trade, finance and development needs, the reality of the Round is that reciprocity on near equal, if not equal, terms has become a pre-condition for developing countries gaining access to the markets of the industrialised world. The so-called "free riding" on the trading system by developing countries has been curbed and the traditional concept of "special and differential treatment" for developing countries has been substantially eroded by the Uruguay Round.

9. The driving force behind these developments - extension of the trade agenda to new areas, enforcement of uniform rules and disciplines, insistence on reciprocity in concessions and commitments, integration of trade, investment, technology and services into a single package, and threat of trade retaliation as a tool for enforcement of obligations in other areas - is the objective of industrialised countries that the markets of developing countries, especially those that have achieved rapid economic growth or those that have large and expanding markets, should be prised open for their goods, services, technology and investment. The "graduation" of developing countries, such as the newly industrialised countries, to higher levels of obligations and commitments and the opening up of the markets of other developing countries that had hitherto remained closed were major aims of the industrialised countries under the Uruguay Round. Such opening up of markets was sought to be achieved not only for merchandise trade, but also for technology (in which protection of intellectual property occupied a central place), investment and services.

10. The outcome of these developments is that the multilateral trading system emerging from the Uruguay Round creates both opportunities and challenges for developing countries, the range and complexity of which will require strategic and sophisticated responses from them. The opportunities for developing countries lie in the strengthened multilateral trading system arising from the Uruguay Round and the enhanced market access they could have in areas such as agriculture, textiles and clothing, tropical and mineral products, industrial products in which they have assimilated technologies and acquired competitiveness (ranging from consumer durables to chemicals and engineering products), and services involving skilled professionals such as computer software. However, their capacity to take advantage of the market access opportunities arising from the Uruguay Round will depend crucially on the strategies and measures they adopt to meet the competition that will intensify in the international market place. In essence, the basic challenge posed by the Uruguay Round for developing countries is not so much a challenge to their sovereignty or economic space as it is to their capacity and determination to cope with the competition they will increasingly face in their domestic and external markets. It is facile to assume that such competition will only be between developing and developed countries as if they are two homogenous and adverse blocks. In vast areas, the competition will be amongst developing countries themselves either in their domestic markets or in the markets of industrialised countries. However, now that tariffs in the industrialised world have come down to very low levels (except in some areas where the problems of "tariff peaks" and "tariff escalation" may continue to persist), developing countries may increasingly face newer forms of non-tariff barriers to their exports to industrialised countries, especially those related to human health and safety, environment and "social clauses" (eg. labour standards, child labour, civil liberties).

11. Investment in infrastructure, technology and human resources holds the key for developing countries meeting the challenges posed by the Uruguay Round. Insulation of the domestic

market from competition, protection of inefficient domestic industry or subsidization of inefficient production or exports may at best provide temporary palliatives but not a durable solution to meeting the demands and competition emerging in the international trading system. To the extent the Uruguay Round package of agreements shifts the focus of attention of developing countries away from protection, subsidization and special and differential treatment approach towards the building up of their efficiency and competitiveness in the international market place, the outcome of the Uruguay Round may even prove to be a blessing in disguise - at least for those countries which do not wish to miss the opportunities for the challenges posed by the Round. The technology factor will play a decisive role in building up the requisite efficiency and competitiveness both in the agricultural and non-agricultural sectors. For instance, the anticipated gains in the export of agricultural products or textiles and clothing in the wake of the Uruguay Round agreements will materialise only if the necessary technological inputs are consciously injected into these sectors including the increasing requirements of health, safety, sanitary and environmental standards of the industrialised countries. Modernisation and upgradation of technology, quality and design improvement, raw material and energy conservation, and adherence to process and production methods conforming to prescribed environmental criteria will all need concerted and conscious attention to selection, acquisition, development and deployment of technologies. The building up of domestic technological capabilities and encouragement, absorption and adaptation of foreign technologies have become more crucial than even before for developing countries staying competitive in the rigorous market place of the post-Uruguay Round world. The manner in which the availability, transfer and diffusion, cost and conditions of technologies will be influenced or affected by the various Uruguay Round agreements is therefore a matter of considerable importance to developing countries.

II CORE PROVISIONS OF SELECTED URUGUAY ROUND AGREEMENTS

AGREEMENT ON TRADE RELATED ASPECTS OF INTELLECTUAL PROPERTY RIGHTS (TRIPS)

12. Before the core provisions and implications of the TRIPS agreement are analyzed, it may be useful to enumerate briefly the main motives behind the objective of industrialised countries to bring the issue of intellectual property rights (IPRs) on the trade agenda and to lay down stringent norms and standards for the protection and enforcement of IPRs. First, technology, especially newer technologies, is fast becoming the driving force behind international competitiveness, and technology by itself is increasingly becoming an invaluable commercial and tradeable asset. Protection and enforcement of one's IPRs is becoming a synonym for protection and dominance of one's market in the world. Secondly, while the industrialised countries are losing, or have virtually lost, their competitive strength in traditional manufactured goods to developing countries, their comparative advantage is rising rapidly in the area of knowledge based industries, in the area of "intellectual goods" so to say.

13. Thirdly, there is a virtual explosion in information, communication, new materials and biotechnologies - generally speaking, in the frontier areas of technology - where the industrialised countries are enjoying a huge lead over developing countries. Past experience has shown that unless this lead is protected through exclusive IPR ownership, the developing countries could quickly acquire them and erode their comparative advantage. Fourthly, the cost of R&D to develop and commercialize new products and processes is rising sharply, especially due to growing and rigorous standards pertaining to health, safety and environment. For instance, the Pharmaceutical Manufacturers Association of America claims, quoting a February, 1993 report of the US Congressional Office of Technology Assessment, that

it costs on an average \$359 million to get one new medicine from the laboratory to the pharmacist's shelf.¹

Fifthly, large transnational corporations (TNCs) are now the generators, and if not the generators, the actual users of R&D intensive technologies. Even where technologies are generated by individual inventors, small firms or universities and government owned research institutions, the TNCs tend to acquire ownership of or rights in those technologies with a view to commercially exploit them around the world. Such exploitation rests upon the protection of their ownership or licence rights around the world. Lastly, the TNCs in industrialised countries, especially the USA, were clamouring that in the absence of adequate and effective protection of their patents, copyright and trademarks, they were losing heavily to piracy in areas such as pharmaceuticals, chemicals (especially agro chemicals), computer software, motion pictures and music.

14. When the agenda for the new round of trade negotiations was being discussed in the early 1980s, industrialised countries, led by the USA, were therefore keen that intellectual property rights, as well as investment and services, should be brought within the ambit of GATT commitments and disciplines. On their part, developing countries were averse to the extension of the jurisdiction of GATT to new areas in which they were at a considerable competitive disadvantage vis-a-vis the developed world. This was particularly true for IPRs because of the technological gap between industrialised and developing countries. They therefore argued that the trade agenda could at best be extended to cross border trade in counterfeit goods and that the issue of substantive norms and standards for the protection and enforcement of IPRs should be left to the jurisdiction of specialized agencies like the World Intellectual Property Organisation (WIPO) which administers the international conventions on the subject. The industrialised countries were, however, insistent upon the extension of GATT's jurisdiction to IPRs because they could then use the lever of trade, i.e. market access opportunities provided by them, and the weapon of trade retaliation to lay down standards and effectively enforce them. They regarded WIPO as an ineffective mechanism in as much as the conventions administered by it, particularly the Paris Convention for the Protection of Industrial Property, left considerable latitude to member countries on norms for the protection of IPRs, and furthermore, there is no effective dispute settlement or enforcement mechanism under them to discipline errant behaviour. Apart from their not being 'demandeurs' in the new areas, but only 'defenders' against inroads being made into their domestic policy regimes, it was precisely this apprehension of 'cross retaliation' by industrialised countries in the goods trade for alleged deficiencies in their IPR regime that was at the root of the reluctance of developing countries to bring IPRs on the GATT agenda. After protracted negotiations, the Punta del Este mandate of September, 1986 launching the Uruguay Round included all the five subjects: agriculture, textiles and clothing (where many developing countries were the principal demandeurs); investment, intellectual property rights and services (the new areas where the industrialised countries were almost the sole demandeurs). A package approach was adopted for the negotiations so that concessions or commitments given in any one area could be leveraged to obtain concessions or benefits in another area. Even then, the divergence of interests was such that it was only in April, 1989, that the mandate was interpreted to include substantive norms and standards concerning the availability, scope and use of intellectual property rights.

15. Turning now to the core provisions of the TRIPS agreement, it covers seven categories of intellectual property rights, namely, copyright, including neighbouring rights, trade marks, geographical indications, industrial designs, patents, lay-out designs of integrated circuits and trade secrets. If the patenting of micro-organisms (i.e. biotechnological inventions) and protection of new varieties of plants (for example, through Plant Breeder's Rights) which are included in the TRIPS agreement under patents are regarded as special categories in themselves, it could be said that the TRIPS agreement encompasses nine major categories of intellectual property. It is worth noting that the agreement

¹ "New Drug Approvals in 1993", Pharmaceutical Manufacturers Association of America, January, 1994.

specifically confers the legal status of intellectual property on trade secrets, although the commercial value of a trade secret rests upon its secrecy and its protection involves action against breach of confidence, breach of contract or other improper means (eg. industrial espionage, theft, bribery) adopted to disclose or acquire a trade secret.²

16. The TRIPS agreement prescribes certain general obligations applicable to all intellectual property rights. With respect to nationals of other member countries, the agreement requires that (i) they shall be accorded treatment provided for in the agreement; that is to say, foreigners shall be entitled to enjoy, at the minimum, intellectual property rights in accordance with the provisions of the agreement; (ii) they shall be accorded treatment no less favourable than that accorded to nationals (i.e. national treatment); and (iii) they shall be accorded treatment no less favourable than that accorded to nationals of any other foreign country (i.e. Most Favoured Nation treatment). On the question of exhaustion of intellectual property rights, the agreement does not pronounce one way or other on national or international exhaustion of the rights and leaves the issue to be decided by member countries in their discretion.

