ESAP CHAPTER 3

INFLUENCE OF TRADE REGIMES AND AGREEMENTS ON AGRICULTURE KNOWLEDGE, SCIENCE AND TECHNOLOGY

Coordinating Lead Authors: Dale Wen Jiajun (China/USA), Dev Nathan (India)
Lead Authors: Lim Li Ching (Malaysia), Sukphal Singh (India)
Contributing Author: Marcia Ishii-Eiteman
Review Editors: Pascal Bergeret (France) Hira Jhamtani (Indonesia)

Key Messages

1. Since the mid-1970s “Asia other than Japan”, has emerged as a major exporter of manufactures and services and also as a major pole of world trade. The combination of the changing composition of demand for agricultural commodities in favour of more expensive foods, like fish, meat and poultry products and the comparative advantage of labor-abundant in Asian countries in the production of labor-intensive agricultural commodities, like vegetables and horticulture products, are both changing the composition of Asian agricultural output, with proportionately less grain and more non-grain output. In order to facilitate the transition underway in Asian agriculture, it, however, is necessary for Asian states to consider putting in place supporting measures, like training, market and quality facilitation, and so on.

2. Through utilizing the possibilities of international trade, all the economies of East and South-east Asia have seen a considerable reduction in the proportion of the population dependent on agriculture for their livelihoods. The shift to manufacturing and services has also, generally, improved livelihood and food security for households. Where women have been drawn into the labor force there is also generally an improvement in their well-being, despite increasing burdens of work. But there are worrying trends, particularly in South Asia, which show that nutritional outcomes, particularly of women and girls, are not increasing in step with higher incomes.

3. Further, as the Asian crisis of the late 90s showed, livelihoods in Asia are also more vulnerable to changes in world trade and payments situations. The countries of developing Asia have yet to put in place social welfare systems that would enable poor households and women (on whom the burden of adjust falls disproportionately) to adjust to the recessions and even depressions that inevitably accompany globalization.

4. At the same time, there are sections of the rural population who find it difficult to change their livelihoods and are adversely affected by competition from imports and where, particularly in small countries, there is little chance of budgetary support for changes in livelihoods. The conversion of agricultural land to industrial or urban use, also displaces many rural inhabitants (with the indigenous or tribal peoples disproportionately represented among the displaced) who are not the beneficiaries of the resulting industrial or other non-agricultural employment.

5. The current long-distance trade in agricultural commodities depends crucially on cheap transport costs. While ESAP countries should continue to utilize trade opportunities, they need to consider the possibility that with rising oil prices, increased transport costs may nullify production cost differences and thus threaten portions of international trade in agricultural commodities, with likely implications for the nature and location of AKST generation and dissemination.

6. Though per capita carbon emissions in developing ESAP are still lower than those in the developed countries, the total quantity of emissions in countries like China, India and Indonesia, is very high. Besides oil prices, it is likely that there will be other pressures on these countries to reduce emissions and shift to low carbon economies. While China has a large and growing non-carbon and renewable-input based energy sector, cheap imports of oil had earlier stopped development of biofuels. But new biofuels (e.g. palm oil in Malaysia and Indonesia, and jatropha or the endemic kusum in India) provide prospects for the development of new agricultural technologies, but there is the continuous threat of converting natural forests into plantation forests and that too monocultured plantations. Further, there is the choice between corporate or community ownership of such biofuel initiatives.

7. Vertical integration of food systems has marginalized primary producers, and the advancement of free trade may further this trend. But this does not mean that there can be no countervailing power, e.g. of organized primary producers, that would improve the share of primary producers. Increasing international trade in agricultural commodities has led to over-exploitation of natural resources in ESAP countries. However, there are positive examples of learning and technology development and systems of culture that have reduced pressure on natural stocks, though they have created new problems of waste management, environmental change, and for biodiversity conservation.

8. Systems of compensation for the provision of environmental services would increase the supply of these environmental public goods. In many Asian countries there are trends to payment of environmental service providers, as for instance in provision of water of stated quality and quantity for power projects.

9. The reduction of the negative consequences of growing international trade, however, is also one of adapting management systems, dealing with gender and other exclusions that occur.

10. There is also an individualization of community resources among, say, indigenous peoples.

11. More equality (gender equality in access to land, technology, etc.) and a reduction of social exclusion can increase productivity.

12. Import dependence for agricultural inputs and technology can create vulnerability for a country, which can be exacerbated by sudden political changes. While foreign exchange reserves can substitute for national food reserves, large purchases on the international food market can worsen the terms of trade and endanger food security.

13. International trade is based on the difference between capital-intensive and labor-intensive production. AKST developed in OECD countries is focused on labor-saving and thus may not be suitable for ESAP countries which require labor-using and land- and capital-saving technologies. Further, international trade is not an end in itself. Its purpose is to further the goals of improving livelihoods and reducing poverty. Labor–intensive technologies do have a comparative advantage in ESAP, which means that ESAP is more likely to develop international trade in more labor-intensive technologies and crops, than in labor-saving technologies and crops.

14. International trade in agricultural commodities takes place as part of a global value chain, a buyer driven chain, with few buyers and many sellers. As producers' groups, it is possible that the producers could increase their share of income from the value chain.

15. Prices of agricultural commodities in international trade have shown both a declining secular trend and large fluctuations. But the Asian developing countries have yet to develop the comprehensive safety net measures to protect well-being in a situation of growing risk and uncertainty. A movement up the value chain, for instance into processing, does allow for a higher price realization, but is inhibited by cascading of tariffs.

16. Continuing OECD subsidies in, for instance, rice and sugar, however, make Asian small producers unable to compete in external markets or domestic markets without tariff support, and have detrimental impacts on their livelihoods and food security. At the same time, many Asian countries' have limited fiscal capacity, which has resulted in Aggregate Measures of Support (AMS) or domestic subsidies that are lower than those allowable under WTO regulations.

17. Tariffs are used to protect against import surges, and for other situations requiring temporary protection; but they need to be combined with methods to increase productivity and to encourage shifts to production of other commodities, where necessary.

18. SPS measures have been used as trade barriers, which have led to trade loss, diversion and higher costs for developing countries in ESAP. However, they also have positive value in terms of promoting better human and animal health and environmental standards.

19. Forms of differential access, as allowed under the WTO to least developed countries, can be considered to be systematized across developing Asia in the various regional and bilateral trade agreements.

20. There has been distortion in agricultural R&D due to focus on major crops like rice and wheat to the neglect of locally relevant crops and technologies, which have been marginalized, both in the private as well as public sector.

21. Public-private partnership for AKST for pro-poor growth is needed at the local, national and global levels. This is needed due to the fact that the state or public sector lacks many capabilities to generate and disseminate new technologies cost effectively. There are many examples of such partnerships, but caution should be exercised to ensure that there is no takeover or privatization of the AKST processes and systems.

22. The shortcomings and inherent inequities in existing intellectual property systems, especially patents, are increasingly acknowledged, with concerns over the net adverse impact of intellectual property rights (IPRs) on developing countries, who remain net IPR importers. There is debate over the role of IPRs in development, with some claiming that high IPR protection is necessary to ensure returns to research investment and innovation. Yet, evidence shows that the monopoly of knowledge afforded by IPRs can be detrimental to development goals. In any IPR regime there will be a trade-off between rewarding development of knowledge and inhibiting the spread of knowledge and the capacity for reverse engineering, which are both crucial for development. While these issues are still being debated and not fully addressed yet, regrettably, higher protection of IPRs, even going beyond that required under the TRIPS Agreement, is increasingly advocated in free trade agreements, particularly with developed countries like the United States. IPRs should not be a WTO issue.

23. IPR standards under trade agreements have contributed to a shift in AKST, by facilitating private sector dominated research and consequently privately-generated and owned AKST. Patents, and to some extent plant variety protection (PVP), have played a part in the major consolidation of the global seed and agricultural input corporations, many of which are also developing transgenic crops. At the same time, public sector research is either stagnating or declining, and also faces barriers in terms of IPRs preventing access to research materials, tools and technologies. There is a need for governments to consider the use of competition law (e.g. anti-trust) to respond to the high level of concentration in the private sector. While some national level action has been taken to break monopolies and encourage competition, there is no international mechanism to deal with such issues.

24. The international trade regime raises issues of relevance, adequacy, affordability and access to AKST; in particular, IPRs may restrict access to plant material for farmers and threaten farmers' rights. Implementation of farmers' rights at the national and international level is critical

to ensure continued conservation and maintenance of agricultural biodiversity and associated AKST, and provide an important counterbalance to the rights accorded to formal plant breeders under PVP and patents.

25. Protection of traditional/indigenous knowledge remains an issue. There is a need to recognize and reward the contributions of local individuals or communities as knowledge holders and innovators, if the processes and systems of traditional knowledge generation and dissemination are to be harnessed. There are questions about whether patentability and ownership of such knowledge and technologies are appropriate, and what processes are needed to protect them and further to share the benefits of protection.

26. There is demand for GI protection for many Asian developing country products.

27. Transgenic crops can pose environmental, health and socio-economic risks, while the evidence for their benefits is mixed and inconclusive. With regard to poor and small farmers, it is unlikely that traded commodity transgenic crops, which are currently the bulk of commercially available transgenic crops, can meet their needs, as their agriculture is complex, diverse and risk-prone. Regulatory and monitoring capacity as well as institutional capacity and resources are lacking in many developing countries, which are mainly importers of transgenic crops. Therefore, the precautionary principle and the principle of prior informed consent need to be implemented, and these are put into operation in the Cartagena Protocol on Biosafety, which primarily regulates the trade in transgenic organisms. Labelling and traceability of traded transgenic crops and products would help address consumer demands, as well as enable biosafety functions such as monitoring, correlation with risk assessments, product recall, emergency measures, liability and redress.

28. Trade agreements have not sufficiently taken into account environmental, social, labor and health dimensions. Governments need the policy space to be able to take environmental, social (including labor) and health protective measures. Other instruments, such as multilateral environmental agreements, labor standards and social development instruments are also necessary. Bilateral and regional free trade agreements can restrict policy space and make it more difficult for governments to implement and enforce environmental, social and health protective measures.

29. There is good opportunity in organic and fair trade products, which are emerging as important niche markets growing at high rate around the globe. There is need to mainstream organic and fair trade movements without bringing in the ills of conventional chains. Organic and fair trade

movements contribute not only to environmental and economic sustainability, but also help rural livelihoods in a sustainable manner.

30. Alternative and domestic markets need to be developed for better and sustainable development as these are the more easily attainable and locally relevant ways of dealing with issues of sustainability and food security and avoiding ill effects of international markets which are highly volatile in their response.

3.1 Introduction

The influence of national, regional and international trade regimes, agreements, intellectual property rights and the regions' response to them and the role of AKST in addressing these is assessed in this chapter. After a broader context setting on trade agreements and regimes, the assessment on WTO and AKST elaborates on impact of biotechnology and information and communication technologies in production systems along with issues of intellectual property rights. The combination of the changing composition of demand for agricultural commodities in favour of higher quality foods, like fish and meat products, and the comparative advantage of labor-abundant in Asian countries in the production of labor-intensive agricultural commodities. Globally as well as in this region, there has been concern about the effect of trade agreement on environment, health and other social dimensions and these are assessed in the last subchapter of this chapter.

Context

The structure of world trade is changing. From the early trade of manufactured goods for raw materials, in the post-Second World War period there was a growth of inter-firm trade, as firms became transnational and set up vertically integrated production bases in different countries. More recently, however, there has been a globalization of production and supply chains, in general a globalization of value chains. With this rather than vertical integration there is the global cutting up of parts of a value chain. Trade don't capture the change in trade within value chains, since, other than in transport equipment and machinery, a distinction is not made in trade between components and whole products. But there are many analyses of the growing importance of intra-industry trade, referred to as "outsourcing" (Feenstra, 1998) or "vertical specialization" (Yeats, 1998).

With this change in the structured of trade, in which Asia has participated perhaps more than any other region, there has been a double shift, one in the composition of trade and two, in the poles of world trade. In the composition of commodity trade there has been a shift from agricultural products (food and agricultural raw materials) which used to account for nearly 50 percent of exports in 1960 to just 7 percent in 2001 and a corresponding increase in exports of manufactured goods from les than 20 percent in 1960 to almost 70 percent in 2001 (Table 3.1: UNCTAD, 2002 and UNCTAD, 2004). Thus exports of food and agricultural raw materials have steadily become less and less important in the exports of developing Asia.

The growth of the Asian economies and the greater importance of trade in their economies have together made Asia an important pole of world trade. Japan, of course, was already one of the triad of world trade, the other two being the US and Europe. But this triad of world trade has

turned into a quad, with “Asia other than Japan” joining in as a new pole of world trade (Gibbon and Ponte, 2005).

Within this pattern of world trade there is also a growth of South-South trade. In 2001 in developing Asia 41.5 percent of exports went to developing Asia itself (UNCTAD, 2004, p. 53). But this trade concentrated in the economies of East Asia. It is mainly of a production-sharing type, resulting in a “triangular trade” pattern, i.e. the more advanced economies within East Asia, e.g. Republic of Korea, Taiwan, export intermediate products to China, where they are inputs for production to be re-exported to developed countries (UNCTAD, 2005, p. 135).

The above, however, is only true of manufactured goods. In the case of agricultural products, South-South trade is not of a triangular nature. It represents final export to meet growing demand, based on the growth of incomes in developing countries. In the middle- and low-income countries growth of income leads to a growth in demand for agricultural commodities, more than in developed countries. This has benefited those economies that mainly export agricultural commodities (UNCTAD, 2005, p. 136). Within Asia, for instance, Vietnam has increased its exports of rice, coffee, and fish, both to markets within the region and to developed countries. Of course, in line with other developing countries of Asia, there has not been a one-sided reliance on exports of agricultural commodities, but also a push in exports of manufactures, labor-intensive manufactures, in particular.

The pattern of consumption of food differs from one country to another. But what is common is a falling share of grain and a switch to higher quality foods, like meat, fish and milk products. Such a switch, however, may be the result of growing inequalities in food consumption (see Utsa Patnaik for a discussion of this issue in the Indian case). The lower sections may have gross deficits even in basic calories while the upper sections diversify their food consumption into higher value foods.

Free trade agreements in ESAP

Of the 33 countries in the ESAP region, 22 are currently members of the World Trade Organization (WTO), with about 6 more countries in the process of accession negotiations. Thus, the rights and obligations under the multilateral trade regime, via the WTO, play an important role in ESAP countries.