17. The central thrust of the TRIPS agreement is on substantive norms and standards for the protection of the IPRs addressed by the agreement. In this respect, the agreement has adopted a "Paris Convention/Berne Convention/ Washington Treaty plus " approach in the sense that the substantive standards of these Conventions/Treaty should be complied with, and in addition, the norms and standards prescribed in the TRIPS agreement should also be adhered to.³ By this approach, the flexibility and discretion allowed in these Conventions, especially the Paris Convention, in the matter of protection of IPRs has been eliminated; the subject matter of protection under various types of IPRs has been widened; and higher levels of protection of IPRs has been ensured. By and large, the TRIPS agreement lays down standards of protection of IPRs now obtaining or acceptable in the IPR regimes of the industrialised world. It is only in areas where the United States and European Community did not have a unified position that the agreement has either left the issue unaddressed or given flexibility to member countries to address it.

18. Taken as a whole, the TRIPS agreement reflects the quest of industrialised countries for extra-territorial protection of their IPRs, especially in developing countries, at a level prevailing in their own countries. More than any other agreement of the Uruguay Round, the TRIPS agreement demonstrates the negotiating objective of industrialised countries that the rules and disciplines, norms and standards must be common for all countries, and developing countries could at best be given longer transition period to fall in line with them. The TRIPS agreement does not provide any substantive concession or relaxation to developing countries as regards the norms and standards for the protection and enforcement of IPRs. However, developing countries have been allowed a transition period of five years (as compared to one year for developed countries) for implementation of the agreement, while least developed countries (LDCs) have been granted a transition period of eleven years. Moreover, Article 66.1 of the agreement and the Marrakesh Ministerial decision in favour of LDCs make it evident that the request of LDCs for

² The TRIPS agreement does not use the expression "trade secrets". It is dealt with under the title "Protection of undisclosed information" and as a part of the wider concept of protection against unfair competition.

³ Paris Convention refers to Paris Convention for the Protection of Industrial Property according to the Stockholm Act of 14 July 1967. Berne Convention refers to the Berne Convention for the Protection of Literary and Artistic Works according to the Paris Act of 24 July 1971. Washington Treaty refers to the Treaty on Intellectual Property in respect of Integrated Circuits adopted at Washington on 26th May 1989.

further extension of the transition period may be considered in a flexible and supportive manner. The TRIPS agreement also permits an additional transition period of five years for introduction of product patents by developing countries in those areas of technology (typically food, beverages, pharmaceuticals, chemicals, especially agrochemicals) where they do not grant product patents on the date of entry into force of the WTO agreement (1 January, 1995). Such countries are, however, obliged to accept product patent applications for pharmaceutical and agro-chemical products, and pending the grant or rejection of product patents on those applications in the wake of amendment of their IPR laws, to grant exclusive marketing rights for five years for those products in case they have received product patent and marketing approval in any other member country. In essence what this provision means is that so far as protection of IPRs in pharmaceutical and agrochemical products is concerned, the TRIPS agreement does not allow any transition period.

19. Although the TRIPS agreement has expanded the scope, ambit and scale of protection of IPRs in all the areas of intellectual property addressed by it, it is mainly in the areas of patents, micro-organisms and plant varieties that the expansion has generated maximum concern and controversy in developing countries. Before the provisions and their implications in these three areas are examined in some detail, it may be useful to touch upon some of the salient features of the agreement in other categories of intellectual property.

Copyright

20. In the field of copyright, besides making it obligatory to comply with Articles 1 to 21 of the Berne Convention, the agreement requires computer programs and data bases to be protected as literary works under the Berne Convention. In respect of at least computer programs and cinematographic works, the agreement requires the recognition of rental rights of the authors, i.e. their rights to authorize or prohibit the commercial rental to the public of originals or copies of their copyright works. The agreement also extends the scope of protection to neighbouring rights, namely, the rights of performers, producers of phonograms (sound recordings) and broadcasting organisations. Although the agreement does not require adherence to the provisions of the Rome Convention (1961), it specifies the acts that will require their authorization and the minimum term of protection of their rights. (Fifty years for performers and producers of phonograms, twenty years for broadcasting organisations). It is also worth noting that since patent protection under the TRIPS agreement extends to all fields of technology, it is open to any member country to grant patents as well as copyright to computer programs.

Trademarks

21. In the field of trademarks, the agreement prescribes in considerable detail the norms and standards for the protection of trademarks. In essence, the agreement closes the gaps in the Paris Convention and tightens the rules for the registration and protection of trademarks. The noteworthy features are the expansion of protection to service marks and well known marks. Trademarks and servicemarks are treated on equal footing and the tightened provisions will apply to service marks as well. In the case of well known marks, the provisions of Article 6 *bis* of the Paris Convention will apply to services also, but further tightening has been done in two respects: Provisions of Article 6 *bis* will apply even when the impugned mark is applied on goods or services which are not identical or similar to the goods or services in respect of which the trademark is registered. Second, in determining whether a trademark is well known, account shall be taken of the knowledge of the trademark in the relevant sector of the public (principally the consumers) generated by the promotional work of the trademark owner (for example, through print or television advertising). The agreement sets strict norms for cancellation of a trademark on the ground of "non-use", making it clear that use of the trademark by a licensed user is equivalent to its use by the owner and that non-use caused by obstacles beyond the control of the

trademark owner, as for example, import restrictions, will not be a valid ground for cancellation of the registration. The TRIPS agreement also prohibits any compulsion to use a trademark in combination with another trademark (the reference is to the requirement that used to be in vogue in some developing countries that foreign trademarks could be used in their domestic markets only in conjunction with domestic trademarks). Finally, the agreement lays down that compulsory licensing of a trademark shall not be permitted, and that the owner of a registered trademark shall have the right to assign the trademark with or without the transfer of the business to which the trademark belongs.

Trade secrets

22. As regards trade secrets, the TRIPS agreement treats trade secrets as a form of intellectual property and expands the provisions of Article 10 *bis* of the Paris Convention dealing with unfair competition. Trade secrets cover both commercial and technical information. For example, know-how that is maintained as a secret falls within the ambit of trade secrets. While the value of a patent lies in its disclosure, the value of a know-how lies in its secrecy. The TRIPS agreement requires that as long as a trade secret has a commercial value because of its secrecy and the owner of the trade secret has taken reasonable steps to maintain its secrecy, it must be protected against dishonest commercial practices such as a breach of contract, breach of confidence, inducement to such breach, theft and any other act of misappropriation. Neither the Paris Convention nor the TRIPS agreement requires the enactment of a special legislation for protection of trade secrets. It is open to member countries to provide such protection through their civil or criminal laws and common law principles. Civil law directed against torts is generally used to provide relief to the owner of a trade secret. Competition law is another that could be used to give protection against acts contrary to honest commercial practices. Now that TRIPS agreement specifically treats trade secret as an intellectual property and enjoins its protection in a defined manner, developing countries would need to examine their legal system to see its conformity to the obligations stipulated in the TRIPS agreement.

Integrated circuits

23. As regards protection of lay-out designs of integrated circuits, the TRIPS agreement requires that the provisions of Articles 2 to 7 (except paragraph 3 of Article 6), Article 12, and paragraph 3 of Article 16 of the Washington Treaty shall be complied with, and in addition, the following provisions would apply: the scope of protection should cover importing, selling or distributing for commercial purposes a protected lay-out design, an integrated circuit which incorporates a protected lay-out design, and an article which incorporates such an integrated circuit. The only exception to this rule is in the case of "innocent infringement" in which case also the person concerned shall be liable to pay a reasonable royalty after he has received notice of the infringement. Compulsory licensing of a protected layout design shall be governed by the strict terms set out in Article 31 of the TRIPS agreement pertaining to compulsory licensing of patents. The term of protection of a layout design shall at least be ten years from the date of application for registration or the date of its first commercial exploitation anywhere in the world, subject to the protection lapsing fifteen years after its creation. Thus, the provisions of the Washington Treaty have been tightened to a certain extent for the protection of the layout design. In particular, the narrowly defined circumstances for innocent infringement (as well as for compulsory licensing) could have implications for the manufacturers of consumer durables, machine tools, instrumentation and control equipment, etc. in developing countries where they use bought-out integrated circuits or parts or components that may contain a protected layout design unknown to them.

Patents

24. As noted earlier, it is in the area of patents that the TRIPS agreement has enlarged and adopted the most stringent standards for the protection of the rights of the patent owner. The most important standards incorporated in the agreement are the following:

1. Patents shall be available for any invention, whether product or process, in all fields of technology. Thus, the exclusion of any sector from patentability or the exclusion of product patent in any sector is prohibited. (It is worth noting that the Paris Convention allows latitude to member countries to exclude sectors from patentability or product patentability).
2. Patent rights shall be enjoyable without discrimination as to whether the products are imported or locally produced. This may be interpreted to mean that importation must be regarded as working of a patent, although Paris Convention permits grant of compulsory licence for failure to work or insufficient working of a patent without legitimate reasons.
3. Plants and animals, and essentially biological processes, may be excluded from patentability, but micro-organisms, micro-biological processes and non-biological processes must be patentable. Plant varieties (i.e. seeds and other forms of propagating material) must be protected either by patents or by an effective *sui generis* system or by a combination of both.⁴
4. The duration of a patent shall at least be twenty years from the date of filing a patent application. (Here again, the Paris Convention gives freedom to member countries to fix the duration in their discretion).
5. If the subject matter of a patent is a process for obtaining a product, the burden of proof shall be reversed in the defined circumstances, i.e. it is for the defendant to prove that the process used by him to obtain an identical product is different from the patented process.
6. A compulsory licence may be granted only according to the narrowly defined circumstances incorporated in Article 31 of the agreement. In fact, Article 31 is the longest and most detailed Article of the entire TRIPS agreement.

25. These standards will strengthen the patent protection system uniformly throughout the world at a level that is almost equivalent to the level obtaining in the industrialised world. The standards are targeted at all areas where the Paris Convention is either silent or allows considerable flexibility to member countries. In particular, the standards take away the freedom to exclude any sector or products from patentability (product or process) or to set different durations for patent for different sectors or products. In addition, patent protection has been extended to life forms and patent or *sui generis* protection to plant varieties. Together with the disciplines on compulsory licensing, reversal of burden of

⁴ The protection of micro-organisms and plant varieties is dealt with as separate subject in the later part of this study.

proof and non-discrimination against imported products vis-a-vis locally produced products, the package stipulated in the TRIPS agreement would ensure for industrialised countries that patents are granted and protected around the world according to standards not lower than those incorporated in the agreement.

26. It may be useful here to touch upon the three issues, importation being regarded as working of the patent, reversal of burden of proof and compulsory licensing, as they have raised some concern in developing countries. From the practical standpoint, the question whether importation is or is not working of a patent is not important in all circumstances.⁵ It is relevant only when it is commercially feasible to work the patent in the host country and yet the host country market is served only by importation and such importation is causing harm to the host country's economy, as for example, by unreasonable prices or by adverse impact on the growth and development of other sectors needing the patented article. Where a product is needed in small quantities (eg. catalysts, instrumentation control systems, even drugs or chemicals needed in small quantities), it is the availability of the product rather than its domestic manufacture that would be of concern to the users. It is only when it is commercially viable to manufacture a product in the host country and third parties with the necessary technological and manufacturing capacity are available to manufacture the product competitively that the question of granting a compulsory licence would assume practical significance. In such an event, if the market being served only by importation is causing harm to the national economy, the compulsory licensing provisions could be invoked citing the public interest reasons involved. It may not be fair to assume that a patent owner can work his patent in all the countries in which he takes a patent nor is it fair to assume that importation of a product by itself is injurious to national economy.

27. As regards reversal of burden of proof, this will not come into play in all cases: it will come into play only in the case of those process patents where the process patent leads directly to a new product. If the alleged infringer has started manufacturing an identical product after the patented process has come into vogue, he has to prove that his process is different from that of the patented process. In adducing his defence, he need not disclose his own process or manufacturing secrets. The rationale behind the reversal of burden of proof is that the patent owner (plaintiff) has no reasonable way of knowing the process used by the defendant. In Anglo Saxon legal tradition at least, the burden of proving any fact which is especially in the knowledge of a person is on that person.

28. As regards compulsory licensing, the TRIPS agreement lays down detailed norms and conditions with a view to placing a very tight lid on the grant of such licences. The TRIPS agreement does not prohibit compulsory licensing. What it prohibits is automatic compulsory licensing through provisions such as 'licence of right' under which licences are made freely available, subject only to payment of a reasonable royalty, without the patent owner being heard. The TRIPS agreement permits grant of a compulsory licence "on its individual merits", but such a licence can be granted only after the licence seeker had made efforts to obtain a licence from the patent owner on reasonable commercial terms and conditions, and his efforts did not prove to be successful within a reasonable period of time.⁶ If a compulsory licence is granted, it should conform to the various conditions enumerated in Article 31 of the TRIPS agreement.

⁵ Working of a patent is normally understood to mean working it industrially, i.e. manufacture of a patented product or industrial application of a patented process. Thus, importation or sale of a patented product or of the product manufactured by a patented process will not normally be regarded as working of a patent.

⁶ The only exceptions to this rule are cases of: national emergency, other circumstances of extreme urgency, public non-commercial use, and remedy against a practice determined to be anti-competitive by judicial or administrative process.

29. Developing countries must use the provisions of compulsory licensing selectively and judiciously on the merits of the individual case. The touchstone for grant of a compulsory licence must be the public interest to be served, not the interest of domestic companies seeking a compulsory licence.

Grant of a compulsory licence merely on the ground that the domestic market is being served by importation may not be a valid ground for a compulsory licence. There has to be a nexus to the public interest to be served by the grant of a compulsory licence. For example, if a drug or vaccine is widely needed for combating or preventing a disease affecting the common man and its prices are unreasonably high because of the protection granted by the patent system, and it is therefore considered essential to create competitive sources of its production and marketing, it may be legitimate to grant a compulsory licence, with such a licence conforming to the conditions enumerated in Article 31 of the TRIPS agreement. Such a licence should be granted without restraining the rights of the patent owner to manufacture the product locally or to serve the local market by importation. Equally, the competition laws would need to be strengthened. The TRIPS agreement permits grant of a compulsory licence without approaching the patent owner if it is to remedy a practice determined to be anti-competitive by judicial or administrative process. The provisions of Article 8 (dealing with public interest) and Article 40 (dealing with the control of anti-competitive practices) should be judiciously used, consistent with the provisions of the TRIPS agreement relating to the substantive rights of a patent owner, to grant a compulsory licence where public interest is sought to be protected.

30. From the standpoint of acquisition and development of technology, the real implications for developing countries arise not so much from issues such as importation being regarded as working of a patent, reversal of burden of proof or strict conditions for compulsory licensing as they do from the extension of patentability (both products and processes) to all fields of technology without discrimination and the elimination of any freedom or flexibility to the host countries in adopting a special regime for particular sectors of vital importance to them. These implications are discussed later in this study while considering the overall implications of the Uruguay Round agreements.

MICRO-ORGANISMS

31. The TRIPS agreement requires that micro-organisms and micro-biological processes must be provided patent protection. In other words, inventions in the area of bio-technology must be eligible for patent protection under the TRIPS agreement.

32. Neither the TRIPS agreement nor the Budapest Treaty (1977) for the deposit of micro-organisms defines the term "micro-organism". It is however clear that for the purposes of patent protection, the term micro-organism will be understood in its widest sense to include any biological material which is self-replicable or which is replicable via a host organism. Thus, it will cover not only unicellular or other micro-organisms per se (eg. bacteria, fungus, virus, etc), but also sub-cellular material like genes, gene sequences, plasmids, replicons, or other material like cell lines, cell cultures, etc. Since disclosure of the invention is a requirement for patentability, the biological material must be capable of being deposited in a "culture collection". Therefore, any depositable, self-replicable biological material will be regarded as a micro-organism for the purpose of patenting.

33. The basic problem with regard to the patenting of bio-technological inventions is the difficulty in deciding where "discovery" ends and "invention" begins; in other words, the difficulty in drawing the borderline between a "product of nature" and a "product of man". The reason is that the starting point or the basic working material of a bio-technological invention is always some kind of living matter, i.e. matter that pre-exists in nature. The difficulty in distinguishing between a discovery and an invention in the case of bio-technological products is being resolved even in the industrialised world more through

judicial pronouncements, court decisions and patent office practices than through clear-cut criteria laid down in law or special legislation. Patent laws of the last hundred years designed and developed for the inanimate world are being moulded to the animate world through the interpretation of the judiciary with a view to accommodating the rapid and startling advances being made in the field of bio-technology. The settled judicial view in the industrialised world now is that the relevant distinction is not between living and inanimate things, but between products of nature, whether living or not, and human-made inventions. It would appear that the doctrine of "man-madness" is gaining ground in the industrialised countries to distinguish between discovery and invention in the case of bio-technological inventions involving living matter. The nature and extent of human intervention and the degree of value or usefulness added by that intervention to pre-existing matter are analyzed to decide whether a patentable invention or discovery has been created or not. Under this approach, a naturally occurring micro-organism as it is "found" in nature or in its original natural state may not be patentable, but if it is isolated, identified, purified or cultured and the resultant product is "new" (in the sense of its having no previously recognised existence) and valuable, it is patentable because it is the product of human ingenuity. While the scope of protection of naturally occurring micro-organisms is still evolving, there is greater certainty that genetically modified micro-organisms (GMOs) or products obtained by using the new bio-technologies such as recombinant DNA, somatic cell hybridization, micro-injection or hybridoma technology are patentable because they are creations of man and cannot be regarded as pre-existing matter.