There has, however, been a proliferation of bilateral and regional free trade agreements (FTAs), with varying degrees of scope, commitments and obligations for the ESAP countries. Globally, some 250 FTAs have been notified to the WTO up to December 2002. Over 170 such

agreements are currently in force; an additional 70 are estimated to be operational although not yet notified. By the end of 2005, if FTAs reportedly planned or already under negotiation are concluded, the total number in force might well approach 300.

Gibbs and Wagle (2005) provide a comprehensive list of FTAs in Asia (not inclusive of the Pacific – see Chapter 1 for this list and also for further details of some of the FTAs in force and currently being considered or negotiated for ESAP).

With this rise in the number of bilateral and regional FTAs, there has been a considerable increase in the number of overlapping agreements. This results in the consequent emergence of the so-called “spaghetti bowl”, with associated myriad of rules, which can strain institutions charged with administering trade agreements (World Bank, 2005). Furthermore, bilateral and regional FTAs can be “WTO-plus”, with provisions that go beyond WTO obligations (Gibbs and Wagle, 2005).

Of particular concern are the FTAs between developing countries and developed countries like the United States. These North-South FTAs are very comprehensive in scope, and extend into the realm of domestic policies (Gibbs and Wagle, 2005), covering areas beyond trade in goods, to include the opening up of services, government procurement, protection of intellectual property rights (IPRs) and creation of new investment privileges and protection (such as binding dispute settlement mechanisms that allow investor-state disputes). They expand what has currently been agreed to in the WTO, and may set precedents that can then be reintroduced in the WTO.

Even where issues already come under the WTO (e.g. intellectual property and services), the flexibilities and options open to developing countries in interpreting and in implementing their obligations are often removed or reduced through the FTAs proposed by developed countries (TWN, 2005). Thus, the “policy space” for developing countries to pursue national development and socio-economic goals may be significantly reduced.

The U.S. FTAs in particular seem to be used to influence partners in larger or multilateral negotiations, and “to establish precedents that consolidate the U.S. position on issues where it has serious differences with its trading partners (such as on GMOs, geographical indications or audio-visual services)” (Gibbs and Wagle, 2005). Foreign policy and security issues also play a part.

Of relevance to agriculture, FTAs do not establish disciplines on the agriculture subsidies in the major developed countries, and this exposes farmers in the developing partner country to unfair

competition (Gibbs and Wagle, 2005). The U.S. FTAs, for example, do not have commitments on anti-dumping or agricultural subsidies, and cover all products (i.e. in terms of obtaining market access), with the exception of "sensitive" ones like sugar. This creates the potential for imbalances in the agreement.

As U.S. FTAs generally ask for agricultural tariffs to be lowered to zero, although with varying time periods of implementation, many developing country farmers would be unable to compete with the influx of subsidized U.S. agricultural products and may be adversely affected. For example, under the North American Free Trade Agreement (NAFTA), from 1993 to 2003, exports of U.S. agricultural produce to Mexico more than doubled, climbing from $3.6 billion to $7.9 billion. Over a similar period, Mexico lost nearly 2 million agricultural jobs, according to Mexico's National Employment Survey (The Washington Post, 2007).

Moreover, U.S. negotiators are also constrained by the Bipartisan Trade Promotion Authority Act of 2002 (currently in operation), which prevents U.S. FTAs from reducing the rate of duty below that applicable under the Uruguay Round Agreements, on "any import sensitive agricultural product" (TWN, 2005). This constraint means that developing countries may not be able to obtain the market access for products that are of export interest to them. Furthermore, non-tariff barriers such as sanitary and phytosanitary measures may still act to limit developing countries' agricultural exports.

On IPRs, U.S. FTAs often demand TRIPS-plus provisions, including requesting the developing country partner to accept patenting of life forms and to accede to the 1991 Act of the International Convention for the Protection of New Varieties of Plants (UPOV) or UPOV 1991. The patenting of life may have considerable socio-economic impacts, such as causing a shift in agriculture towards large biotechnology companies. This would potentially disrupt access to essential products such as seeds and foodstuffs, and grant the companies greater control over the agricultural production chain (Kuanpoth, 2005),

Ratification or accession to UPOV 1991 is a requirement in U.S. FTAs with Bahrain, the Central American countries - Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua - under CAFTA, Chile, Colombia, Morocco, Oman, Peru and Singapore.

Such obligations remove the flexibility afforded under the TRIPS Agreement that allows countries to choose the option of a sui generis system of plant variety protection, which could be tailored to protect farmers' rights (TWN, 2005). The UPOV 1991 system currently restricts farmers' rights to use and save seed, and prohibits them from exchanging or selling seeds of the varieties it

protects, thereby subjecting poor farmers who depend on farm-saved seed to dependence on commercial breeders.

There are also numerous South-South FTAs, which may be able to promote South-South trade and allow countries to export goods for which they face market access barriers in the North. South-South FTAs may be more equitable in that there is less of an imbalance between the negotiating partners and they are less likely to be as comprehensive in scope as the North-South FTAs, since they tend to focus mainly on trade in goods.

Nonetheless, the South-South FTAs have to be also assessed carefully to ensure that the overall benefits outweigh the costs for the countries concerned and that any sectoral implications as a result of the liberalization of tariffs on goods are properly addressed to help with adjustment costs. For example, under the Thai-China FTA, agricultural tariffs have been lowered on 116 types of fruits and vegetables, including garlic and onions, from 1 October 2003. Since then, Chinese garlic has entered the Thai market in large quantities and at lower prices, with the result that garlic growers and small traders have lost their livelihoods (Narintarakul and Silarak, 2005). Red onion producers in Thailand are facing similar difficulties.

It is clear that the rapidly changing landscape of bilateral and regional trade agreements within the ESAP region needs to be closely analyzed, in order to ascertain the benefits and costs to developing countries, particularly of what some have termed ‘asymmetric’ North-South FTAs. A major issue would be to ensure that policy autonomy is retained for national development and the particular needs of each society.

Major players: their roles and interactions

Different countries and block of countries have major roles depending on their roles are importers or exporters or both driven by size of population, their food production. More recently, large corporations have become major players and have influenced trade policies.

Within Asia, China and India, with their large and growing markets will have a substantial influence on the pattern of trade. Because of the size of their economies, their influence is likely to be greater than that of Japan or Republic of Korea during a corresponding period of their ascent as manufacturing powers (UNCTAD, 2005, p. 43) b.

The influence of China is already being felt in both global and regional markets; while India’s influence is not as yet as broad, nor even as strong in a regional sense. With China already achieving basic calorie requirement levels (accepting the regional and socioeconomic-based

inequalities in such an aggregate measure), there is likely to be a further rise in demand for livestock products, oil crops, vegetable oils, fruit and vegetables (FAO, 2002) and with the boom in home construction for wood. In India there is a lag of a decade or so, as compared to China, in the changes in the pattern of consumption. There is still considerable scope for increase in consumption of basic calories and an increase in per capita food consumption.

Some of the boom in demand is clearly negative, as in the case of demand for wildlife products in East and South-east Asia for food and medicine. This has driven the illegal trade in wildlife trade in the region (World Bank, 2005).

Both Japan and Republic of Korea have substantially protected rice markets. But for other agricultural commodities, including fishery and meat products and vegetables, they present large and growing markets.

Overall in Asia, the dietary pattern is changing not only towards higher value foods but also to the use of semi-processed and processed food stuffs, which are more convenient even for home cooking and even towards more consumption of food outside the home (Popkin, 1993). The last trend is particularly influenced by the large-scale entry of women into the non-home-based labor force.

Within the ESAP region, Australia and New Zealand are both large agricultural exporters. They are among the Cairns group of countries that press for free trade in agricultural commodities. They are joined by Thailand and Vietnam, both of which are efficient agricultural producers.

The other major players are the developed economies of North America, Europe and Japan. Their policies have affected the trade prospects of Asian countries in many agricultural commodities. They were all substantial importers of sugar, but subsidized production of corn-based and beet-based sugar have changed the picture. Since the early 70s, US sugar imports have declined from more than 5 million tons per year to just more than 1 million tons per year. The EU has changed from a net importer of 2.5 million tons in early 70s to a net exporter of 5 million tons, while Japan's sugar imports have fallen from 2.5 million tons to 1.5 million tons per year (Mitchell, 2005, p. 141). At the same time, the EU also exports about 5 million tons of sugar at the lower price created by its subsidies, thus further undermining the price received by farmers and producers in developing countries (Robbins 2003).

Countries, however, are not the only actors in the region, or, for that matter, in the world as a whole. Trade policies are decided by countries and their governments. But these policies themselves are influenced by the various lobbies in the countries. In fact, even WTO policies are

influenced by corporate interests, which maintain substantial lobbying presences at WTO headquarters in Geneva (ActionAid, 2006).

Corporations, particularly the big multi-national corporations, influence economic decisions in the region not only through their lobbying with governments and international bodies, but also through their economic practices. Production is more and more being organized in global value chains, as mentioned in the Introduction to this chapter. Agricultural commodities, in particular (though not only agricultural commodities) are organized in what are called buyer-driven or retailer-driven value chains. The big food retailersand producers have substantial influence over prices that are paid to producers of primary agricultural commodities at the end of the value chain. In their product markets there is oligopolistic competition. The price pressures of this competition are passed on to the producers through lower prices. As the analysis of Singer in the Singer-Prebisch thesis, pointed out, it is competition among producers with no better alternative, that enables buyers to gain lower prices from small producers (Singer, 1950).

The big retailers and other lead firms use their dominant position. A study of British supermarkets found that “buyer power was used to extract concessions on price, to enforce nonstandard (and in certain cases predatory) contractual terms, and to leverage significant changes in the traditional division of labor between retailers and suppliers (Gibbon and Ponte, 205, p. 18). Case studies in Asia (e.g. Harilal, et al, 2006, and SOMO, 2006) bring out the poor well-being consequences of such power in global value chains. Concentration is not only a factor among buyers in agricultural product markets. It is also increasing in agricultural input markets (UNCTAD, 2006).

A set of players that has recently entered as policy makers in international markets are consumers. Particularly in developed countries, consumers and consumer lobbies have become more active in demanding certain standards. This is sometimes reflected in improved SPS standards, some of which have becomes contentious issues between developing and developed countries. But there are also other standards, environmental standards, for which consumers have shown a willingness to pay a premium on standard prices and include organic food, shade coffee and certification of sustainably harvested wood products.

A study by the International Trade Centre (ITC) of UNCTAD and the WTO surveyed the European market for organic foods and beverages. A major conclusion of the study was that demand for these products is growing rapidly (see also subchapter 3.4.5) and that insufficient supply rather than demand is the problem for these markets (Kortbech-Olsen, 2001). There is also a growing demand for organic foods in the urban centres of many Asian countries, though it

is still quite limited. A study by IFAD reported that China's production of organics under the Green Label was close to $12 billion, which almost matches the size of the US market, the largest organic market in the world (IFAD, 2005) India's exports of organics was just about $15 million, though a lot of organic production is consumed locally and not marketed outside the locality.

There are also other forms of consumer standards, as the Forest Stewardship Council (FSC) certification. The certification is expected to be based on environmental and community-role criteria. The 'Bird Free' symbol of 'Shade grown coffee', again, certifies the non-destruction of forests to clear space for coffee plantations. All of these certification systems provide for some premia on price, probably to make up for the loss of productivity.

While consumers and consumer lobbies have begun to have some impact on international trade in agricultural commodities, producers' associations have not had the same impact. In the first few post-WWII decades marketing boards for many agricultural commodities, like coffee and cocoa, tried to control prices and reduce outputs. But the weaknesses of these opposition from buyers' lobbies, and the spread of production outside export quotas (e.g. Vietnam's entry into world coffee markets) undermined the boards. The post-WWII experience would lend itself to the hypothesis that changes in the location of production cannot be managed through export quotas, as countries keen to expand their own export opportunities are likely to undercut established producers (Nathan, Reddy and Kelkar, 2006).

National policy trends

Within the ESAP region there are a number of differences in national policy. In the OECD members, Japan and the Republic of Korea, there is a strong protection to their rice producers, often justified on the basis of national culture, or tastes. For Australia and New Zealand exports of agricultural commodities (including livestock) are an important source of national income. They, along with other members of the Cairns group press for removal of restrictions on trade. This is a measure from which they expect to gain a larger share of world agricultural exports.

In developing Asia, there is a difference between East and South-east Asia and South Asia. In most of East and South-east Asia the proportion of the population dependent on agriculture has come down substantially over the last few decades. Among them, for Thailand and Vietnam, agricultural exports are important but account for a declining share of total exports, as manufactured exports have increased.

But in Indonesia and the Philippines there is a large proportion of population still dependent on agriculture, more like the picture in South Asia, where there is still something like 50 percent of the population dependent on agriculture as the mainstay of their livelihoods. The high numbers of

people dependent on agriculture and the relative stagnation in agricultural technology, and yields, along with the lack of growth or insufficient growth of labor-intensive manufactures have made it difficult to move more people out of agriculture.

The above differences within South-east and South Asia are reflected in different national policies. In countries like Thailand and Vietnam there is a stress on increasing productivity, so as to retain or improve their competitive positions in world agricultural trade. In China too there is a similar stress on improving productivity and moving into high value agriculture. In both cases the attempt is to improve infrastructure and provide research and technology development and marketing support.

But in South Asia (as also in Indonesia and the Philippines) there is a much greater stress on protecting domestic producers from international competition. While there are moves to diversify into high value agriculture, these are not as consistent. In the 'Green Revolution belt' of Punjab-Haryana continued minimum price support to wheat and grain (a support that is not provided to wheat and rice farmers in most other regions of India) continues to stall attempts at diversification, as the rates of return from assured grain prices inhibit a shift towards more risky, if higher return, crops (see Joshi et al 20004 and Rao et al 2006).

Along with the above, there are also trends to opening up sections of the agricultural markets, for instance in cotton. In India this has led to a fall in cotton prices, affected as they are by competing imports from subsidized producers, like in the US (Philip and Jenniah, 2006). "Between the period 1990 and 205 the import of cotton lint increased at a compound growth rate of over 75 percent, growing in geometric multiples to domestic production. The price witnessed a decline of more than 55 percent between the years 1996 and 2003. In terms of individual years, the prices dipped as low as US$1000 per tonne in the year 2002," (Philip and Jenniah, 2006, p. 5). The plight of cotton farmers was compounded by the many instances of sale of spurious Bt cotton seeds. The destitution of many farmers has resulted in numerous suicides. This has become a frequently recurring political issue.

Overall, South Asia, in particular, has yet to work out ways to effectively deal with the opening up of agricultural markets. It is less of a problem in East and south-east Asia, affecting a much smaller proportion of the population and where there has been more of a stress on achieving transitions to more productive methods of cultivation and higher value crops.