34. Developing countries would need to consider carefully the definition of micro-organisms that they may wish to adopt for the purpose of granting product patents. Given the widespread concern that their wealth of naturally occurring genetic material would get patented by foreign multinational companies and their use of naturally occurring substances would thereby be interfered with, and given also the fact that they are strangers to the complexities of patent protection in the field of living matter, it may be prudent for them to begin the process on a cautious note. A possible approach that they may consider could be along the following lines: First, naturally occurring micro-organisms including genes, gene sequences, cell lines, cellular or sub-cellular material, howsoever derived or even if trivially modified, may not be regarded as patentable. They may be treated as pre-existing matter or discoveries and hence not inventions. Second, only genetically modified micro-organisms (GMOs) may be regarded as patentable if the GMO represents a novel genetic make-up and the resultant product satisfies the criterion of utility or industrial applicability. Third, the GMOs that qualify for patent protection may be allowed patent only for the particular claim of trait or use accepted for the patent, but the GMO *per se* may not be patented. This is to ensure that the GMO is available for use for other purposes that may be later discovered. The products in which the GMOs are incorporated may also be eligible for patents or plant breeder's right if the products fulfil the applicable criteria. So far as micro-biological processes are concerned, they may be eligible for process patents if they satisfy the usual criteria for patenting. As developing countries gain knowledge and experience, and as international scientific opinion on the issues involved reaches greater clarity and consensus, they could refine and strengthen their intellectual property protection system in the area of bio-technological inventions.

PLANT VARIETIES

35. The TRIPS agreement requires that plant varieties must be protected either by patents or by an effective *sui generis* system or by any combination thereof. Unlike in the case of micro-organisms, there is no obligation to provide patent protection for plant varieties. But if a country chooses not to provide patent protection, it must provide an effective *sui generis* system for the protection of plant varieties. Countries are also free to provide protection by both patents and a *sui generis* system as is the current practice in several industrialised countries.

36. The most well known *sui generis* system today for the protection of plant varieties is the Plant Breeder's Right system. The International Convention on the subject, known as the International Convention for the Protection of New Varieties of Plants - or more commonly known as the UPOV

Convention by the acronym of the French title - came into force in 1968 (although it was concluded in 1961) and was revised in 1972, 1978 and finally in March, 1991. The UPOV 1991 Act is yet to come into force and it is the UPOV 1978 Act which is currently in force. It is worth noting here that the UPOV 1991 Act contains a specific provision, as an inducement to developing countries, that developing countries may join the Convention by adhering to the 1978 Act if they deposit their instrument of accession before 31st December, 1995. At present, about 20 industrialised countries alone are members of the UPOV Convention, although some developing countries in Latin America are contemplating to join it.

37. The UPOV 1991 Act has considerably expanded and strengthened the rights of the plant breeder. The UPOV Acts of 1961 and 1978 conferred only a "commercial" right on the plant breeder, namely, the exclusive right to produce, for purposes of commercial marketing, the propagating material of the protected variety (i.e. seed or seedlings) and to market such material. The exclusive right was applicable to the propagating material only. The UPOV Act of 1991 has expanded the right of the breeder to an "exploitation" right akin to that of a patent owner. Under the 1991 Act, all the following acts in respect of the propagating material will require the authorization of the breeder: production or reproduction (multiplication), conditioning for the purpose of propagation; offering for sale, selling or marketing, exporting, importing and stocking for any of these purposes. Furthermore, subject to the breeder having had reasonable opportunity to exercise his right at the preceding stage, the exclusive right of the breeder will extend to the harvested material and the products made from the harvested material in a cascading fashion.

38. A sensitive issue in the case of plant breeder's right is the issue of "farmer's privilege", namely his freedom to use farm saved seed for subsequent cultivation. The 1978 Act of UPOV did not need to contain a specific provision for farmer's privilege because the exclusive right of the breeder was confined to production for the purposes of commercial marketing and to marketing of the seed or seedlings. The farmer's privilege was therefore not affected. Since the 1991 Act has expanded the right of the breeder to an exploitation right that encompasses production or reproduction (multiplication) *per se*, it contains a specific provision for farmer's privilege, but circumscribing it with strict conditions, namely, (i) the farm saved seed has arisen from the harvest of the farmer on his own holding (ii) the farm saved seed is used for growing subsequent crops on the farmer's own holding and (iii) the exemption in favour of the farmer is used within reasonable limits and subject to safeguarding the breeder's legitimate interests. Thus, strictly speaking, even limited sale or exchange of farm saved seed across the fence will violate the breeder's right, although it is doubtful whether this can be controlled or even whether this would be of interest to the plant breeder.

39. The TRIPS agreement does not stipulate that the standards of the UPOV Convention, either 1978 or 1991 version, must be observed for a *sui generis* system to be considered "effective". There can be no doubt that the TRIPS agreement does not require a country to follow the standards of the 1991 Act of UPOV, and that if a country were to follow broadly the standards of the 1978 Act of UPOV, it would meet its obligations under the agreement for effective protection of plant varieties.

40. Developing countries would be well advised to model their plant breeder's right system on the 1978 version of UPOV regarding the scope, criteria and duration of protection as well as the progressive extension of protection to all genera and species. In particular, they may need to ensure that the exclusive right of the breeder is confined only to the "commercial right" as set out in the 1978 Act and not the all encompassing "exploitation" right as prescribed in the 1991 act of UPOV, and that the protection extends only to the propagating material of the protected variety and not to the harvested material and products made from the harvested material. It is also important to ensure that the "farmer's privilege" and "researcher's privilege" are provided for unambiguously without, of course, undermining the legitimate interests of the breeder. Farmer's privilege should provide that a farmer can use farm-saved seed of the

protected variety for subsequent cultivation either on his own land or on leased or rented land or for traditional exchanges within village community. As long as a farmer remains a "grain producer" and does not turn himself into a "commercial seed seller" of the protected variety, he should not be regarded as infringing on the right of the plant breeder. The researcher's privilege should ensure that there is adequate freedom to use one protected variety to breed another new variety without the authorization of the breeder of the protected variety.

41. There are two other major issues, namely, the sovereignty and control of States over their biological resources, and the concept of "Farmer's Rights" (as distinguished from farmer's privilege referred to earlier) that are raising some concern in developing countries. There is nothing in the TRIPS agreement that takes away or abridges the sovereign rights of States over their biological resources and their right to grant access to such resources only on mutually agreed terms, as provided for in Article 15 of the Bio-diversity Convention which has come into force in December, 1993. The TRIPS agreement does not also interfere in any mechanism that may be adopted to enable developing countries to derive economic benefits from the exploitation of their genetic wealth or to obtain compensation for its use. Some of the mechanisms contemplated are contractual arrangements between host countries and enterprises interested in employing the resources, the creation of property rights in genetic resources or public transfers of funds. The concept of 'farmer's rights' has been conceived of as another mechanism to recognize and reward the contribution of rural and tribal men and women to the preservation and improvement of genetic diversity.

42. Genetic diversity is the basic raw material for modern plant breeding and biotechnology. Until the advent of molecular biology and genetic engineering, plant breeding depended for its success on access to genetic diversity within a species. Genetic engineering has, however, rendered the transfer of genes across sexual barriers possible and has thus enhanced the economic value of bio-diversity. Through indigenous knowledge systems, the rural and tribal men and women of the Third World have over centuries preserved and promoted genetic diversity in plants and the genetic resources created by them have been freely made available to plant breeders and seed companies in industrialised countries for developing new plant varieties for which they obtained intellectual property protection. Free access to genetic resources of the Third World thus became "a one-way subsidy from the poor to the rich". To remedy this inequity, the FAO Conference in 1989 adopted the concept of 'farmer's rights' whose aim was to recognize and reward the contribution of farm men and women of the past, present and future generations to the conservation and improvement of genetic diversity in crop plants. The farmer's rights would be of a collective nature; they would not belong to individuals, but to communities, and they would not create property rights over the genetic resource or seeds.

43. The concept of Farmer's Rights has thus far remained on paper only and no international consensus has yet been developed to give it a practical shape. The TRIPS agreement does not preclude any country from giving effect to this concept in its own way in its sui generis system for the protection of plant varieties. The "Madras Dialogue (Jan 1994)" organized by M.S. Swaminathan Research Foundation, Madras (India), which has proposed the draft of a "Plant Variety Recognition and Protection Act" has suggested a methodology for implementing the concept of farmer's rights in India.⁷ In essence, the suggested methodology is to levy a five per cent royalty on domestic sales of the protected variety of seeds and to credit it to an autonomous Community Gene Fund. Where the crucial genetic material for the success of the protected variety can be traced to a local area, the royalty will be transferred to the

⁷ The proceedings of this dialogue are available in: "M.S. Swaminathan and Vinceta Hoon (1994). Methodologies for Recognising the role of Informal Innovation in Conservation and Utilisation of Plant Genetic Resources, Proceedings No.9, CRSARD, Madras". Publishers: CRSARD, 3rd Cross Street, Tharamani Institutional Area, Madras 600113, India.

concerned local level elected institutions for strengthening the *in situ* conservation activities of the community. Where it is not possible to identify the exact location from where the useful genes originated, the royalty credited to the Gene Fund will be utilised to strengthen the *in situ* conservation activities of local communities in areas threatened with serious genetic erosion. For implementing the scheme, the applicant for plant variety protection will be required to indicate to the extent possible the 'pedigree' of the variety, giving the names and details of the land races, wild species or other "folk" varieties which have contributed to the success of the variety, and where full pedigrees are not available, the applicant will provide information on the parental material used. The data furnished by the applicant will be analyzed by the National Bureau of Plant Genetic Resources/National Institute for Plant Variety Testing and Evaluation to identify the location within India from where the crucial genetic material had originated.