Trend in private and public institutional roles

Some of the studies referred to in this chapter point to, as the UNCTAD study put it, the weakness of "world governance on questions of corporate conduct and competition" (UNCTAD, 2006, p. 38). Whether it is competition policy or corporate governance, there has been a globalization of economic processes, but not a globalization of the regulatory framework. This is an important public issue that affects agriculture and trade.

An example can be given to illustrate this problem of corporate conduct. When China, as a concession to the growing trade surplus with the USA, agreed to buy soya, prices of soya immediately began to go up. They went up from $7.70/bushel in December 2003 to $9.82/bushel in March –April 2004, and when China completed its purchases, the price promptly fell to $5.93/bushel in August 2004. It was estimated by the Chinese Academy of Science (http:www.hinafeed.org.cn/cms/_code/business/include/php/218139.htm) that China overpaid $1.5 billion on this purchase. What is of greater interest is the next part of the story. Because of the high import prices of soya, many processing plants in China went into the red and as many 64 out of 90 soya mills are now partly or wholly owned by the same soya trading companies, ADM, Cargill, Bunge, and Luis Dreyfus. International trade still does not have the regulations and organizations to deal with such cartel behaviour.

Trade and food security

3.1.1.1 regional experience of trade and food security

[References in this subchapter will be put in later]

There are substantial gains from international, particularly, regional trade in food grains. Carrying and transport costs can be lowered as regional trade in food grains becomes part of the national food management system of countries, particularly smaller countries. But the ability to utilize regional trade to supplement domestic production depends on the country concerned having adequate foreign exchange reserves, otherwise it can be subject to unwanted external pressures.

Farmer households do react to market prices in deciding between production alternatives. But market prices are lowered by subsidized exports, something done not only by developed countries but also by developing countries, as are rice exports by Thailand, India and Vietnam.

Thus, given the twin realities of power relations and subsidized exports, countries cannot depend entirely on market-based individual household production decisions to set domestic food production levels. Subsidized exports can justify import duty to the extent of the subsidy.

In the absence of improvements in public service delivery like irrigation and other agricultural infrastructure, adequate research and extension, and adequate institutional credit and marketing channels, poor producers remain trapped in low productivity states. Poor and food insecure households can benefit from expanded opportunities of trade provided that those constraints are addressed. Giving voice to poor producers' interests by placing these issues on the policy agenda is crucial for fostering reforms that unleash the productivity potential of poor people and increase their bargaining power.

Importantly, however, food security issues are related not only to poor producers but also to poor consumers. Low prices of food, brought about through imports of cheap food, when combined with increased productivity, can lead to both higher real wages and increased farm incomes. Internal political economy considerations, i.e. the strength of different lobbies, determine the level at which food prices are set. But setting import duties higher than the extent of subsidies provided by exporting countries would further erode the food security gains of higher real wages. The possibility of substantial unofficial trade to take advantage of price differences in neighbouring countries, in fact, sets a limit to the extent to which import duties can be greater than transport costs.

As detailed below, small producers' livelihood are often threatened by imports. In the manner of providing domestic support, however, measures to increase productivity are superior to providing subsidies to continue high-cost production. They would not only increase national productivity but also can strengthen the fiscal position as compared to subsidies.

Household food security would be improved by allowing farm households to choose their own mix of crops and livelihoods, reacting to market prices and their own aspirations, rather than have the mix of crops dictated by administrative decision. Farmers in many areas of Nepal, Bangladesh, Indonesia, etc. are themselves moving into areas of comparative advantage, like vegetables and such-like crops, which require more labor than cereals. But developing competitiveness in new areas of production requires substantial support, especially in improving quality and building capabilities, for instance, in meeting Sanitary and Phyto-Sanitary Standards.

Thus, uniform rules on the nature and measures of support cannot be applied to developed and developing countries alike, in particular, to LDCs. Developing countries in general, and LDCs in particular, with narrow markets countries and not-so-developed capabilities, need to provide specific support to build on areas of comparative advantage. If they are bound by the restrictions of the WTO, disallowing benefit or support that is specific, they will be unable to undertake the

necessary diversification of production that can increase household incomes, and thus food security.

Prices of primary commodities, like coffee, however, are subject to substantial fluctuations, threatening the food security position of producing households. But measures of price stabilization can be combined with steps to encourage diversification of product use, as is the case with palm oil. Further, as lower cost producers, or producers willing to accept lower returns enter the market, higher cost producers need support to move into other areas production, with disincentives for not doing so.

In all of the above measures of changes in production structures responding to comparative advantage, gradual change would reduce the social costs of the transformation compared to 'big bang' type of change, and would thus be more desirable

Freer trade, and not just regional trade, has created new livelihoods, as in various labor-intensive sectors of manufacture. Though work in the garments industry does not meet standards of 'decent work', it provides improved food security to millions of women and their households across developing countries. In dealing with the competition among countries in attracting capital in such industries, the tendency to lower labor standards can be countered by global action of the workers and civil society organizations to set minimum labor standards.

Migration is gaining importance as a source of livelihood, and thus household food security. Through foreign exchange remittances, it is important even in even national food security. The legalization of migration and the regularization of remittances would increase the returns from migration.

Where women have participated in the commercial process fostered by trade, they have gained in household and social position, though often at the cost of an increased work-load. But the frequent exclusion of women from long-distance trade may be tackled by access to capital, training and facilitation measures.

The non-market access rights of tribal or indigenous peoples to land and forests, which are important for their food security, may be eroded through trade agreements which open up land to the market. At the same time, the increased scale of production fostered by commercialization cannot be sustained without a transformation of indigenous property systems in the direction of individualization or regulated commons, so as to link investment and returns.

Below, some details of negative effects of liberalization of trade on food security of specific groups of small producers are detailed.

3.1.1.2 Globalisation and the upland poor

With underdeveloped infrastructure, the upland and mountainous areas of Asia suffer from social deprivation due to political neglect and remoteness. According to IFAD (2001), the current process of globalization increases the risk of further marginalization, disempowerment and desperation, unless it is specially adapted for these areas.

The limited accessibility, fragility, marginality and diversity of the mountain areas generally require diversification of resource use and production. But globalization, guided by short-term profitability and external demand, promotes narrow specialization in few specific products. It encourages indiscriminate resource-use intensification and over-extraction of niche opportunities, with little concern for their environmental and socio-economic consequences. The process of globalization is so rapid that mountain communities do not have sufficient lead-time and capacity to adapt (IFAD, 2001).

According to IFAD, several processes are in operation through which globalization is eroding the mountain areas' niche of comparative advantages:

- In response to high external demand and profitability, globalization introduces new incentives, technologies, infrastructure and support systems. As a result, man-made facilities are created for the production in the plains, undermining the comparative advantages held earlier by mountain areas. In India, for example, products such as off-season vegetables, crop seeds, honey, mushrooms, flowers and herbs can now be produced cost effectively, and in large quantities, in greenhouses in the plains of Punjab, substituting the production of such commodities in the mountain areas of Himachal Pradesh.
- Trade liberalization and the opening up of imports will further erode the comparative advantages of mountain areas in the production of high-value commodities, as they will not be able to compete with cheap imports on domestic markets. For example, it is difficult for apples from the mountain areas of India to compete in the domestic market with imports of apples from developed countries.
- Lack of resources and skills prevent mountain people from participating in, and gaining from, opportunities offered by globalization, which is leading to their exclusion from the global economy.
- Mountain people are also being exposed to resource-base exclusion, as huge areas of land are leased out or auctioned to outsiders for mining or tourism development or cultivation of non-timber forest products (NTFPs) in many countries of the region.

3.1.1.3 Cases of Cheap Imports Affecting Local Farmers

Asian farmers' associations asking for protection from cheap imports.

In many Asian countries, small farmers have been or anticipate being affected by competition from imports that are cheaper than their products. Their organizations have been raising the alarm and requested assistance from their governments. An example of Asian farmers making such requests was at a meeting of Asian farmers' associations grouped in the Asian Farmers Group for Cooperation. A report by Antara News Agency (19 April 2000) stated that the Group at their second meeting held in Jakarta would ask the WTO to let Asian countries continue to protect their agricultural products. Its president, Sutrisno Iwantono (also chair of the Indonesian Board of Cooperatives) said the WTO was tending to be more representative of developed countries' aspirations, and wanted to abolish import duties particularly of developing countries. "We don't want this situation. We will ask the WTO to give priority to efforts to make developed countries open their markets first." The agriculture sector is important particularly to nations with large populations. If the sector was liberalized, many farmers would move into the industrial sector. Iwantono added that if they no longer want to be farmers, the Asian countries would be threatened in the matter of food security.

3.1.1.3.1 Sri Lanka Farmers Facing Competition from Imports

The Sri Lankan agricultural sector has come under heavy pressure from increasing competition arising from cheap imports resulting from import liberalization.

That this would pose problems for Sri Lanka and for IFAD projects in the country was suggested by an IFAD Country Program Evaluation Report for Sri Lanka (Jan 2002). The report emphasized that a key factor for the sustainability of projects supported in that country relates to appreciation for the future prices of agricultural commodities in general and of rice in particular. It added that in view of the impending liberalization of markets, it would be necessary to assess the farmers' resulting improvement in productivity in relation to import and export parity prices, rather than financial prices in the local market. It observed that long term forecasts suggest that prices of agricultural commodities in general and of rice in particular would decline significantly over time.

The report recommended that the comparative and competitive advantage of Sri Lanka to produce particular commodities be considered in selecting IFAD's interventions in future projects. "Such considerations do not appear to have entered into the preparation of previous and ongoing projects," asserts the evaluation report.

There have been reports of protests of Sri Lankan farmers who were adversely affected by cheap imports. According to an IPS news report on 30 August 1999, the protests were held first by potato farmers, then by chilli and onion producers and then chicken farmers who were up in arms against cheap and ruinous imports (Samath 1999). The report added that with Sri Lanka's once-thriving poultry business buckling, farmers said they are forced to sell below production cost. There are 75,000 chicken and egg farmers with more than 200,000 involved in the trade. Thousands of small farmers, worried about growing imports of chicken meat and eggs, took to the streets in April 1999, demanding the government ban imports since it was affecting their livelihoods. In response, the government said it would permit imports only under licence and put in place a proper pricing formula for imports.

The report also stated that potato, onion and chilli farmers have been complaining about the influx of cheap imports from India and Holland. Local farmers were unable to produce food cheaper than their foreign counterparts and were demanding protection through higher import duties and lower local taxes and reduced tariffs on imported inputs.

A study on Sri Lanka by the FAO in 1999 observed that the impact of import surges on major food items like chillies, onions and potatoes "...seems precarious, as reflected in the significant drop in areas of production and the rise in imports." (FAO 2000).

According to the FAO report, the risk of high dependence in imported food items such as onions became obvious in 1998 when India imposed a ban on onion exports, resulting in more than a quadrupling of retail prices of onions in Sri Lanka, to almost 80-100 rupees per kg. Moreover, local production fell to 17,000 tons as the area cultivated was reduced significantly, with unfavourable consequences for both onion farmers and consumers.

3.1.1.3.2 Philippines and Poultry Sector

In 2000, the U.S Agriculture Department accused the Philippine government of violating WTO rules when the import of US chicken was disallowed. The Philippine government limited the import of U.S chicken according to the Minimum Access Volume (MAV) to curtail dumping. According to the MAV, only 19,000 metric tons could be imported to safeguard the local chicken industry. (The Philippine Daily Inquirer, 21 July 2000).

U.S. chicken, whose price was at one time as low as P60 per kilo at the shelves, is priced below the cost of production. "These are excess produce of the US market that is being dumped here and is killing our local chicken market which is priced at about P91 per kilo, already down from P120 before US chicken flooded the market", said the Philippine Daily Inquirer article. It added that 330,000 workers or a third of a million in the chicken industry were affected.

Domestic chicken production is almost enough to meet local requirements. According to IBON Foundation, a Filipino research institution, due to the country's commitment to the WTO, chicken imports grew tremendously in 1998. More than half of the chicken imports in 1996 came from Singapore and 12 per cent from China. In 1997, the U.S accounted for four-fifths of chicken imports. From 1997 till 2000, the U.S and Canada accounted for 79 per cent of chicken imports. (IBON, 2000)

3.1.1.3.3 China and Impending Competition After Entry into WTO

The economic reforms in China, especially on the occasion of China's entry into the WTO, have led to concerns by some senior officials as well as experts that there may be adverse effects on the competitiveness and livelihoods of local farmers.

According to a report by Peter Goodman in the International Herald Tribune, 26 September 2002:

"China's leaders worry that economic reforms could be placing more burdens on farmers than they can bear. Farmers are on the receiving end of the earliest and sharpest changes from the new policies that China agreed to implement to gain entry to the WTO. Protective tariff must be lowered. Foreign foods must be allowed into the country to compete with local produce….According to a report by China's State Council, the country's WTO commitments are likely to wipe out the livelihoods of 13 million farmers who grow wheat, rice and cotton, while creating new ones in non-grain crops for only about 1.5 million. Some economists reckon that China will eventually need to find jobs for about 200 million farmers as its market reforms continue. 'The Chinese farmer is in a very unenviable position,' said Ke Bing-sheng, director general of the Research Centre for Rural Economy, which is part of China's Ministry of Agriculture. 'The impact of reforms on agriculture is profound.'"

According to another report, by Bill Savadove, carried by Reuters news agency on 5 February 2002:

"China is facing big challenges in raising the incomes of farmers and keeping a lid on social unrest in 2002, its first year in the WTO, said Agriculture Minister Du Qinglin. China's entry into the WTO will bring a flood of foreign farm imports and speed layoffs in a country where almost two thirds of its 1.3 billion people live in the countryside. 'After WTO entry, imports will lash China's agriculture. The difficulties will be more prominent,' Du told a news conference….Analysts say farm product prices are likely to fall this year as imports increase after WTO entry, since domestic prices are far higher than in the international market. China must find jobs for 40 million

'surplus' rural workers between 2001 and 2002, officials say. Du said 78 million rural dwellers migrated in search of jobs at some point last year."

3.1.1.3.4 India and Import of Skimmed Milk, Butter Oil and Milk Powder

Indian farmers have in recent years faced competition from imported skimmed milk. According to Devinder Sharma (2002):

"The import of 17,000 tonnes of skimmed milk powder from Denmark at zero duty a couple of years ago resulted in a political uproar in Punjab. The dairy industry is once again up in arms. New Zealand has dumped a large quantity of butter oil into India. Even after paying an import duty of 35.2 per cent, the butter oil imports have been at less than US$1,000 per tonne against the prevailing global price of US$1,300 per tonne. Domestic prices crashed, coming down by 10-15 per cent….

It took India nearly 30 years to achieve self-sufficiency in milk production, involving farmers through a network of cooperatives….The logic behind allowing MNCs to import milk powder without countervailing duties is difficult to fathom, when their own governments are giving them massive subsidies. The Producer Subsidy equivalent (subsidy as a percentage of value of milk produced) in 1997 was 82 per cent in Japan, 59 per cent in Canada, 54 per cent in the EU, 47 per cent in the US and 23 per cent in Australia. Further, the per tonne subsidy of US$811 for milk powder declared by the EU in 1998 or the US$875 per tonne subsidy by the US under its dairy export incentive program constituted 55 per cent of the prevailing international price of US$1,500 per tonne in the same year….

Such has been the high level of protection that even with the stipulated reduction in subsidies, the EU and US can continue to flood and dump their highly subsidised milk and milk powder onto the unsuspecting developing countries, which have little safeguard mechanisms to protect their small dairy producers. The signs are therefore ominous. Highly subsidised imports of milk flowing into India will only further marginalise millions of milk producers. Thousands of dairy cooperatives which pulled the poverty-stricken masses into a path of economic emancipation will collapse faced with cheap and highly subsidised imports."

3.1.1.3.5 Indonesian Farmers Affected by Cheap Imports

Indonesian farmers in several sectors – including poultry, rice and corn have been affected by cheap imports on different occasions in recent years. This situation has been described by Kafil Yamin in an IPS agency report on 28 April 2002:

"Indonesia has spent the last few years adjusting its import policies with WTO agreements. But lowering import duties and lifting bans on various commodities have not sat well with local producers, who say they are being forced to close shop as a result. Complaining loudest are those in agriculture-related businesses as well as poultry and animal husbandry entrepreneurs, who grumble that the flood of imports is hurting them most. Food imports have been growing.

Indonesia is already a major importer of rice. Intensifying dependence on expensive corn imports, meanwhile, has led to an 80 per cent contraction in the chicken industry, which uses corn for feed. When the price of imported feed soared in mid-January, many poultry farmers went out of business. Now, an upcoming lifting of a ban on imported chicken legs has local chicken breeders up in arms again; at least 48,000 breeders have suspended their operations. The local industry is not yet ready to compete with cheaper imports…

When Indonesia experienced a food crisis in 1999, Jakarta lowered import tariffs on rice and corn. The imported varieties made such an impact on the local market that the domestic rice and corn industries are now described as being paralysed. These days, the "foreign food" bogey is scaring farmers of other crops. Last week, hundreds of sugarcane growers from Java and South Sumatra flocked to the compound of the Industry and Trade Ministry and poured sacks of sugar and sugarcane onto the ground in protest of the sugar import. The farmers say they have simply been unable to compete with imported sugar. They are demanding the import duty increase from 20 to 110 per cent."

3.1.1.3.6 The rice sector

Rice is the staple food for most Indonesians and is a strategic commodity for the country, grown by 40 million farmers.

According to Suparmoko (2002), prior to 1998, i.e. before the reforms in the country following the Asian financial crisis, the price of rice was kept at low levels by the government's food agency, BULOG, by implementing a buffer stock policy. Farmers were given production input subsidies. During the harvest season, BULOG used to purchase rice produced by the farmers to protect them from the declining price of rice, and it built the rice stock during the harvest season. During the dry season when rice production usually becomes lower, BULOG sold the rice stock to the market to protect consumers from the high rice prices. The price of rice was maintained low and stable was to curb the inflation rate which was very high during the 1960s and 1970s (600% in 1966). Most Indonesian rice farmers operate very small sizes of paddy fields, and as a result, income from the rice farming is low and averages around US$ 50 to US$ 70 per capita per year.

In 1997, the country was hit by the Asian financial crisis and Indonesia turned to the IMF for emergency support. Although the crisis was rooted in the banking sector and exchange rate policy, the IMF demanded trade liberalization measures in both the agricultural and manufacturing sectors. This included ending the monopoly of the BULOG on food imports and marketing, and cutting the import tariff on rice to zero (Oxfam 2005).

From 1996 to 1999, rice imports more than doubled, reaching 4.7 million tonnes. Since BULOG was unable to defend the floor price promised to producers, farmers were left to sell their crops at low prices. In late 1999, the government stepped in to restrict the flood in imports and in 2000, re-introduced a levy, equivalent to an import tariff of 30 per cent.

BULOG was turned into a state-owned and profit-oriented company, partly due to the IMF. Oxfam's research in West Java in 2004 among rice-farming families showed that BULOG is no longer buying the rice of farmers, who now have to sell to middlemen at prices 25-40 per cent below the promised floor price for rice.

3.2 Trade Agreements and Technology Developments

Composition of output and relationship to technology development

The rice market in Asia is less dominated by imports than it was two decades ago. Asia accounted for two-thirds of the global rice demand in 1970s, but this has come down to a third in the late-1990s (Tabor et al, 2002). This is due to the regional spread of HYV-rice, which has increased domestic production in most Asian countries.

The growth of the sugar industry in the developed countries, due to the development of technology to extract sugar from corn and beet, propped up by substantial subsidies, has almost eliminated Asia developing countries' possibilities of exporting sugar.

With Asia as a whole being a labor-abundant region, it could be expected that comparative advantage in international trade would lie in the production of labor-using products, like vegetables, fruits and flowers, as against the less labor-using products, like cereals. Calculations for Bangladesh showed that the Domestic Resource Cost (DRC) in vegetables is only about 10 percent of the export rice, as against 60 percent for aromatic rice and more than unity for other rice (Ahmed, 2004, p. 240-49). At the same time, in import price terms the DRC of other rice is also around 60 to 70 percent. Thus, while development of rice is beneficial in import substitution terms, it is not beneficial in export terms. Thus, Bangladesh, and most other Asian economies with similarly abundant labor, have turned to export of vegetables, fruits and flowers. The production of these 'new export crops' has grown across most countries of Asia (Table 3.2).

It, however, is not only the more abundant and cheaper Asian labor that is the factor enabling Asia to undertake export production of fruits, flowers and vegetables. It is also depends on the advances in transport (containerization), packaging and communication technology (ICTs). The extent to which it is profitable to shift perishable agricultural commodities long distances depends on transport costs. As fuel prices rise, which they will by all indications, small differences in production costs might be neutralized by higher transport costs. Thus, while making use of the international trade possibilities currently available, countries may also find it necessary to consider alternatives in the event that fuel prices and transport costs rise substantially.
The growth of demand in some agricultural commodities, however, has triggered some changes in technology or the widespread adoption of some technologies. This has been the case, for instance, in both fish and forest products. In fish there has been a shift from capture fisheries to culture fisheries. In 2002, Asia accounted for above 90 percent of the quantity and 70 percent of the value of aquaculture, both freshwater and marine (SOFIA, 2004, p.15). This is a technology whose widespread adoption was induced by the shortages resulting from over-harvesting of wild fish.

Similarly, in the case of wood products and Non-Timber Forest Products (NTFP) there has been an initial depletion of natural stocks and then a shift to plantation of valuable species. Asia in 2005 accounted for more than 50 percent of plantation forests in the world (FAO, 2006). In a number of NTFP too collection from the wild has been replaced by culture or plantation as wild stocks have been depleted. A well-known example is that of orchids. Initially collected from the wild and with the growth of demand, subject to depletion, tissue culture has now replaced such collection in most countries and regions. Regions like North-east India, however, still continue collection rather than tissue culture.

High prices of timber have stimulated the development of substitutes for wood in different uses, some using artificial substances, like plastic, other fast-growing species, like bamboo, and still others, former waste material, like the trunks of aged rubber trees.

A broad conclusion can be drawn from these experiences. Initially increasing trade (both international and national) in agricultural commodities that are collected from the wild, led to over-exploitation of natural resources. But this has been followed by changes in both technology (aquaculture, plantation) and management systems (community-managed, or individual household-based in the place of open access systems), and the development of substitutes. There are positive examples of learning and technology development and systems of culture that have reduced pressure on natural stocks. But they have also created new problems of waste management, environmental change, biodiversity conservation and increasing social inequality.

Restrictions on technology development

There are two ways in which trade systems can affect technology development. The first is by making the acquisition of information or knowledge more expensive. The second is by prohibiting certain forms of technology development, like copying or reverse engineering.

TRIPS has made the acquisition of knowledge and information more expensive. Royalties will have to be paid for various types of knowledge and even for, say, use of seeds in research. It has been estimated that TRIPS will result in larger royalty payments by developing countries, which in general do not possess the patents that earn royalties for their use. It has been estimated that TRIPS will require developing countries to make royalty payments in multibillions (see subchapter 3.3.6 for more details).

Many developed countries will benefit financially from TRIPS (Tables 3.4 and 3.5). The index presented in Table 3.4 thus measures the consequences of TRIPS for economic differentiation between countries rather than the net benefits or losses (Gibbon and Ponte, 2005, pp. 60-61 from McCalman, 2000)

The higher price of acquiring knowledge and information has a one-time effect in increasing the cost of research and thus technology development. More important, however, is the dynamic effect of TRIPS and related IPR protection in inhibiting certain routes of technology development in developing countries. Developing countries, in Asia as elsewhere, are in a phase of catch-up development i.e. they are trying to learn to use and adapt the technologies developed largely by the developed countries. An important part of catch-up development is reverse engineering, i.e. learning to make a product once it has been invented.

Before the advent of TRIPS (see subchapter 3.3 for more details on TRIPS), many countries, had only process and not product patents. As a result, corporations within the country (India being a prominent example) could work out a different process to manufacture a particular chemical compound and then market it, either as a branded or as a generic product. But with TRIPS all WTO members are required to have product patents. This effectively prevents developing countries from learning the methods of technology development.

Licensing of local production is another way in which developing countries can advance on the road of catch-up development. Through such licensed production corporations at least learn the production or manufacturing methods. But there is no provision for compulsory licensing. Brazil, however, in its legislation introduced the provision of compulsory licensing of pharmaceutical

production. But in further trade negotiations, the US refused to allow such licensing to be extended to any other area for development purposes, and even insisted that Brazil not implement the compulsory licensing clause, using the threat of reopening a WTO case (Wade, 2005). What the US was asking for was a TRIPS-plus clause, since TRIPS has a provision (Article 31) for compulsory licensing. But realizing this right is a matter of bargaining.

In bilateral trade agreements, as between the USA and Singapore or Vietnam, there are even more stringent provisions of protection for patent holders, so-called “TRIPS-plus” clauses. The period of protection is enlarged in these agreements from the usual 20 years to more by mechanisms that allow extensions for delays due to the regulatory processes, etc. (Fink and Reichenmiller, 2006). The US- Australia and US-Bahrain agreements extend the scope of patentability by mandating that patents must be available for new uses of known products, and enhance patent protection for plants and animals. They do not allow the TRIPS option of exempting plants and animals from patents (ibid).

Subsidies and market access

It was mentioned in Subchapter 3.2.1 that developed countries (or industrial countries) share of world agricultural exports remains as high as above 63 percent (see Table 2.16 in Aksoy, 2005); while the share of developing countries, obviously, also remains around 36 percent. Asia and the Pacific together have a share of 13.9 percent of world agricultural exports in 2000-01, which is almost the same as in 1980-81. This is in contrast to the change in the shares in manufacturing exports, where developing countries, particularly those of Asia, have substantially increased their share of world manufacturing exports.

What accounts for the high share of developed/industrial countries in agricultural exports and the relatively low share of developing Asia? A much commented upon factor is that of high subsidies and tariffs for agricultural products. The combination of tariffs (border protection) and direct subsidies were 44.9% of farm gate prices in 2000-02 (Aksoy 2005a, p. 41). This support was down from 62.5 percent in 1986-88, but still a very high figure. Among OECD countries, only Australia and New Zealand, had low levels of total support, which went down from 10.6 percent in 1986-88 to just 3.6 percent in 2000-02. They are both substantial exporters and as mentioned previously members of the Cairns Group that pushes for freer agricultural trade.

In contrast to the OECD countries, developing countries as a whole reduced average agricultural tariff rate from 30 percent in 1990 to 18 percent in 2000 (Table 3.6, Aksoy 2005a, p. 43).

The various supports provided are divided into various boxes, Amber, Blue and Green. The first is supposed to be the most trade distorting; the second potentially distorting, but includes supply restriction; and the third, minimally trade-distorting, as it is not related to current output. But money received from any box is fungible to the farmer, and hence what counts is the aggregate measure of support (AMS). Similarly, in government budgets too what counts is the AMS and the various measures of support can themselves easily be shifted from one box to another depending on the current WTO requirements (see for example de Gorter and Cook, 2006).

Developing countries, in particular LDCs, are exempt from reducing the so-called de minimis support. But the important problem here is that developing countries' budgetary positions do not allow them to reach even the allowed de minimis support.

It is necessary to first consider the nature of the world food market. Here we take the example of rice, since rice is of critical importance to food security in most of the countries studied. The world rice market is neither deep nor very competitive (Tarbor et al, 2002). As this paper points out, the rice market is less dominated by import demand from Asia than it was two decades ago – Asia accounted for two-thirds of global rice demand in the 1970s, but this figure has come down to a third in the late-1990s. The number of traders in the rice market has increased and there are now numerous small traders, involved in what is called smuggling, but is better regarded as unofficial trade. But world rice prices at below $150 per ton, are dominated by the major exporters. All of which use various forms of support to subsidize rice exports. The USA, as would be expected, provides the largest subsidy to rice export, $143 per ton of paddy (Wailes, 2005) or about $530 per ton of exports (Tabor, et al, 2003, p. 6).

The major Asian exporting countries also subsidize rice exports. Thailand provides loans at above-market prices, Vietnam provides credit subsides, while India allowed exporters to buy rice at the subsidized prices supposed to be for 'Below the Poverty Line' (BPL) households. Consequently, although the exporters are also lower cost producers than the importers, competition between exporters is "less on productivity gains and more on the degree to which domestic markets are protected and exports subsidized" (Tabor, et al, 2002, p. 8).
Vietnam is said to have the lowest rice production costs in the world (UNEP, 20-05, p. 9). This has allowed it to enter the market for rice exports in medium to low qualities of rice. Over the 90s Vietnam's rice exports have grown at 13% in quantity and at least 12% in value terms (UNEP 2005, p. 26).

In response to the low export prices of rice, some of the major rice exporters, like Thailand and Vietnam, have proposed the formation of a cartel. But this has been rejected by India, which has

continued to undercut its rivals in the low end of the market (mainly Pakistan and Vietnam) by selling highly subsidized rice.