44. The Madras Dialogue provides a useful basis for implementing the concept of 'farmer's rights', but it recognizes the fact that in the absence of an international system, such recognition and rewarding of the rural and tribal men and women has to be confined to domestic sales. As the pedigree of a new plant variety may draw its useful genes from several countries, an international system is needed to reward the contribution of farm men and women from all the countries concerned. It has been suggested that UPOV should work out, in conjunction with FAO, an international system of Farmer's Rights whereby contributions to a Global Community Gene Fund and the methods of its distribution could be settled. UPOV can thus become an International Union for the Protection of Breeders and Farmers Rights. By recognizing and rewarding both the intellectual property rights of the breeder and the indigenous knowledge systems of the farmer that has contributed the feedstock of genetic diversity for the breeder, it would ensure that the breeder and the farmer are allies and their interests are not projected as though they are antagonistic.

ENFORCEMENT OF INTELLECTUAL PROPERTY RIGHTS

45. Finally, the TRIPS agreement lays down certain minimum standards for the effective enforcement of intellectual property rights, although it does not obligate any country to establish a special judicial system for such enforcement distinct from that for the enforcement of laws in general. As for dispute settlement, the provisions of Article XXII and XXIII of GATT 1994 as elaborated and applied by the Dispute Settlement Understanding (DSU) of the Uruguay Round will apply. This means that the provisions of "cross-retaliation" across sectors will also be applicable, although such cross retaliation can be resorted to under the DSU only after all other remedies have been exhausted and multilateral authorization has been obtained for it. Among the enforcement measures must be noted the special border measure requiring suspension by the customs authorities of importation of goods suspected to be counterfeit trademark or pirated copyright goods. Members may extend, as industrialised countries may do, the provision for suspension of importation to goods which involve infringement of other intellectual property rights (eg. patents, layout designs of integrated circuits or plant breeder's rights). Export of goods that are alleged by the importing countries to involve infringement of their IPRs will therefore become increasingly difficult, although there is a general exhortation in the TRIPS agreement that the enforcement measures must be applied "in such a manner as to avoid the creation of barriers to legitimate trade and to provide for safeguards against their abuse".

AGREEMENT ON TRADE RELATED INVESTMENT MEASURES (TRIMS)

46. Although the extension of the trade agenda to investment measures was a matter of deep concern to developing countries at the beginning of the Uruguay Round negotiations, it ceased to be a controversial issue by the time the negotiations came to a conclusion. The main reason for this change was the liberalization in the foreign investment policies of developing countries. As a result, the TRIMS agreement became perhaps the thinnest agreement of the Uruguay Round and the obligations it contained were well within the ambit of the foreign investment policies being pursued *suo moto* in most developing countries.

47. The TRIMS agreement applies to investment measures related to trade in goods only. It prohibits any TRIM that is inconsistent with the provisions of Article III (national treatment) and Article XI (general elimination of quantitative restrictions) of GATT 1994. An illustrative list of such TRIMS is given in the Annex to the agreement. Developing countries have been allowed a transition period of five years (least developed countries seven years) to eliminate any TRIM that may be inconsistent with the provisions of the agreement. The balance-of-payments cover available to a developing country under Article XVIII of GATT 1994 is not eroded by the TRIMS agreement.

48. In substance, the TRIMS agreement seeks to eliminate "performance requirements", particularly those relating to phased indigenisation of the manufacturing programme or to export obligations. The agreement prohibits limitations on the importation of products or compulsory use of locally produced products that are related to the volume or value of either the local production or the exports of the enterprise concerned.

49. From the point of view of technology transfer, the justification for the phased indigenisation of the manufacturing programme used to be that without such an obligation, the manufacturing operations of an enterprise, especially foreign owned enterprises, would merely be confined to CKD/SKD assembly operations and there would be no transfer of basic manufacturing technologies. Actual experience has, however, shown that when a manufacturing programme lacks inherent techno-economic or commercial viability, the performance requirement has only proved to be counter productive and has not led to viable or technologically competitive manufacturing processes. It has also affected the flow of foreign investment in view of the fact that transnational corporations are increasingly employing integrated production structures around the world and freedom to source components and parts and to locate different segments of their production activities in different countries is increasingly becoming important for them. Developing countries have therefore been eliminating or minimizing the stipulation of performance requirements as a part of the liberalization of their foreign investment and trade policies, leaving it to market and competitive forces to influence the nature and extent of the indigenous manufacturing or sourcing programmes and export operations of enterprises, be it national or foreign owned or joint ventures. The TRIMS agreement does not therefore come in conflict with the changes and trends taking place in the foreign investment and technology acquisition policies of the developing countries.

GENERAL AGREEMENT ON TRADE IN SERVICES (GATS)

50. The Uruguay Round agreement on trade in services is a framework agreement under which the obligations of "most-favoured nation treatment (MFN)" and "transparency" (i.e. the prompt publication of all laws, rules and regulations) will apply to the entire universe of services, while the obligations of "market access" and "national treatment" will apply according to the negotiated specific commitments incorporated in the schedule of each Member country. Negotiations for incorporation of specific commitments in the Members' schedules in respect of financial services have just been completed (28 July 1995) with United States opting out of the deal as it is not satisfied with the market opening measures of other countries.

51. While the objective of industrialised countries is to gain market access in developing countries for capital and technology intensive services such as banking, insurance and basic telecommunications, the objective of the developing countries is to secure higher levels of commitments on the part of industrialised countries for the movement of natural persons for supply of services, especially in the areas of computer software and professional services. Rather than resorting to unilateral liberalisation, developing countries would be well advised to utilise their liberalisation policies in the areas of banking, insurance, financial services, telecommunications and other infrastructure areas as a

bargaining chip to obtain enhanced levels of commitments from the industrialised countries for movement of their skilled and professional people in service sectors of export interest to them such as computer software, professional services, hospital or healthcare services, construction and hotels.

52. Article IV of GATS enumerates certain measures to be taken for increasing the participation of developing countries in international trade in services. It calls for strengthening the domestic services capacity of developing countries "through access to technology on a commercial basis", improvement of their access to distribution channels and information networks, and liberalisation of market access in sectors and modes of supply of export interest to them. It also requires developed countries to establish "contact points" within two years of the WTO Agreement to facilitate the access of developing countries to information on commercial and technical aspects of supply of services to their respective markets, requirements for obtaining professional qualifications, and the availability of services technology. Article VI of GATS incorporates certain disciplines to ensure that qualification requirements and procedures, technical standards and licensing requirements in the field of professional services do not constitute unnecessary barriers to trade in services. During the course of further consideration or negotiation of these issues under WTO, developing countries may need to use their collective bargaining strength to give operational content to these provisions. Unless this is consciously attempted, there will hardly be any impact on the asymmetry that exists in global trade in services as between developed and developing countries.

AGREEMENT ON TECHNICAL BARRIERS TO TRADE (TBT)

53. The agreement on TBT deals with technical regulations and standards, including packaging, marking and labelling requirements, and procedures for assessment of conformity with technical regulations and standards.⁸ The agreement applies to all products, including industrial and agricultural products, but it does not apply to sanitary and phyto-sanitary measures. The agreement recognises the right of member countries to adopt technical regulations and standards and conformity assessment procedures for, inter alia, the protection of human health or safety, animal or plant life or health, or the environment. However, the following major principles should be observed in the application of such measures: there should be no discrimination as between locally produced and imported products; they should not cause unnecessary obstacles to international trade; as far as possible, international standards must be used where such standards exist; the results of the conformity assessment procedures of the exporting countries should be accepted subject to their conformity assessment bodies having adequate and enduring technical competence; and all technical regulations should be promptly published. The agreement also urges member countries to participate actively in the work of international standardizing bodies with a view to harmonizing technical regulations and conformity assessment procedures.

54. As far as developing countries are concerned, the preamble to the agreement emphasizes two aspects: first, the contribution which international standardization (of technical regulations and standards, and conformity assessment systems) can make to the transfer of technology from developed to developing countries; and second, the special difficulties that developing countries may encounter in the formulation and application of technical regulations and standards and conformity assessment procedures, and therefore, the need to assist them in their endeavours. The agreement

⁸ For the purposes of the agreement, technical regulations are regulations relating to product characteristics or their related processes and production methods compliance with which is mandatory. Standards are standards set by a recognised body for product characteristics and related processes and production methods compliance with which is not mandatory.

contains lengthy and detailed provisions for (a) technical assistance to developing countries and (b) special and differential treatment in favour of developing countries. In essence, the provisions urge developed countries, including their regulatory bodies, to grant technical assistance and advice to developing countries to enable them to establish the necessary legal and institutional framework for formulation and implementation of technical regulations and standards and conformity assessment systems, including the establishment of national standardising bodies and their participation in the work of international standardising bodies.