Subsidies to exports mean that global rice prices are not a good guide to marginal costs in supplying world rice requirements. This is the first reason why domestic food production cannot be determined by pure global price-based decisions. International rice prices would have to be revised upwards and domestic rice production would then also be higher than that which would be dictated at existing international rice prices.

Subsidies of OECD countries also means that world prices of these commodities are depressed. When developing countries open up their economies, in response to pressures from the WTO, it could often result in lower domestic prices. In China, for instance, sugar prices were higher than world market prices. But with China's impending joining the WTO, sugar and sugarcane prices began to fall. Sugarcane prices fell from Y 230/ton in 2003 to just Y 170/ton in 2004 ("Bitter Sugar—how unfair trade hurts China's sugar industry", Oxfam Hong Kong Briefing Paper, 2003; and Brian Calvert, 2004, "Guangxi's Globalization Gap", in China Pictorial, November, available at http://www.china-pictorial.com/chpic/htdocs/English/content/200411/6-1.htm), bankrupting small producers. Thus, adjustment to world market prices, particularly where they are depressed because of OECD country subsidies, can mean substantial loss of incomes and even destruction of livelihoods for small producers in developing Asia. An option is to allow import duties, equal to the extent of subsidy paid by OECD countries and for as long as these subsidies, in whatever form they are given, continue to be in place.

Agreement on agriculture and fiscal support

The Agreement on Agriculture (AoA) puts limits to the extent of support that governments could provide to their agricultural producers. Further, there is no compulsion on developing countries to reduce their support. The aggregate measure of support (AMS) that developing country governments can provide is quite high, at 20% of the value of agricultural production. The AMS is one of the main issues of contention in the world trade discussions of the Doha Round. Countries dependent on exports of agricultural commodities, like the West African countries that export raw cotton, are pressing for the elimination of developed country (OECD) support to agriculture, as this support depresses world prices and enables, say, USA to export its cotton at prices that eliminate or reduce the presence of West African producers from the market.

Middle-level developing countries like India are trying to get agreements that will maintain their own existing levels of support while reducing the levels allowed to developed countries. There are complex bargaining positions in the negotiations that are currently underway.

The issue we need to consider is: Is the sovereign right of governments to decide on the AMS curtailed by the AoA? Or, are developing country governments, and least developed countries (LDCs) in particular, being forced to reduce their levels of support because of WTO agreements?

The AMS ranges from less than 2% in the case of Bangladesh to about 8 to 10% in the case of India and Vietnam. In both cases the AMS is below the permissible WTO limit. What keeps the AMS at the present levels is not the limit set by the WTO, but the fiscal weaknesses of the governments concerned. The case studies of Bangladesh, Cambodia and Nepal all point to fiscal weakness as the reason why AMSs are below the level permitted by the AoA.

Even if AMS can be increased, and that too by Green Box measures that are acceptable supports, is that the route that should be followed? Given that all developing country governments face considerable resource constraints, which in fact restrict the AMS, one needs to ask what is the right balance between price-support or input-subsidy measures and productivity-enhancing investments? Price support measures in food grains have negative effects on food buyers, who include not only laborers but also small farmers. This is a negative effect of whatever positive merit there might be in price support for farmers.

On the other hand, investments in infrastructure, including irrigation, and public research and extension will have productivity enhancing effects. Given the admittedly low productivity of many sectors of food production in developing Asia (give figures from WDR 2006) it is necessary to concentrate on productivity increasing measures. Such productivity increases will pay for the costs of the support.

Conversely, price support measures can lead to various distortions, both in product and input markets. For instance, subsidies for use of electricity in India have led to overuse of electricity. Since the cost of electricity does not matter, farmers buy cheap engines that are very inefficient in the use of electricity. There is the well-known case of overuse of urea. Further, many of these input supports programs though targeted at protecting farmers, mainly benefit the input-producing enterprises (Vietnam Country Study, ActionAid, YEAR).

In product markets, the continued high levels of subsidy through MSP for rice and wheat in Punjab and Haryana have made it difficult if not virtually impossible to get farmers in these states to shift to diversify and shift to other crops. A phased withdrawal of such price support is needed to induce farmers to both increase productivity and diversify into higher value, but more labor using, crops. As already pointed out, the examples of Bangladesh and Vietnam show that all-

pervasive price supports, as in India, are not necessary for productivity increases in food production. What is needed is development and transmission of the necessary technology, along with liberalization of input markets.

Besides various types of domestic support, there are also explicit export subsidies. They can take various forms - like low interest loans or longer-term loans, both financed out of public subsidies, and other related promotional measures. But export subsidies can also take the form of food aid. Food aid, unlike other export subsidies, is not subject to the Uruguay Round AoA schedule of reductions. Food aid is often used by developed countries (now even some developing countries like India) to dispose off surpluses. The effects of food aid on the market are similar to that of export subsidies – they depress prices locally and reduce incentives to local producers, where the aid is being distributed.

There is a long-standing analysis in economics, going back to Adam Smith and Condorcet, that rather than direct distribution of food in conditions of hunger, it is better to undertake income-enhancing measures, even including distribution of income. As they pointed out a long time ago, distribution of food aid disrupts normal trade channels and retards market development. Contemporary experience (e.g. Afghanistan in the post-Taliban period) shows that distribution of food aid can reduce local prices and thus serve as a disincentive to local producers to increase production.

Tariff escalation

Tariff escalation refers to the practice of increasing tariffs as commodities progress along the value, moving from raw materials to processed products. Moving up the value chain also means that the country and its producers are less affected by price fluctuations, as both intermediate and final product prices tend to fluctuate less than raw material prices. But such movement up the value chain is inhibited by the practice of increasing tariffs with stages of processing. For instance, the tariff on oranges is less than the tariff on orange juice. This makes it difficult, if not impossible, to use the developed country markets to make the shift from selling raw materials to selling processed products.

Tariffs on fresh, i.e. unprocessed fruit and vegetables in developed countries range from 0.9 percent for fresh fruits in Canada to 9.2 percent in the EU. But for processed fruits the EU tariff rates are above 20 percent, with many facing tariffs of 50 percent (Diop and Jaffee, 2006). Such escalation of tariffs makes it less profitable to try to make the transition from selling agricultural raw materials to processing them and selling the processed goods.

The trade restricting measures could be classified as:

Economic: Measures which affect pricing, competition, and market entry or exit. For example, Quotas, and domestic content requirements;

Social: Measures that protect public interest like health, safety and environment. For example, quality standards, food safety measures and environmental regulations; and

Administrative: Measures that are administrative formalities. For example, customs valuation, classifications and clearance procedures.

The technical barriers to trade (TBT – Table 3.7) are regulations and standards governing the sale of products into national markets which have, as their primary objective, the correction of market inefficiencies stemming from externalities associated with production, distribution, and consumption of these products. These externalities may be regional, national, transnational or global. These barriers include measures that protect public interest such as health, safety, environment, and social cohesion. These could be food safety measures, environmental measures or quality standards. Depending on the policy instrument, TBT could be in terms of import bans – total or partial, technical specifications like process, product or packaging standards, or information remedies like labeling requirements. They could apply either to domestic as well as import products, or only imports or some imports. The compliance with these measures could mean either loss of markets or higher costs to the importers (Roberts, 1999). A study of technical barriers to US agricultural exports for 1996 (Table 3.7) showed that they were more of risk reducing measures, that too in the area of food safety and commercial animal and plant health protection. They were implemented through process and product standards mainly in the case of food safety and total and partial bans, besides process and product standards, in the case of animal and plant health protection. On the other hand, non-risk reducing measures were few and mainly with respect to quality attributes. Many countries use very blunt instruments such as import bans that excessively restrict imports well beyond what is necessary for protecting the health of their people, plants or animals. The level of protection involved in some cases is equivalent to tariffs of more than 10 % (Hoekman and Anderson, 1999).

Technical Barriers to U.S. Agricultural Exports in 1996

- Mostly (80 %) risk reducing measures
- Majority (60 %) measures about commercial animal and plant health protection (CAPHP)
- About 25 % about food safety

- More than 50 % in CAPHP and 75 % in food safety in terms of process and product standards
- Non-risk reducing (quality attribute) also mainly in terms of process and product standards
- 85 % of barriers under SPS agreement with an average trade impact per barrier being US $ 17 million.
- Major restriction by barriers was in market access or market expansion
- Most of the barriers in East Asia, Americas, and Europe
- Major products facing barriers were fruits, vegetables, grains and feed grains, animal products (beef and pork), and seed (Hoekman and Anderson, 1999).

On the other hand, from the US alone there were numerous technical barriers to developing country exports, of up to 56 detentions per $million imports (Table 3.8)

The WTO agreement on TBT sets standards for labeling and packaging of agricultural products as recommended by the Codex Alimentarius Commission (CAC). The CAC, on which both the TBT and the SPS Measures agreements of WTO are based, was established by FAO and WHO in 1962 which recommends food safety and labeling standards. In the 1980s, the CAC, which is nothing but Code of Food Commission, came out with general labeling standards and nutritional labeling standards. After this, in the Tokyo round of GATT, an agreement on technical barriers to trade was negotiated. The TBT agreement which has been now signed by all the WTO members is applicable to all products including agricultural goods and food but its provisions do not apply to SPS measures (Swinbank, 1999).

The TBT agreement covers labeling of food, quality requirement for fresh food products, packaging requirements, and labeling of textiles in the agro-food sector (Chawla and Kumar, 1997). Although the public debate on the use of technical barriers to trade has focused on use of these measures to protect consumer and the environment interest, a large number of these measures actually protect the commercial interest of producers by reducing the probability of biological risks to crops and livestock (Roberts, 1999). There is no doubt that TBT will remain an important issue in international regulatory and trade policy forums for the foreseeable future.

Sanitary and Phytosanitary (SPS) Measures and AKST

The SPS measures agreement of WTO, which reaffirms the right of countries to set their own health and safety standards, provided that they are justifiable on scientific grounds and do not result in unjustified barriers to trade, includes any measure:

a) to protect animal or plant life or health within the territory of the Member from risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organism, or disease-causing organisms;
b) to protect human or animal life within the territory of the Member from risks arising from additives, contaminants, toxins, or disease-carrying organisms in food, beverages or feedstuffs;
c) to protect human life or health within the territory of the Member from risks arising from diseases carried by animals, plants, or products thereof, or from the entry, establishment or spread of pests; or
d) to prevent or limit other damages within the territory of the Member from the entry, establishment or spread of pests (Swinbank, 1999).

Sanitary and Phyto-Sanitary (SPS) measures include all relevant laws, decrees, regulations, requirements, and procedures including, inter alia, end product criteria; processes and production methods; testing, inspection, certification and approval procedures; quarantine treatments including relevant requirements associated with the transport of animals or plants, or with the materials necessary for their survival during transport; provisions on relevant statistical methods, sampling procedures and methods of risk assessment; and packaging and labeling requirements directly related to food safety (Swinbank, 1999). The SPS measures, thus, encompass food additives, contaminants, toxins, drug or pesticide residues in food, certificate of food, animal or plant health safety, processing methods, food labeling, plant or animal quarantine, requirements for prevention, control or establishment of pest or disease and sanitary requirements for imports. Whereas the sanitary provisions relate to food and animal health, the phyto-sanitary provisions cover plant health aspects of products (Chawla and Kumar, 1997). The SPS measures can become trade barriers when a) the domestic standards are lower than that for imports, b) standard conformity processes differ across countries or c) these processes of one country are not recognised by the other country.

For the purpose of the definitions, “animals” includes fish and wild fauna; “plant” includes forests and wild flora; “pests” includes weeds; and “contaminants” include pesticide and veterinary drug residues and extraneous matter (Adopted from Swinbank, 1999: Original source GATT, 1994). The SPS standards comprise articles on basic rights and obligations, non-discrimination, harmonisation, transparency, equivalence, regionalisation, risk assessment, and control, inspection, and approval procedures; and are based on Codex Alimentarius Commission (CAC) guidelines of FAO/WHO which is nothing but application of Hazard Analysis and Critical Control Points (HACCP). This method is about improving and controlling processes as variability in processes can cause quality problems; and is product- specific in nature. In HACCP, there are seven principles which are:

a) Assess the hazard, list the steps in the process where hazard can occur and describe the prevention measures.
b) Determine critical control points.
c) Establish critical limits for each point.
d) Establish procedures to monitor each point.
e) Establish corrective action to be taken if there is deviation from the limits.
f) Establish record keeping for the HACCP system.
g) Establish procedures to verify that the system is working correctly (Unneveihr and Jenson, 1996).

The basic rights and obligations clause means that members have the right to take SPS measures necessary for the protection of human, animal or plant life or health provided such measures are consistent with the provisions of the agreement, are based on scientific principles and do not arbitrarily or unjustifiably discriminate between members where identical or similar conditions prevail. The harmonisation provision calls for members to base their SPS measures on international standards where they exist though members can adopt more stringent SPS measures if there is a scientific justification as per the agreement. Under the agreement, members are also to recognise the SPS measures of other members as equivalent to their own if the exporting member objectively demonstrates to the importing member that its measures achieve the importing member's appropriate level of SPS protection (principles of equivalence). Further, if members wish to apply more stringent measures than the international standards, then they are obliged to base their risk assessment and level of SPS protection on scientific evidence and their levels should not be more trade restrictive. Members are also required to consider objective geographical and ecological conditions rather than national boundaries to apply SPS measures (regionalisation clause). Under the transparency clause of the agreement, members are to ensure that all SPS measures and changes in them are notified in a transparent manner through a single national enquiry point. Finally, the control, inspection and approval procedures are to be applied in no less favourable manner for imported products than for like domestic products (Swinbank ,1999).

Critique of SPS measures. Since both the agreements (TBT and SPS Measures) are relatively new and technical, there is a certain amount of confusion and a lack of differentiation between the two measures. For example, shelf life regulations can be adopted as a SPS measure or a TBT measure depending on the exact purpose. Therefore, knowing the objective of a measure is critical to determine whether a measure is subject to the discipline of TBT or SPS agreement. Similarly, the range of measures given in the SPS agreement is not totally inclusive. For

example, measures introduced to control the spread of weeds would generally be covered by the SPS agreement. But, the agreement is not clear enough about the concerns of those who believe that use of genetically modified organisms (GMOs) could lead to cross-pollination and GMO genes into the natural flora. In this context, the USA challenged the EU's labeling requirement for certain products produced from GMOs under the TBT rather than under the SPS agreement arguing that it is not aware of any information that GM foods differ as a class in any way from products produced by other methods (Swinbank 1999).