55. With regard to special and differential treatment of developing countries, the agreement lays stress on the following: Given their technological and socio-economic conditions, developing countries may need to adopt technical regulations, standards and conformity assessment procedures aimed at preserving indigenous technology and process and production methods compatible with their development needs. They should not therefore be expected to use invariably the international standards as the basis for their technical regulations or standards. Secondly, developing countries may face special problems, arising from their institutional and infrastructural deficiencies as well as their stage of technological development, in the field of preparation and application of technical regulations, standards and conformity assessment procedures. They should, therefore, be eligible, upon request, for specified, time-limited exceptions in whole or in part from obligations under the agreement. It must be noted that both the Articles relating to "Technical Assistance" and "Special and Differential Treatment" contain only "best endeavour" clauses and they do not cast any substantive obligations on developed countries or confer any substantive concessions on developing countries.

AGREEMENT ON THE APPLICATION OF SANITARY AND PHYTO-SANITARY MEASURES (SPS)

56. The agreement on sanitary and phyto-sanitary measures (SPS) applies to all SPS measures which may, directly or indirectly, affect international trade. Sanitary or phyto-sanitary measure means any measure applied to protect human, animal or plant life or health from risks arising from the entry, establishment or spread of pests, diseases and disease-carrying or disease causing organisms as well as risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs. As in the case of the TBT agreement, the SPS agreement recognises the right of a country to adopt and enforce measures to protect human, animal or plant life or health (The TBT agreement extends also to the protection of the environment). However, the sanitary or phytosanitary measures must be based on international standards, guidelines or recommendations where they exist.⁹ It is open to a country to adopt a level of sanitary or phyto-sanitary protection higher than that of the relevant international standards, if there is a scientific justification or if it is necessitated by the "appropriate level of SPS protection" needed by it. The agreement requires a member country to accept the SPS measures of another member country as equivalent if the exporting country objectively demonstrates to the importing country that its SPS measures achieve the importing country's appropriate level of SPS protection. The agreement also urges member countries to recognize the concepts of "Pest-or-disease free areas" and "Areas of low pest or disease free prevalence", which have been defined in the agreement.

⁹ For the purpose of the agreement, international standards, guidelines and recommendations mean those established or developed by the Codex Alimentarius Commission for food safety (eg. for food additives, contaminants, veterinary drug and pesticide residues); by the International Office of Epizootics for animal health; by the Secretariat of the International Plant Protection Convention for plant health; and for matters not covered by these organisations, those promulgated by other relevant international organisations open for membership to all member countries of the WTO.

57. So far as developing countries are concerned, the agreement takes note of the fact, as in the case of the TBT agreement, that developing countries may encounter special difficulties in complying with the standards set by the importing countries. The agreement seeks to address this issue by way of (a) Technical assistance and (b) Special and differential treatment. The agreement urges developed countries to assist developing countries, either bilaterally or through the appropriate international organisations, in the areas of processing technologies, research and infrastructure as well as in the establishment of national regulatory bodies. Such assistance may be in the form of advice, credits, donations and grants, including for the purpose of seeking technical expertise, training and equipment. The special and differential treatment clause envisages, *inter alia*, developing countries being given time-limited exceptions to comply with the agreement and their being facilitated to participate actively in the work of the relevant international organisations.

58. In respect of both the TBT and SPS agreements, as the right to set the standards rests with the importing countries including the right to set standards different from or higher than those of international standards, developing countries would face two major problems: (a) the availability and cost of technologies needed by them to comply with the standards and (b) the increasing possibility of the standards being used by the importing countries as non-tariff barriers to their exports.

III IMPLICATIONS FOR AND SUGGESTED STRATEGIES AND RESPONSES BY DEVELOPING COUNTRIES

59. The Uruguay Round creates opportunities for developing countries to gain from international trade, but their realization of those opportunities rests crucially upon their ability to meet the competition and demanding requirements of the industrialised country markets. Given the thrust of industrialised countries to gain enhanced access to their own markets, developing countries will face the heat of competition from foreign enterprises in their domestic markets as well. The ability of developing countries to meet the competition and demands of the external markets, including disguised barriers to their trade, will in turn rest crucially upon their technological capacity and strength. Technology is increasingly becoming the dominant determinant of international competitiveness. Indeed it is this fact, coupled with the huge lead that developed countries enjoy over developing countries in the technological race, that lies at the root of their quest for stringent extra-territorial protection for intellectual property rights around the world.

60. There are three basic issues arising from the Uruguay Round agreements, especially the TRIPS, TRIMS, TBT and SPS agreements, that require particular attention: (a) the availability, cost and the terms and conditions of acquisition of foreign technologies, (b) the building up of domestic technological capabilities, including the promotion of indigenous knowledge systems and the derivation of benefits from genetic resources, and (c) the protection of public interest in sectors of vital socio-economic importance. To cope with the challenges posed by the Uruguay Round agreements, each developing country would need to analyse these issues in its individual circumstances and work out responses best suited to its own conditions. Considering the diversity in the stage of their technological development, resource endowments and market conditions, the responses would, needless to say, vary as between different developing countries, for example, the newly industrialising countries, developing countries with large markets or substantial technical manpower, and least developed countries.

61. The strengthening of the intellectual property protection system and its extension to new areas such as micro-organisms and plant varieties under the TRIPS agreement has caused the deepest concern in developing countries. The concern stems from the fact that the TRIPS agreement lays down uniform

and stringent standards for protection of intellectual property rights, ignoring the need for relating the limits of protection to the stage of economic and technological development of each country. There has been a good deal of debate as to whether intellectual property protection is indeed required as a spur to innovation and investment in R&D, or if it is needed, as to the level of protection that will strike a reasonable balance between public interest and the private interest of the innovator. There is no scientific proof for or against protection of IPRs or for the limits of protection that would be appropriate to the stage of economic development of a country. However, if one looks at the world situation, a strong patent protection system seems to exist in those countries which are technologically the most advanced. Is it because they have a good protection of intellectual property or for other reasons? Perhaps for several reasons one of which may be a good intellectual property protection system. Even those who hold the moderate view that the level of protection of IPRs in each country should depend on its stage of economic development therefore argue that intellectual property protection has an important role in development and modernisation of an economy and that strict minimum limits must exist for such protection. Opinions may however differ as to what those minimum limits are. The TRIPS agreement takes the view that the minimum limits for intellectual property protection are those incorporated in the agreement. The assumption of the TRIPS agreement is that the standards adopted in the agreement would help achieve the objectives stated in Article 7 of the agreement, namely, "the protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations".

62. While the academic debate may continue on the merits and demerits of intellectual property protection or the appropriate limits for such protection in the case of developing countries, pragmatism demands that developing countries endeavour to make the best use of the TRIPS agreement now that it has become a reality. A two - pronged approach on their part is called for : First, use the strengthened intellectual property protection system to attract technology oriented business alliances through foreign direct investment, licensing or other arrangements. Second, adopt a well defined strategy to encourage domestic investment in commercially oriented R&D and to bring about close interaction between domestic industry, academic and research community and the government in order to foster domestic technological capabilities.

63. There is a clear nexus between trade and investment and between investment and intellectual property protection. Most trade now follows investment, and given the rising trend in the globalization of their production structures by transnational corporations, intra firm trade now constitutes a significant proportion of the global trade of TNCs. Even where the primary objective of a TNC is the large or lucrative market of the host country, it is increasingly sought to be realised by local production in the host country than by direct exports, more so when such local production has adequate freedom to source its inputs from any source internal or external. The propensity to invest in a host country will increasingly be influenced by the adequacy of its intellectual property protection system, especially for R&D intensive and high technology investments.

64. Besides private investments, even sponsored or contractual research and development arrangements between industry and academic institutions (eg. universities) or between industry and government owned research institutions, or inter-governmental agreements for cooperation in the field of science and technology tend to focus now on the question of protection of the intellectual property (especially patents and know-how) and the sharing of the ownership and benefits of the intellectual property rights emanating from the collaboration. No industry - university or industry-research institution or university-university or inter governmental agreements concerning R&D or science and technology is signed nowadays without the IPR protection and benefit sharing mechanism incorporated in it.

65. There is therefore scope and need for using the strengthened intellectual property protection system arising from the TRIPS agreement to induce foreign investment, through subsidiaries, affiliates or joint ventures as the parties may choose, as well as licensing or other forms of contractual arrangements. Assurance of a good intellectual property protection system conforming to international standards coupled with incentives for investment in high technology or high risk R&D could play a role in attracting technology oriented investments and activities, especially in countries that have a good technological infrastructure (eg. highly skilled or technical manpower in the form of scientists, engineers, technicians, etc). Apart from manufacturing ventures, there may even arise the possibility of some part of the R&D activity or some part of the developmental or evaluation activity being located in developing countries with sufficient techno-infrastructure if the IPR system encourages it.

66. There is a view point that once a strong patent protection system is introduced in developing countries, there would be no pressure on the patent owners to produce the patented products in the host country, and host country markets would be served only by imports monopolized by patent owners. This will be facilitated by the fact that TRIPS agreement regards importation as working of the patent, and further more, it will not be easy to grant a compulsory licence. Even if the patent owner undertakes local production, it will be through subsidiaries controlled by him. Either way there will be no transfer or diffusion of technology in the host country. In particular, developing countries will not see local production of new generation drugs or other high technology products.