Secondly, the standards differences across countries are very difficult to resolve even with the best scientific advice. The examples of disputes under WTO umbrella in this field include that of beef harmones, irradiated food, cheese made from unpasteurised milk, and genetically modified foods (Hoekman and Anderson, 1999). Though the SPS agreement does not impose international standards on members, it does enhance the importance of international standard setting agencies as it encourages members to base their SPS measures on international standards and that national provisions have to be justified on scientific grounds if they are more stringent than international standards. Over time, it tends to impose, a de facto, set of international standards worldwide.

From the developing countries' and the Indian prospective, the SPS measures set very high standards which are not suitable for these countries either because they have higher cost of compliance or are not required in their contexts. Further, no lead-time has been given to these countries for implementing these provisions. It is also argued that what was designed in the Western contexts (CAC guidelines) has been imposed on the developing world. There is also hypocrisy in the practice of these provisions as there is lack of transparency and prevalence of discrimination against the developing world. For example, under Codex standards, the raw material for some types of cheese like mozzarella, cheddar has been restricted only to cow milk in the Codex standards on the basis of the argument that these cheeses were traditionally made from cow milk. This means that there may be difficulties in exporting cheese made from buffalo milk (Table 3.9; Chawla and Kumar, 1997).

A SPS measure becomes a barrier:

1) When domestic standards are lower than those for imports
2) When standard conformity assessment is different/not recognised by two countries
3) Duplicates costs of product testing.

There is also no doubt that the SPS barriers can lead to import bans which means higher cost of compliance (15-40% of FOB value) for the developing country exporters which, in turn, could lead

to reduced trade or diversion of trade between exporters due to high cost. The developing countries are also likely to find it difficult to implement these standards as there is lack of SPS control systems, lack of awareness and understanding of standards, lack of technical abilities to implement standards, and organisational structures are not geared for such standard setting (Henson and Loader, 1999). There are also problems of multiplicity of standards organisations which leads to duplication and lack of co-ordination, and small size of firms/farms.

SPS Measures and India

Due to the TBT and SPS provisions of WTO, India has faced non-tariff barriers for its products. In 1997, Indian fishery products were banned by EU and were put on automatic detention by the US (Scheuplein, 1999). There were numerous detentions in 2000-2001under the SPS provisions (Table 3.10)

Cases of SPS Restrictions on Indian Food Exports subsequently have included:

1) UAE ban on Indian meat imports (for 10 companies) due to health and hygiene reasons

2) EU ban on Indian fish imports due to lack of SPS standards especially in canning (only 90 out of 404 plants approved for fishery exports to the EU)

3) Fruit fly problem in fresh fruits and vegetables which needs to be treated (VHT) as the pests may be carried to the importing country (mango (stone weevil) in case of Australia, mango, citrus fruits, and flowers in case of Japan, and grapes in case of China)

4) HPS groundnut and spices (EU, Italy and Germany) and Chillies (Spain) due to aflatoxin and chemical residues

5) India delisted from the list of approved countries in EU for import of egg powders, two years ago, for non-submission of Residue Monitoring Plan (RMP)

6) Dairy products export problems:

of mastitis in bovines and F& M disease in cattle and buffalo which leads to deterioration in composition of milk

Somatic Cell Count (SCC) based pricing in first world

Input sector related problems like quality of fodder which affect milk quality

7) 'Karnal bunt' in wheat, and also Iran's rejection of Indian wheat sent by two private exporters due to quality problem

8) Indian basmati rice consignments (40) (of 16 companies) detained in 1999-2000, by the USFDA on grounds of being filthy and containing pesticides

Source: compiled from different sources.

Under the WTO agreement, India had obligated itself to comply with the SPS provisions by the end of 1997. In the food sector, this includes strengthening of the national food export control system.

Food products intended for domestic consumption in India are regulated by the PFA Act. The exported articles including foodstuffs are exempted from this Act and instead are regulated by the Export (Quality Control and Inspection) Act 1963 which was amended in 1984. This Act authorises preimport inspection and quality control for certain specified commodities and prohibits the export of specific notified commodities when they fail to satisfy appropriate quality specifications (Scheuplein, 1999). It empowers the Ministry of Commerce to notify products/commodities which should be subjected to quality control prior to export, to adopt standard specifications, and to recognise export inspection agencies for the purpose of enforcement of quality control and pre-shipment inspection. The Act covers food products including black pepper, chillies, cumin seeds, curry powder and other spices, fish and fish products, fruit and vegetable products whether frozen, canned or bottled including fruit juices, jams and jellies. There are 28 government export inspection laboratories and approximately 40 private export inspection laboratories. But only government laboratories are authorised to conduct food export inspection. This set up includes about 1500 government inspectors and analysts. It is clear that with this kind of resources for 1000 commodities on the notified list and for the entire country, it would be very difficult to check all export consignments (Scheuplein, 1999).

Till 1991, the Directorate of Marketing and Inspection (DMI) was exercising quality control on 41 commodities under this Act. Thereafter, certain relaxations were made wherein export inspection is now not mandatory for these commodities for government recognised export houses, star trading houses, in process quality control facility holders, and in such cases where importers specifically mention that preshipment inspection is not required (Bhatia, 1998). The Ministry of Commerce has also published detailed orders and rules governing quality control, inspection and monitoring of various products including guidelines on HACCP. But their implementation is very weak. If implemented properly, these specifications are very close to WTO recommendations on SPS. This is despite the fact that there is an exclusive agency for the promotion of production and export of each of the many of these commodities like fisheries (MPEDA), spices (SBI), processed foods (APEDA) and so on.

A study of quality control and monitoring practices in two of the commodity sectors in India (fisheries and spices) found that there were serious problems of maintenance of hygiene and quality standards and processes at the primary production or procurement level (table 3.10). For

example, the fishing boats did not have ice on their streams when they arrived at the pier. The appearance of the boats was dirty and it did not seem possible under those conditions that they complied with hygiene standards. When fish and shrimp were unloaded from the boats, they were dumped into piles sometimes very carelessly and in an unorganised manner. There was no separation of fish from the general walking areas and every one appeared to have free access to any place on the pier or any pile of fish. On the other hand, the processing centres were excellent at maintaining quality and hygiene standards and they had HACCP in place and in operation. But this may not be the case with all the 400 processing facilities in India. Most of the quality and hygiene problems at the primary produce level were due to lack of awareness and lack of infrastructure like portable water and landing facilities. Similarly, in spice production and processing, the major problems were in production which is carried out by small-scale farmers who lack knowledge of quality and hygiene and do not have an incentive to maintain them. Here too, the processing plants had all the quality systems in place, but the contamination takes place at the farmer and the trader level (Scheuplein, 1999).

Options. At the international level, there is a need to make the WTO system more transparent. The farmers' organisations should be allowed to participate, either through their governments or directly, into the standard setting bodies like the CAC so that farmer concerns could be brought into the body and its rules and recommendations.

Further, since domestic markets do not value quality, the farmer is not encouraged to maintain high quality standards of the produce. Therefore, what is required is not end-product testing for exports but monitoring of the entire commodity chain to maintain quality and hygiene standards. It is here that the application of HACCP comes in as a process control concept which places the burden of ensuring safety on the members of the food chain which include farmers, traders, processors, and distributors. There is serious need to link up farmers with processing and exporting agencies and firms so that quality can be ensured right from the raw material production stage. This can be achieved through appropriately designed arrangements like contract farming or the procurement co-operative alignment with processing and marketing companies.

Anti-dumping measures and AKST

After the removal of all other non-tariff barriers under the WTO regime, the anti-dumping measures are the most important non-tariff barriers as they are being used as a protectionist measure with little connection with dumping or fair trade. The anti-dumping disputes (15.4 % of total) were next only to import restrictions (on goods) related disputes (38.4 % of total) brought to the WTO during 1995-2003 (Rameshan, 2003-2004). It is not the use of the anti-dumping

measures but their very existence that can have significant trade effects like collusive behaviour among domestic and foreign firms (Zanardi, 2004). This is already evident in the fact that in the recent past, there has been a steady increase in the number of anti-dumping actions by both the developed and the developing countries. The exporters in many developing countries find that, as their exports rise, there are increasing pressures from developed country industries for the levy of anti-dumping duties on the ground that goods are being dumped. Thus, anti-dumping measures might counter balance the tariff reductions accomplished by various GATT rounds.

In this situation, it is essential for enterprises to be familiar with the agreement on anti-dumping measures and the rules applicable in this area. An understanding of such rules can help the exporting enterprises to avoid anti-dumping actions by taking precautionary steps. On the other hand, if domestic enterprises are aware of the anti-dumping provisions, they can seek help of these provisions to avoid the ill- effects of imports on their business. It was found by a FICCI study that the Indian industry does not have adequate information to satisfy the designated authority for a prima facie decision to initiate investigations. The industry is also not aware of the type of data to be collected by the authority on its own during investigation. The affected industries find it difficult to collect data particularly those relating to determination of normal value. Their efforts to collect data from Indian diplomatic missions abroad are often not successful (Bhattacharyya and Gupta, 2001). The effects of anti-dumping are higher for developing countries as their export base is narrow and they find it difficult to meet the cost of litigation in anti-dumping cases.

Dumping can be of two types: monopolizing and non-monopolising. The first can be strategic or predatory where the former is supported by protected home market and based on economies of scale. The latter is intended to drive rivals out of the export market and gain monopoly power and entails below cost pricing. On the other hand, non-monopolising dumping can be due to reasons of market expansion based on price discrimination, cyclical in nature due to excess capacity and demand depression, or state trading where state owned agencies are involved in exporting.

Anti-dumping measures are intended to prevent the import of products at prices lower than those at which they are sold within the exporting (home) country markets. It is a type of penalty against imports to protect the domestic industry. All members of the WTO are obliged to set up their own anti-dumping authorities to prevent injury to domestic industry.

3.2.1.1 Scope of the agreement on anti-dumping measures.

The WTO agreement on anti-dumping measures stipulates a rigorous framework for dealing with the problem of dumping. The anti-dumping measures, as per the agreement, can be initiated only

when; a) an existence of dumping is identified; b) injury to industry is measured; and c) causal link between dumping and injury to industry is established. All these steps require strong technical and analytical support (Panchmukhi, 2000). Dumping is defined as the introduction of a product of one country into the commerce of another country at less than the normal value of the commodity. Dumping of goods, in a general sense, means sending goods, that are unsaleable because of high prices they have in the home market, to a foreign market for sale at low prices with the intention of keeping up the price at home and, at the same time, capturing the new foreign market (Gupta, 1996). The principal criterion for determining dumping is whether the price of the product exported from one country to another is less than the comparable price in the ordinary course of trade for the product, when destined for consumption in the exporting country. In the absence of the domestic price, the highest comparable price for the like product for export to any third country in the ordinary course of trade or the cost of production of the product in the country of origin plus a reasonable addition of selling cost and profit are relied on. No matter which standard is used, in each case, it is enjoined that due allowance shall be made for differences in conditions and terms of sale, difference in taxation and other differences affecting price comparability (Kaul, 1997).

The conditions for imposition of anti-dumping duties to offset or prevent dumping are:

1) The anti-dumping duty shall not be greater than the margin of dumping.

2) No anti-dumping duty shall be levied by reason of exemption from or refund of duties for taxes borne by a product when destined for domestic consumption in the exporting country.

3) No anti-dumping duty shall be levied unless it is determined that the effect of dumping is such as to cause material injury to an established industry (Kaul, 1997).

Anti-dumping duties can be of several types i.e., ad valorem duty, specific duty, and dumping margin duty. Besides anti-dumping duty, the other measures against dumping can be provisional measures or duties, price undertakings, and voluntary export restraints. Provisional measures are used to prevent injury being caused during the anti-dumping investigation, and can be in the form of provisional duty, security deposit or withholding of appraisement. These measures are normally limited to four months and expire with the conclusion of the proceedings. Provisional duties are refunded if no evidence of dumping and injury is found, and the difference is reimbursed if the final duty is less than the provisional duty. Price and voluntary export restraint undertakings are voluntary undertakings given by any exporter to the effect that the exporter agrees to increase the prices or to cease/reduce exports to the area in question at dumped prices in order to satisfy the authorities that the injurious effect of dumping has been eliminated (Gupta, 1996). When petitions result in voluntary export restraints, exporters are allocated with export

licenses based on firms' foreign market shares in the past. Thus, forward looking exporters have an incentive to enlarge their market shares by dumping more at present and thus securing larger profits under the export restraint (Zanardi, 2004).

Two important elements of the definition of dumping are: (i) dumping defined in terms of less than normal value price, and (ii) the normal value being at or above the domestic sale price of a like product. The definition of like product has two aspects: One, a like product can be either identical or although not alike in all the respects, have characteristics closely resembling those of the product under consideration. When no like product exists at home, comparison may be based on the selling price of the product in the third country, thus not allowing price discrimination between markets. Two, the calculation of cost, particularly average cost, is central to dumping investigations. Costs are based on the average cost per unit (fixed and variable) plus allowed incidental costs such as selling and administrative costs. When prices at which a product is sold are not expected to provide for the recovery of all these costs over a reasonable period of time, it is not sales in the ordinary course of trade. An authority may 'construct' a price, a practice common in the US investigations, on the basis of the sale price to a third party or when the products are not resold or are resold in another form (Ghate, 1998).

The definition of injury also has two aspects. First, injury must be caused by an increase in the volume of imports and those imports must be causally linked to the change in price in the market concerned. Second, a causal link must be established between the imports and the effect on the domestic producers. A determination of threat of material injury must be based on facts and not merely on allegation, conjecture or remote possibility. The change in circumstances which would create a situation in which dumping would cause injury must be clearly foreseen and imminent. The test of injury is three fold: one, a company must show evidence of dumping, two, it must show an injury to its business, and three, it should be established that there is a causal link between dumped imports and the alleged injury. The dumping margin, on the basis of which anti-dumping duty is imposed, is calculated by taking an average of both the normal value from various transactions in domestic market/third country market and the export market price from various transactions. The weighted averages of the two values are used to calculate the margin. The difference between the two values divided by weighted average export price gives the dumping margin in percentage terms (Gupta, 1996). Some times, injury margin is also calculated to assess the impact of dumping which is nothing but the difference between the fair selling price for the domestic industry and the landed cost of the imported product under consideration (Silberston, 2003).

The application must contain the identity of the applicant and his/her product, information on volume of business, a description of allegedly dumped product along with country of origin or export, information on prices at which the product is sold in the domestic markets of the country of origin or export, and information on the evolution of the volume of the allegedly dumped imports. No complaint shall be pursued unless it is lodged by or on behalf of producers who account for more than 25% of the domestic production of the affected product. It will be considered only if it is supported by those domestic producers whose collective output constitutes more than 50% of the total production of the like product. In the case of EU, the community interest is to be considered before imposing anti-dumping duty (Silberston, 2003).

The application shall be rejected and investigations terminated as soon as the authorities concerned are satisfied that there is no sufficient evidence of either dumping or of injury to the domestic industry. This is especially so when the margin of dumping is ‘de minimis’ i.e. less than or just two per cent of the export price, or volume of dumped imports, actual or potential, or the injury is negligible i.e. dumped imports from a particular country are less than three per cent of the total imports of like products. But, collectively, the exporting countries should not account for more than seven per cent of total imports. The anti-dumping investigation shall, except in special circumstances, be concluded within one year and in no case, will take more than 18 months after its initiation (Gupta, 1996; Ghate, 1998).

The interested parties in an anti-dumping case include an exporter or foreign producer or the importer of a product subject to investigation, a trade or business association of such product, the government of the exporting member, and a producer of the like product or the importing member or a business association of the like product in the importing country. The dumping duties may be collected from various individual companies that are named or from any company from the offending country if the domestic anti-dumping authority sees fit to do so. The anti-dumping duty will be collected in the appropriate amounts in each case on a non-discriminatory basis on imports, if such products from all sources are found to be dumped and causing injury. The amount of duty may be assessed on a retrospective basis and in such case, the final liability for payment of duties shall take place within 12 months and in no case, more than 18 months after the date on which a request for final assessment of the amount of anti-dumping duty has been made. On the other hand, if the duty is assessed on a prospective basis, then provision shall be made for refund of duty in access of the margin of dumping. The anti-dumping duty will remain in force only as long as, and to the extent, necessary to counteract dumping which is causing injury (Ghate, 1998).

3.2.1.2 Practice of anti-dumping measures.

Until recently, most intensive use of anti-dumping actions has been made by the US, Canada, the EU and Australia in that order. Canada was the first country to adopt an anti-dumping legislation in 1904 followed by Australia in 1906 and several others by 1920. After the passing of the anti-dumping code during the Tokyo round of GATT in the 1970s, many developing countries also started passing anti-dumping legislation with India doing it in 1985 (Zanardi, 2004). By the end of June 1997, 76 members (with EU countries counted as one) had submitted notification of their anti-dumping legislation or regulations to the WTO's committee on anti-dumping practices and by the end of 2001, 94 countries (with EU countries counted individually) had their anti-dumping laws in place. By the end of 1996, the WTO member countries reported 900 anti-dumping measures, including price undertakings, being in force which rose to 1119 by the end of 2000. The major sectors affected by these measures were base metals, mostly steel, chemicals, plastics, textiles, machinery and equipment and agriculture and food in that order (Ghate, 1998; Zanardi, 2004)). The 'Big Four' i.e. the US, the EU, Canada and Australia still account for more than 40% of all anti-dumping investigations (Bhattacharyya and Gupta, 2001).

By 2001, more than 90% of world wide imports were potentially subject to anti-dumping actions compared with only 71% in 1990 (Zanardi, 2004). And, the developing countries are the major targets of anti-dumping actions. They faced 38% all cases during 1990-94 which rose to 42% during 1995-99 (Bhattacharyya and Gupta, 2001). On the other hand, Argentina, Brazil, Mexico, India and South Africa emerged as major users of anti-dumping actions accounting for 1/4th of all anti-dumping investigations since 1995 (Bhattacharyya and Gupta, 2001). The WTO Anti-Dumping Measures agreement excludes the use of AD in a retaliatory fashion in line with the non-discriminatory principle of the WTO (Zanardi, 2004).

During 1980-2001, 4597 anti-dumping investigations were initiated and the largest four users (Australia, Canada, EU and the USA) each had a double digit share and altogether filed 64% of all anti-dumping petitions. But, in more recent times (1995-2001), only the seven largest uses together reach a share of more than 64% with new ones being Argentina, India, and South Africa who have even larger shares than Australia and Canada. India initiated a total of 192 anti-dumping investigations during 1980-2001 with most being after 1996 (Zanardi, 2004). India has been one of the major users as well as victims of the anti-dumping measures. India initiated 140 anti-dumping cases during 1995-1999 compared with only 15 during 1991-94, and 45 during 1993-1997 with definitive duties in 11 cases (Panagariya, 1999), and it was the highest among the developing countries, accounting for 15% of all cases in the developing world. India imposed its first ever provisional anti-dumping duty in January, 1993. The index of such anti-dumping initiations was 1875 per dollar of imports for India compared with only 100 for the USA.

India also faced very costly anti-dumping actions for its exports which was 779 per dollar of exports in terms of index, compared with only 100 for the USA (Mattoo and Subramanian, 2000). In 1998 alone, India faced one case of anti-dumping for every $ 2.74 billion of exports as against only 15 such cases faced by the US for every $ 45.46 billion of exports. India was next only to Ukraine in this regard. In fact, more than 15% of all final measures imposed under anti-dumping investigations were aimed at India (Bhattacharyya and Gupta, 2001).

Over the period 1980-2001, 113 countries were targets of anti-dumping investigations and during the recent period of 1995-2001 alone, 93 countries faced anti-dumping investigations with prominent ones being from Asia i.e. China, South Korea, Japan, Taiwan and Thailand which together accounted for 30% of all cases. In fact, China has faced about 15% of all (2416) anti-dumping cases filed by the WTO members up to the end of 2003. Due to this, China has recently set up an early warning system on 189 goods of export importance mainly including textiles, home appliances, steel and furniture which account for 60% of China's exports to the USA (Joseph, 2004). India's share in all anti-dumping actions suffered went up from 0.9% in the 1980s (1981-87) to 3.72% by the late 1990s (1995-2001) (Zanardi, 2004). Also, it is increasingly the developing world countries which are targeting more of other developing world countries (50% cases) besides the developed countries targeting developing countries. But, most of the cases in Japan, South Korea and the EU have been settled with price undertakings as the Japanese avoid courts and litigation by tradition. On the other hand, India had all its anti-dumping investigations settled through anti-dumping duties only (Zanardi, 2004).

The USA imposed anti-dumping duty on Indian preserved mushrooms along with those from China and Indonesia in 1999. The dumping margin calculated for India was the highest (243%), followed by China (198%) and Indonesia (22%). The USA imposed company specific anti-dumping duties on Indian firms which ranged from 7-243% though the effective rates were ranging from 7% to 15% as other firms were not exporting any more (The Economic Times, March 1, 1999). The EU investigated 28 exporters from India, the highest number followed by China (24) and South Korea (20) during 1998-2002 mainly in iron and steel, chemicals, and textiles. On the other hand, the EU suffered most from USA and India in 2002 with 25% of the cases each by the two countries (Silberston, 2003).

There is also significant evidence of retaliation in anti-dumping actions. Twelve countries simultaneously targeted to protect the same industry group wherein same product was subject to anti-dumping duty both at home and abroad. It is difficult to accept the fact that an industry that is

injured by imports from a country can be causing injury to the very same industry in another country (Bhat, 2003).

3.2.1.3 China and the EU in anti-dumping.

China has now become the country most accused of dumping by the EU. In 2000, anti- dumping charges against China reached a peak of about 20% of the EU's total anti-dumping cases. This was largely due to non-market economy treatment of China by the EU, product market competition between the Chinese and the European countries, EU's trade deficit with China, and the very concentrated nature of the EU market structure. The anti-dumping policy of the EU is likely to affect much larger volume of exports than the ones subjected to anti-dumping because it acts as a deterrent for current and future exporters to set low prices. A majority of EU anti-dumping cases against China led to unfavorable results for China. Out of a total of 90 anti-dumping cases, 65 led to, first provisional anti-dumping measures, and later to definitive measures. Out of these, in 55 cases, definitive duties were imposed while in other 10 cases, Chinese exporters agreed to price undertakings. Even in cases, where more than one country was listed as a defendant, China normally faced the most severe duties. The EU industries complaining against Chinese imports were so concentrated that there were, on an average, 4.5 firms per case and only in five per cent of the cases, there were 10 firms involved. In fact, in many cases, the complaining firm has been a monopolist company accounting for 100% of the EU production (Liu and Vandenbussche, 2002).

From the Chinese side, about half of the enterprises facing anti-dumping actions have been state owned enterprises. This itself is one of the grounds for more frequent anti-dumping actions by the EU against China as state owned firms are subsidized by the state. In most of these anti-dumping cases, there was very little or no-cooperation from the Chinese exporting companies for information to the EU Commission. In fact, the Chinese exporters did not respond to the dumping charges. When EU treated China as a non-market economy up to 1996, the markets selected by the authorities to construct normal values of Chinese products were mainly US, South Korea, India and Turkey. Most of these countries have a much higher level of economic development than China which made China vulnerable to violation of dumping in the EU law. Even now, to get a market economy status from EU, Chinese exporters have to prove that they are operating under market economy conditions. Only five of the 32 Chinese exporters who applied for market economy status have been granted such status. Many of those who failed to get this status were state owned enterprises. Most of the time, injury to the industry in the cases against Chinese firms by the EU was determined on the basis of changes in imports or importers' market share, price undertakings, price depreciation and local firms' market share decline. So far as the causal relationship between dumping and injury is concerned, if the commission could not explain the

condition of the EU industry with any other factor, then it was presumed to be due to dumping. Even the community interest has been used to favour the consumers as they were intermediate users of the products. But, with China becoming a member of the WTO and opening up for global competition, there is likelihood of decline in anti-dumping cases by the EU against China (Liu and Vandenbussche, 2002).

Decisions of the WTO Panels on Anti-dumping Measures. The working of the WTO panels on anti- dumping so far has shown that it is able to build confidence in the dispute settlement mechanism of the body. This is evident in the case of US Anti-Dumping Act of 1916 where the WTO panel and the Appellate Body have unequivocally held that the US Act, which provides for specific action against dumping in the form of civil and criminal proceedings and penalties, is inconsistent with the WTO agreement on anti-dumping (Satapathy, 2000a). Similarly, the WTO panel ruling on India's complaint against anti-dumping measures by the EC on imports of bed linen from India, in favour of India, suggests that WTO panels can not be manipulated. In particular, the measures of anti-dumping by the EU which is one of the four major traditional users of these measures along with the US, Canada and Australia and has a long experience and administrative and legal set up, has been defeated. Secondly, the panel has ruled against the EU practice of zeroing negative price differences in the calculation of dumping margins. The EU used to calculate dumping margins by setting the export market prices artificially at zero whenever they were higher than the normal value, thus ignoring situations of 'negative dumping'. This finding of the panel against the zeroing practice would now force the prevailing practice in some of the developed countries to change. This will mean that in many cases, the dumping margins may disappear or come down below the 'de minimis' level for the developing country exporters, requiring no anti-dumping duties (Satapathy, 2000b).

Further, the EU did not even collect data for examining the effect of all economic factors on an industry which led the WTO panel to reject the EU's claim on injury to the industry because of dumping of imports. This means that in all the countries, much more economic analysis to determine injury to industry and to attribute it to dumping will be required. The panel even questioned the sample used for determining injury for the domestic producers as the EU found domestic industry to consist of 35 producers but used data on other and lesser number (17) of producers. The panel also argued that before imposing anti-dumping duties, possibilities of constructive remedies should be explored by the developed countries. The EU had rejected India's request to offer price undertakings and by doing so, EU had failed in its obligation to explore constructive remedies to the problem of dumping as provided in the Agreement on Anti-Dumping Measures (Satapathy, 2000b).

3.2.1.4 Implications of and problems of the anti-dumping measures agreement.

Anti-dumping system has been able to sustain and grow in practice due to public perception of 'dumping' which is different from the rules and regulations and its relevance as a safety valve, political expediency due to impact of liberalization and globalization, lobbying by pressure groups, and differences in competition standards cross nations (Tharakan, 1999). Anti-dumping actions have implications for foreign investment flows. There seems to be a coincidence between anti-dumping cases and inward investment. The evidence from the EU and the US shows that anti-dumping actions have substantially increased the incidence of manufacturing investment by Japanese firms in these regions. What it means is that imports are being replaced by local production by foreign firms which can still practice price discrimination or sales below full production cost. But, at the same time, anti-dumping actions lead to large welfare losses. Anti-dumping duties can also have negative impact on export competitiveness of an industry if duties are imposed on products that go as inputs into that industry (Bhat, 2003).

There are many problematic aspects of the Agreement. The definition of dumping favours the party imposing anti-dumping duties. Dumping is considered to exist if the export price of a product is less than the comparable price of the product or like product in the domestic market in the ordinary course of trade. However, when the average export and domestic prices of a product are calculated, domestic sales prices below total cost are considered beyond the ordinary course of trade and therefore, excluded. But, all export prices are included. This, artificially, raises the domestic price. Also, if no home market prices can be found, the sales price in a third country – the so-called surrogate country – can be used for comparison. Since, different countries have different levels of economic development and comparative advantage in different sectors, the arbitrary choice of a surrogate country may easily lead to finding of dumping. For example, while investigating dumping by the Chinese firms, the US authorities often use, as 'surrogate' country, market economies with higher cost of labor and raw material or countries where economic reform is proceeding more slowly and production in many sectors is less efficient than in China. This will naturally lead to the non-market economy being considered to be dumping. This practice has been now done away with by the EU in case of Russia but still prevails for other so called non-market economies and even Russia in non-EU markets (Silberston, 2003). Even use of constructed value price in the absence of availability of home market or third country prices is prone to inherent subjectivity as the costs which go into constructed value price vary greatly among countries and companies. The concept of injury is also problematic as if a market in an importing country is expanding in which domestic industry is also expanding but slower than the imported products which are taking a larger share of the market, can it be said that the domestic industry has been injured because it is expanding slower than imports? Further, the presence of dumping may have nothing to do with injury to the injury which may be the result of other local

and international factors happening at the same time. Therefore, it is very difficult to establish a strong link between dumping and injury (Silberston, 2003).

Even selling below total cost is a normal business practice in some situations. For example, a firm may have to sell below total cost in order to attract skeptical customers or to meet existing competition in a foreign market, without any intention to dominate the market, especially if the product is new and un-established. It is unreasonable to subject such practices to anti-dumping investigations. Further, the anti-dumping laws are also country specific instead of being firm specific as the country does not really represent costs of particular firm and all firms from a country should not be targeted. Another problem with the practice of these laws is that though the agreement recommends 'lesser duty' than the margin of dumping if that suffices to prevent injury, but many developed countries do not follow it and impose duty equal to margin of dumping as there is no obligation under the agreement which only refers to the desirability of the practice (Reich, 203). Further, many firms and countries resort to back-to–back anti-dumping petitions in order to benefit from trade effects of anti-dumping litigation which discourages imports in their markets (Zanardi, 2004).