67. While this criticism may be valid to a certain extent, a good patent protection system may equally act as an incentive to locate production units and even some parts of R&D activity in the host country, especially when the overall investment climate is perceived to be congenial and it makes commercial sense to establish local production. Quite often, the effective use of a sophisticated technology depends on the availability of the secret know-how underlying a patent and that know-how may be more valuable than the patent itself. Without the consent and cooperation of the technology owner, it is not possible to obtain the know-how to operate a patent. Or it will take time, effort and money to develop one's own know-how to do so. It is because know-how is so valuable that even in countries where patent protection is kept below par, there is strong protection of know-how by respecting secrecy and confidentiality obligations in contractual arrangements. Transnational corporations already operating in a country through subsidiaries, affiliates or joint ventures may more readily establish local production units for patented products than new entrants, but compulsions of market penetration may dictate recourse to local production in large or growing host country markets.

68. The building up of domestic technological capabilities holds, however, the key for realizing the best value out of intellectual property protection system. Unless there is a strong commitment and determination to develop domestic technological capacity (which may range from generating new technologies to assimilation and adaptation of imported technologies), the TRIPS agreement may cut short " reverse engineering", "imitative research" or "copying culture", but it will not spark domestic innovation or inventive activity. The ever widening technological gap between developed and developing countries should be a matter of serious concern to international community. As the first World Science Report, 1993 of UNESCO points out, the gap between rich and poor countries today is not so much a resource gap as it is a knowledge gap. The Report's comparison of investment in R&D which is a good indicator of a nation's commitment to science and technology brings this out in grim relief. Japan is devoting nearly 3% of its GDP or about US \$70 billion a year now to R&D, while the United States is spending about 2.8% of its GDP or about \$ 150 billion a year on R&D. The European countries within and outside of EEC are also devoting this order of their GDP to R&D. The newly industrialising countries and territories such as the Republic of Korea and the Taiwan Province of China are also doing reasonably well on this score spending nearly 1.9% of their GDP on R&D. In stark contrast, developing countries are spending not even 1% of their GDP (typically 0.5 to 0.75%) on R&D. Given the size of their respective

GDPs, the per capita spending on R&D works out to \$650 in Japan, \$600 in United States, \$400 in Scandinavian Countries, \$300 in EEC Countries, \$70 in Republic of Korea and \$3 in India. For developing countries as a whole, the per capita spending on R&D is less than \$10. Furthermore, nearly three fourths of the R&D spending in developing countries emanates from the government, while in industrialised countries it is the other way round, with private sector, especially the TNCs, accounting for the bulk of the R&D spending, especially in applied research and commercially oriented R&D.

69. The presence or absence of intellectual property protection system may not be responsible for this weak commitment of developing countries to R&D, except perhaps to the extent that the weakness in the R&D field is reflected in their indifference or opposition to strong intellectual property protection. However, now that they are accepting international obligations for effective protection and enforcement of IPRs and those obligations will affect their trade interests, it is imperative that Science and Technology policy in general, and commercially oriented R&D in particular, are placed high on the agenda of national economic development policies. In particular, developing countries should consider providing strong fiscal and financial incentives to their enterprises and institutions in private and public sector for commercially oriented or original R&D, especially in areas of special importance to their socio-economic and trade interests. For example, they could consider establishing Technology Development Funds, generally or for specific sectors, from which equity or equity like assistance could be given to enterprises and institutions for approved R&D projects. Developing countries should also consider measures, suitable in their individual context, for promoting an effective coalition or alliance between government, domestic industry and domestic research and academic institutions (eg. research laboratories, universities) in order to forger industry-research/academic community links directed at commercially useful technologies. Unlike the situation in industrialised world, this kind of link is weak in developing countries with industry and research/academic institutions moving in parallel streams unrelated to each other. It is necessary to remedy this situation.

70. It is also important to promote a 'patent culture' among scientists, technologists and the research and academic community as well as in domestic enterprises. For a variety of reasons, there is a lack of awareness and understanding of what intellectual property protection means, how a patent or other intellectual property protection right is obtained, and what precautions are needed to obtain and protect one's intellectual creativity. Even where commercially valuable inventions have been made or where the potential exists for developing the research to the point of a patentable invention, developing country research institutions, universities, scientists and technologists have not taken advantage of their creations. The tendency to rush to academic publications, generated by peer pressure based on the number of academic publications to a scientist's credit in preference to the number of patents taken by him, is a contributory factor. A strong intellectual property protection system could be used positively to enable domestic research institutions, scientists and technologists to reap a reward from their intellectual creativity, for which it is important to enhance their understanding of the requirements of the intellectual property protection system. It will also be useful, at least in the initial stages, to provide them with financial and technical assistance to obtain international patents. The creation of a patent culture will also be helpful in domestic research and academic institutions entering into collaboration agreements with agencies in other countries or with private industry in sponsored or contract or cooperative R&D.

71. A major implication of the strengthened intellectual property protection system arising from the TRIPS agreement is the availability, cost and terms and conditions of technologies for developing countries. There is a real danger that once IPRs are heavily protected, the technologies so protected may not be made available or if they are made available, the cost and terms and conditions may be onerous. The magnitude of this problem may perhaps depend on the nature of technology and the global corporate strategy of its owner. Where a technology is virtually the monopoly of its owner, the problem may reveal its most serious face with the technology not being made available or its price being prohibitive. But for most technologies, alternatives would be available including the lower generation technologies. Therefore,

it is not so much the availability as its cost that may be the real problem. Even where the technology is made available to a local production unit, its dissemination or diffusion will be severely restricted. These challenges can hardly be wished away, but to the extent that a developing country is able to strengthen and expand its own technological capabilities and to the extent that it offers an attractive market for the technologies, it may be less difficult to contend with them. In this context, it may be worth mentioning that the technology export control regimes of the industrialised world may have a more potent effect on developing countries acquiring newer technologies than the protection of intellectual property pursuant to the TRIPS agreement.

72. The protection of public interest, consistent with the protection of the rights of the owner of the intellectual property, is another important area for policy response. There is no inherent contradiction between protection of public interest and protection of intellectual property rights. The TRIPS agreement does not prohibit compulsory licences. What it prohibits is automatic, indiscriminate or across the board issue of compulsory licences. As noted earlier in this paper, selective and judicious use of compulsory licences is permissible to serve vital public interest or to prevent abuse of right by the holder of the patent. The main ground for a compulsory licence should be not importation (of the patented product) *per se* but the need for establishing competitive sources of production to serve a vital public interest. Such an approach would permit the possibility of a compulsory licence being granted regardless of whether the patent owner has established local production or whether the patented product is only being imported. The conditions laid down in Article-31 of the TRIPS agreement should, however, be complied with as regards the scope and terms of a compulsory licence. Article 8 (1) and Article-31 of the TRIPS agreement should be used in a combined and judicious manner to serve a vital public interest.

73. In this context, the need for formulating or strengthening competition laws in developing countries cannot be overemphasized. Article-31 (k) of the TRIPS agreement permits a compulsory licence to be granted without hearing the patent owner if it is to remedy a practice determined after judicial or administrative practice to be anti-competitive. Article 40 recognises that "some licensing practices or conditions pertaining to intellectual property which restrain competition may have adverse effects on trade and may impede the transfer and dissemination of technology". The Article also says that member countries are free to specify in their legislation "licensing practices or conditions that may in particular cases constitute an abuse of intellectual property rights having an adverse effect on competition in the relevant market". Some examples of such practices are given in the Article. Member countries are free to adopt appropriate measures, consistent with the provisions of the TRIPS agreement, to prevent or control such anti-competitive practices. It is important that developing countries develop and strengthen their competition laws and regulations as well as their enforcement mechanisms to control abuse of intellectual property rights, if necessary by seeking technical expertise and advice from other countries, including industrialised countries, and international organisations.

74. Three areas of the TRIPS agreement, namely, (a) Introduction of product patents in the pharmaceutical sector (as also the agrochemical sector); (b) Patenting of micro-organisms (i.e. patenting of biotechnological inventions); and (c) The protection of plant varieties (through plant breeder's right protection if not patent protection) require the special attention of developing countries. The extension of product patents to the pharmaceutical sector has important implications for (i) drug prices and (ii) development of the indigenous pharmaceutical industry. The impact on drug prices will chiefly depend upon the nature of the drug (that is, how essential it is) and the number of alternative drugs available for treatment of the disease concerned. The availability of previous generation drugs may act as a check on the price that a new patented drug can command. But if the new drug is a medical breakthrough, as for example, a vaccine against AIDS or cancer, the price commanded may be phenomenal. The TRIPS agreement does not affect the right of a country to regulate drug prices, but it must be kept in view that excessive control of drug prices could have an adverse effect on investment in pharmaceutical industry,

including investment in R&D. The TRIPS agreement also permits compulsory licensing for "public non-commercial use" by the government, but the possibility of using this mechanism would be very rare. As noted earlier, there is scope for using the compulsory licensing route for commercial purposes in a selective and judicious manner to protect a vital public interest. The use of compulsory licensing presupposes that the licence seeker has the technological capacity to produce the patented product in competition with the patent owner. This may not always be the case, and further more, the motivation to invest in R&D for developing cheaper process to manufacture a patented product may be severely inhibited by the uncertainty and difficulties that surround the grant a compulsory licence. Where a vital public interest is to be met, there will therefore be a need for some kind of governmental intervention and support for investment in R&D to develop alternative processes by prospective compulsory licence seekers.

75. The chief impact of product patents in the pharmaceutical sector is that it closes the option of indigenous industry to produce new patented drugs by "reverse engineering". It is beyond the financial, if not the technological, capacity of most enterprises and institutions (eg. research laboratories) to invest in high risk R&D and develop an new chemical entity from the laboratory to the pharmacist's shelf. But with strong fiscal and financial support from government, it may be possible in the long run for some enterprises and institutions to take up original R&D for inventing a new molecule, especially to tackle diseases common to developing countries (Contrasting the situation between developed and developing countries, it is often said that developing countries continue to suffer from "age old ailments", not "old age ailments"). However, for the majority of enterprises in developing countries, the introduction of the product patent system in pharmaceutical sector will call for a shift in strategy which may encompass the following: (a) joint ventures or co-marketing arrangements with TNCs (b) establishing joint ventures or co-marketing arrangements abroad, especially in other developing countries (c) focus on production of "generics" or drugs which will soon come off patent protection and (d) collaboration with TNCs in new drug development to take up an appropriate part of the drug development chain, especially in Phase-II or III of clinical testing. Developing countries which have acquired certain resilience and strength in their domestic pharmaceutical industry (eg. Brazil, China, India) have all these options to be examined and encouraged in order to sustain their pharmaceutical industry. For some other developing countries, some of these options may not be feasible, but they could, as noted earlier, use the strengthened intellectual property protection system to encourage the establishment of local production of patented products where such production would make industrial sense for the IPR owner.

76. The extension of intellectual property protection to new areas, such as micro-organisms and plant varieties, raises a number of complex issues, awareness and understanding which are still limited in developing countries. Bio-technology is the technology of the future in agriculture and industry, food and medicine, waste management and environmental protection. It is a knowledge, not capital, intensive industry. Many developing countries have attached priority to this sector and have started building up their capabilities, if not in the "new" or "gene biotechnologies", at least in the more mature areas (eg. tissue culture, diagnostic kits). It is of importance that even as they are building up their capabilities in this sector they pay attention to the policy, legal and institutional framework for patent protection for biotechnological invention. As discussed in Part-II of this paper, they will have to give careful consideration to the question of definition of micro-organisms and of patenting naturally occurring micro-organisms. As suggested therein, it may be advisable for them to exclude naturally occurring micro-organisms, how so ever derived or trivially modified, from patent protection and confine patent protection to genetically modified micro-organisms only and that too for the particular use or trait claimed for it. Another important issue for their consideration is the question of establishing or recognizing the culture collection centres for the deposit of micro-organisms for meeting the disclosure requirements of a patent application. It would be desirable, where the capacity exists, to make it obligatory to deposit a sufficient number of strains of the micro-organism in a designated domestic culture collection.

77. As regards the protection of plant varieties, given the substantial availability of plant breeding skills in many developing countries, it is in the interest of developing countries to establish a system for protection of plant breeder's rights in order to stimulate private investment in seed industry and to enable their public sector institutions to earn some reward for their investment in developing new plant varieties. This could contribute significantly to enhancing their agricultural production and productivity, and even to their making an entry in the world seed industry. Plant breeding skills and agro climatic diversity can be combined to yield tangible benefits under an appropriate plant breeder's right (PBR) system. But it is equally important to consider how the system for protecting biotechnological inventions and plant varieties could be combined with (a) the realization of economic benefits for the genetic material contributed by the country to intellectual property right holders and (b) the recognition of the "informal innovation" of farmers over generations in conserving and improving bio-diversity. These are complex and emotive issues : it has been alleged that " bio piracy " and free use of the traditional knowledge of the indigenous people are causing huge losses to the Third World. Patenting, it is argued, protects all knowledge and innovation except the knowledge and contribution of the indigenous people. The 'Madras Dialogue' discussed in Part - II of this paper suggests a methodology for implementing the concept of "Farmer's Right", but it is only partial in its scope because it cannot extend to international sales in the absence of an international system for recognising and rewarding the Farmer's Rights.

78. Perhaps the most important problem that developing countries may face in the emerging trade environment is the availability, cost and terms and conditions of environmentally safe technologies, including technologies related to packaging materials. The agreements on TBT and SPS give full freedom to countries to adopt and enforce measures they consider necessary to protect human, animal or plant life and health or the environment. Although the agreements lay down the general principles that such measures should not constitute arbitrary, unjustifiable or disguised barriers to international trade, and that as far as possible, the standards should be transparent and internationally recognised standards, the border line between the standards being necessitated by legitimate environmental concerns and their being employed as newer forms of non-tariff barriers may increasingly become hard to distinguish. Developing countries will be under constant pressure to ensure that exports, both of agricultural and industrial products, conform to the environmental and safety standards of the importing countries in the industrialised world.

79. As the European Union's Council Regulation No.880/92 of 23 March, 1992 introducing the "eco-label" award scheme typifies, the environmental standards will attempt to follow a "cradle-to-grave" approach. This means that the ecological criteria adopted for grant of an "eco-label" will encompass the entire life cycle of a product, starting with the extraction or production of raw materials, progressing through the stages of production, distribution and consumption, and ending with the disposal after use. Thus, for example, in the case of garments, the standards may apply from growing "organic" or "green" cotton with no pesticide residues to the garments being free from benzidine or azo-dyes and the method of disposal of the packaging. In other words, the process and production methods (PPM) in the developing countries will have to satisfy the desired environmental criteria as much as the end product and packaging reaching the industrialised country market.

80. Developing countries may face a two fold problem: (a) awareness and understanding of the standards being adopted by the importing countries; and (b) the availability, choice and cost of the needed technologies. With respect to the first problem, it is of importance that developing countries participate actively in the work of international standard setting bodies, besides establishing or enhancing the

technical competence of national regulatory and testing bodies.¹⁰ For this purpose, they may wish to seek technical assistance or advice from industrialised country or international institutions. In this context, the recommendation of the Eminent Persons Group (EPG), contained in the second report of the EPG to the summit conference of the Asia-Pacific Economic Forum (APEC) held in Bogor, Indonesia in November, 1994, is worth serious attention. The EPG has recommended the adoption of an "APEC Standards and Conformance Framework" with a view to harmonisation of national product standards and testing procedures, or in areas where this is not feasible, mutual recognition of each other's standards and testing procedures, including mutual recognition of each other's testing laboratories. Such mutual recognition could pave the way for acceptance of the conformity assessment principle "tested once, accepted everywhere". Bilateral, regional and multilateral cooperation is essential to give a push to this concept.

81. The cost and acquisition of environmentally safe technologies will pose an equally formidable problem. Much of the technology resides in private enterprises in the industrialised world, and much of it may also be closely held or protected by patents. Eco-labels, whether granted by government agencies or authorised by private labellers, may increasingly become the passport for gaining entry into industrialised countries, but the cost of their acquisition may eat into the profits or competitive position of developing country exporters. In any case, developing countries will need to develop and strengthen their skills in choosing and acquiring technology equipment, raw and other materials, and expertise that will enable them to meet the environmental standards adopted by the importing countries. Unless they develop their skills in this new field, they may find it difficult to realise the market access opportunities they have envisaged from the Uruguay Round agreements.

82. In this context, it may be worth noting that a major motive behind the drive of industrialised countries to adopt increasingly stringent standards on environmental grounds could well be the fillip it will give to their environment technology sales. As has been observed, for the industrialised countries, good environment is also good business. The environment technology (ET) industry is one of the fastest growing industries world-wide. The global market for ET is currently estimated to be in the US\$200 - 300 billion range and is expected to reach US\$ 500 - 600 billion by the year 2010. In the United States, the domestic ET industry was estimated to have a turnover of \$ 134 billion in 1992, with about 45,000 - 60,000 firms being active in the industry. Besides large transnational corporations, many small and medium sized firms are also active in this sector specialising in particular niches of the ET spectrum. Alive to the huge business potential of the ET industry, the U.S. Administration has created a separate Office of Environmental Technologies Export (ETE) in its Department of Commerce with the twin objective of pushing environmental concerns at international fora and promoting US exports of eco-technologies. Both in WTO and in bilateral or regional trade agreements, there will be a growing insistence on the inclusion of tough environmental clauses that will promote the interests of the ET industry of the industrialised countries. It is estimated that while U.S. exports 5 to 10 per cent of its ET output (despite its being the leading producer), Japan and Germany export about 25 and 30 per cent respectively of their annual production. An important target of their ET sales will no doubt be the developing country markets, especially the large and affluent markets.

83. Finally, there will be substantial administrative and institutional burden on developing countries in the implementation of the Uruguay Round agreements relating to intellectual property rights as well as standards on SPS and TBT. This will be particularly the case for least developed countries and other developing countries with limited experience in this field. They will have to formulate, amend or reshape their policy, legal, institutional, administrative and judicial framework. For example, the grant of patents will require their patent offices being staffed with adequate number of patent examiners who possess the

¹⁰ For instance, India has formulated a two-year action plan to establish 35 full fledged eco-testing laboratories to enable its textile industry to conform to the new ecological standards being enforced abroad. The action plan includes also dissemination of information on emerging eco-standards.

requisite knowledge in all fields of technology. In the matter of patenting "micro-organisms", they may need to establish or indicate the "culture collection" centres where deposits of micro-organisms are to be made. Considering the fact that patenting of naturally occurring micro-organisms is still in an evolutionary stage and the borderline between "discovery" and "invention" is often settled by court decisions, developing countries may need increasingly lawyers who are scientists, and scientists who are lawyers. The TRIPS agreement recognises the fact that developing countries will need substantial technical assistance to establish or upgrade their institutional framework for adoption and enforcement of intellectual property rights.