Besides, the use of anti-dumping duties to protect domestic industry from imports may be misplaced if the difficulties of domestic producers result from their own inefficiency. In this situation, the anti-dumping duties tend to penalise the more efficient foreign producers. Also, because of the difficulties in finding out the origin of a product due to global sourcing, it is problematic to identify the agency responsible for dumping. The anti-dumping agreement also does not define the concept of export price, and the globalisation of production further leads to difficulties in determining export price as products are the result of global souring. There are even problems with defining domestic industry (Didier, 2001).

Then, there is also an overlap and a contradiction between anti-dumping laws and the competition policy. Since anti-dumping actions aim at reducing anti-competition practices, they are a part of the competition policy. But, sometimes actions like price undertakings are anti-competition and in conflict with the competition policy of WTO (Bhattacharyya and Gupta, 2001). Some firms may also resort to anti-dumping in order to foster collusive agreements between/among domestic or foreign firms as this action will give relief from foreign competition or a domestic firm will use this threat to negotiate a collusive agreement with a foreign firm. This kind of practice was found in the USA.

The cumulation of imports from different countries or sources is another problematic aspect of the anti-dumping actions. After the provision for mandatory cumulation in the US, the proportion of

cases with cumulation went up significantly. Due to this, naming multiple countries or exporters becomes a more profitable strategy for the local firms (Prusa, 1998). Cumulation negatively affects the interests of small developing countries who individually account for only small proportion of the total imports in a market. There is a need to take into account competition policy considerations, strengthen community interest and public interest clauses, raise the 'deminimis' standard for the market share of the defendant, and a justifiable definition of the 'like products' in anti-dumping proceedings (Tharakan et al, 1998; Gupta, 2001-02).

Options

The above discussion shows that despite the WTO agreement on anti-dumping measures, there will be widespread use of these measures against the developing country exports as well as dumping into these countries. Anti-dumping is also seen as a necessary valve in the presence of trade liberalisation and globalization which protects domestic firms from foreign competition. There is need to introduce competition considerations, do away with practice of cumulation of market shares in injury determination except in cases where there is evidence of collusion, and introduce some form of counterfactual analysis in measuring injury margins (Tharakan, 1999). Further, it is also suggested that anti-dumping duty should be imposed only if it is established that there was a predatory intent on the part of the exporting country. If the market is declining at a rapid rate anyway, then dumping by any exporter should be ignored (Silberston, 2003).

3.3 Trade Agreements, Intellectual Property Rights and AKST

IP (intellectual property) at the center of modern business is driven by technology and business tactics. Intellectual property rights (IPRs) are not natural rights but rather privileges granted to inventors to reward them for inventions. This is accompanied by decline of public domain of knowledge (privatization of knowledge) and changes in the nature of knowledge (e.g. biotechnology). But, there is trade-off between protection of production v/s distribution of knowledge. Finally, there is a large variety of knowledge and stake-holders. There are many types of IPRs like patents, trademarks, plant breeders' rights, and copyrights. Patents in agriculture are important for promoting agricultural research and development (Alam, 2004). This conferment of the privilege of monopoly is supposed to be an incentive for innovation, and to enable recovery of cost. Any IPRs system has to balance the privilege given to inventors and corporations owning the IPRs with the public interest. The public interest includes consumer welfare, the right of other producers to use technology, the right to develop, sustainability, and environmental protection.

3.3.1 The TRIPS agreement and other IPR regimes

3.3.1.1 WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). The Trade-Related Aspects of Intellectual Property Rights (TRIPS) was established as part of the WTO in 1995. The TRIPS agreement has resulted in a very significant shift in the balance in the IPRs regime away from the public interest towards the monopolistic privileges of IPRs holders. Since TRIPS is a legally binding international framework enforceable in the WTO through the threat of trade sanctions, it has been able to effectively disseminate a model of IPRs regime throughout the world to its over 130 member states. TRIPS has therefore instituted a basically "one-size-fits-all" system of IPRs, where similar standards are set for countries of differing levels of development. It is in the developing countries where the unsuitability and effects of the inappropriate provisions are most adversely and acutely felt.

Before the WTO-TRIPS Agreement, countries were free to choose the type of patent, copyright or other intellectual property standard or law that was suitable. They could even choose to not provide for any proprietary claims.

There are a number of treaties on different types of IPRs under the World Intellectual Property Organisation (WIPO), before TRIPS came into existence, and countries were free to choose whether or not to be a Party.

Before TRIPS, where patent law existed, most countries provided for "process" patents but not product patents. So different people could use different processes to produce the same product and that allows many products to enter the market and consumers can have competitively priced products. Research and innovation was also encouraged, and a good example was pharmaceutical products.

Most developing countries, before TRIPS, did not allow patents on food and medicines even if they had patent laws in operation. Patents on biological resources were also not allowed in almost all countries. Countries were free to choose the scope of patents, the term of patent protection (usually from 5 to 15 years depending on the national laws) and other safeguards to meet their socio-economic objectives.

Developed countries in their developing stages did not allow patenting and other IPRs, or had very narrow scope of IP protection. Many of them also discriminated between nationals and foreigners, favoring the former. This was to promote domestic research, innovation and creativity. For example, Switzerland only allowed patents on pharmaceuticals and agricultural

chemicals in the 1970s. But having reached industrial status, these countries then sought to have high IPR standards around the world to protect the technological advantage and market dominance of their major industries especially those in the pharmaceutical, agriculture, biotechnology and information technology sectors.

Under TRIPS, product patents have to be given and so developing countries must now patent food and pharmaceutical products unless they can be excluded within the terms of TRIPS. For the first time, product patents became mandatory by international law.

TRIPS sets mandatory "minimum standards" but these are based on standards of developed countries in the late 1980s to early 1990s when TRIPS was negotiated. Therefore the standards are actually very high and have serious adverse impacts on the development prospects of developing countries.

However, there is a broader development context for TRIPS provisions to operate:

- TRIPS Article 7 on Objectives states that IPR protection and enforcement should be "in a manner conducive to social and economic welfare, and to a balance of rights and obligations".
- Article 8 on Principles states that Members may "adopt measures necessary to protect public health and nutrition, and to promote the public interest in sectors of vital importance to their socio-economic and technological development".
- Article 71.1 provides for the regular review of TRIPS implementation, and amendment of the Agreement is possible if agreed upon by WTO Members. The first review under Article 71.1 started in 2000 and is ongoing.

Though the TRIPS Agreement for the first time set international compulsory standards, the implementation is still by national law - there is no international enforcement system of the IPRs given under national laws. Thus it is important for countries to make full use of the exceptions and flexibilities in TRIPS and to interpret the TRIPS provisions in a way that can protect the public interest, the environment and the rights of indigenous peoples and local communities, taking into account Articles 7, 8 and 71.1.

With the implementation of TRIPS, processes and products are patentable if they satisfy the criteria for patentability, i.e. the process or product is new or novel; involves an inventive step; and is capable of industrial application. This is a foundation of patent law and is embodied in Article 27.1 of TRIPS.

However, the definition of terms and the application of the patentability criteria are left to national law.

In addition, Article 27.2 provides that an "invention" can be excluded from patentability, if it is necessary to protect *ordre public* or morality and the grounds include[1]:

- to protect human, animal or plant life or health;
- to avoid serious prejudice to the environment.

Thus inventions can be excluded from patentability on grounds contained in national patent laws. The grounds for excluding patents are not exhaustive in TRIPS, so countries can decide what those grounds are, that are in line with the protection of *ordre public* and morality. There are also other provisions that give a WTO member flexibilities and safeguards at the national implementation level.

It is therefore important to understand and interpret TRIPS in a proper way.

TRIPS Article 27.3(b) is relevant in the area of biological resources and genetic engineering. Under this provision, a WTO Member has to allow for the patenting of the following:

- non-biological and microbiological processes for production of plants and animals;
- "microorganisms".

With TRIPS, for the first time there is an international obligation to patent microorganisms. But many countries interpret this to exclude "naturally-occurring microorganisms" as these are discoveries. Gene sequences and other parts of microorganisms are not specifically mentioned and many countries exclude these in their national laws, too.

A WTO Member may exclude the following from patentability:

- essentially biological processes for production of plants or animals;
- diagnostic, therapeutic and surgical methods for treatment of humans or animals.

IP experts and scientists have observed that it is illogical to exclude patents on biological processes but mandate patents on microbiological processes. This was a concession to the biotechnology industry that was already bioprospecting and commercializing microorganisms, and TRIPS is openly acknowledged today as the result of successful industry lobby.

[1] The word "include" means that there can be other grounds for excluding patentability.

The criteria for patentability should also be carefully understood and applied. Patent principles and law were designed for mechanical inventions. Applying patent law to biological resources raises ethical, religious and socio-economic issues. The patenting of gene sequences and microbiological processes also raises scientific questions on the legitimacy of patents in this area[2].

TRIPS Art. 27.3(b) also requires new plant varieties to be patented or protected by a *sui generis* system or a combination of both. Many countries reject patents and are trying to develop or have developed national laws on plant variety protection that can protect plant breeders' rights as well as farmers' rights (see more discussion on this in subchapter 3.3.5). But they are under pressure to adopt the 1991 International Convention on the Protection of New Plant Varieties (UPOV) as the "*sui generis*" system, but this is more like a patent and favors plant breeders at the costs of small farmers.

3.3.1.2 IPRs provisions in Convention on Biological Diversity (CBD).

The entry into force of the United Nations Convention on Biological Diversity (CBD) in 1994 (before WTO agreements entered into force) raised important issues on access to biological resources and the fair and equitable sharing of benefits arising from the use of such resources, between countries of origin or source and user countries. There are provisions in the CBD that directly deal with IPRs. The provisions are in Article 16 and appear to be finely balanced. Article 16.5 states: " Contracting parties, recognizing that patents and other intellectual property rights may have an influence on the implementation of this Convention, shall cooperate in this regard subject to national legislation ad international law in order to ensure that such rights are supportive of and do not run counter to its objectives."

This clause seems to recognize the IPRs can have a negative effect on implementing the CBD and that contracting parties have to cooperate to ensure that IPRs are supportive of and do not run counter to the CBD's objectives. However, the clause itself has a conditioning term, namely, that the cooperation is subject to national and international law. It is also balanced by Article 16.2.

Article 16.2 states that access to and transfer of technology to developing countries shall be provided and/or facilitated under "fair and most favorable terms, including on concessional and preferential terms where mutually agreed." In the case of technology subject to patents and IPRs, "such access and transfer shall be provided on terms which recognize and are consistent with the

[2] For further discussion see "Why Biotech patents are Patently Absurd - A Scientific Briefing on TRIPS and Related Issues" by Mae-wan Ho published by Third World Network, 2001.

adequate and effective protection of intellectual property rights. The application of this paragraph shall be consistent with paragraph 3,4, and 5 below."

Article 16.3 states that each contracting party shall take measures with the aim that parties (especially developing countries) that provide genetic resources are provided access to and transfer of technology which makes use of those resources, on mutually agreed terms, including technology protects by patents and IPRs, in accordance with international law and consistent with paragraphs 4 and 5.

3.3.1.3. Tensions between TRIPS and CBD.

There are several areas of tension between critical aspects of TRIPS and the CBD and of relevance to many countries as they are signatory to CBD and TRIPS. Following are some examples.

a) Differences in rational, origins and overall framework.

TRIPS is an international agreement drawn up with the encouragement and active support of large corporations to promote their technological dominance and gain additional margins of profit through obtaining private monopolies. Policy makers have to decide on the balance between the rights of and benefits to IPRs holders, rival producers, and consumers. The IPRs model contained in TRIPS is tilted heavily in favor of the rights and benefits of IPRs holders. Because WTO members are obliged to fulfill TRIPS obligations, TRIPS has facilitated the extension of its particular model of IPRs to the wide membership of the WTO. WTO member countries now have to implement changes in national IPRs-related laws to reflect the TRIPS model, which promotes private monopoly rights that are expected to largely benefit transnational companies. TRIPS is basically a commercial treaty with commercial objectives that largely benefit strong private corporations. The principles of environmental protection or human development are not central to TRIPS and are in fact marginalized by it, although there are references to or exemptions made on behalf of the environment, human and animal health and public order.

The establishment of the CBD was prompted mainly by the growing concern about the rapid worldwide loss of biodiversity, recognition of the important role of traditional knowledge and the rights of local communities that developed and hold the knowledge, and the need to regulate access to and the sharing of benefits deriving from the conservation and sustainable use of biodiversity, including genetic diversity. Thus, unlike for TRIPS, the promotion of commercial interests is not central to the objectives of the CBD, and in fact one of the CBD's central aspects is to the recognition of the need to regulate the behavior and effects of private corporations and researchers and constrain their rights of access and benefits within a larger framework that

stresses the goals of environmental protection and the rights of sovereign states to their resources and the rights of local communities within them.

Many of the tensions betweens TRIPS and CBD stem from these differences in the overall rational and framework of the two regimes.

b) National sovereignty versus rights of foreign IPRs holders.

Based on the principle of national sovereignty enshrined in the CBD, countries have the right to regulate access of foreigners to biological resources and knowledge, and to determine benefit sharing arrangements. TRIPS enables persons or institutions to patent a country's biological resources (or knowledge relating to such resources) in countries outside the country of origin of the resources or knowledge. In this manner, TRIPS facilitates the conditions for misappropriation of ownership or rights over living organisms, knowledge and processes on the use of biodiversity takes place. The sovereignty of developing countries over their resources, and over their right to exploit or use their resources, as well as to determine access and benefit sharing arrangements, is compromised.

c) Conflict between private rights of IPRs holders and community rights of traditional knowledge holders.

In the preamble of TRIPS, it is recognized that "intellectual property rights are private rights". In TRIPS, the award of IPRs over products or processes confers private ownership over the rights to make, sell or use the product or to use the process (or sell the products of that process). This makes it an offence for others to do so, except with the owner's permission, which is usually given only on license or payment of royalty. This system of exclusive and private rights is at odds with the traditional social and economic system in which local communities make use of, and develop and nurture, biodiversity. For example, seeds and knowledge on crop varieties and medicinal plants are usually freely exchanged within the community. Knowledge is not confined or exclusive to individuals but shared and held collectively, and passed on and added to from generation to generation, and also from locality to locality. The CBD has several provisions that acknowledge this and also that aim at protecting community rights, the key provision being Article 8(j).

d) Differing treatment of innovators using modern knowledge and traditional knowledge.

Related to the different ways in which the CBD and TRIPS treat private and community rights is the difference in their treatment of knowledge holders is the difference in their treatment of knowledge holders or innovators using modern and traditional technology. Whilst the CBD adequately recognizes the nature and crucial role of traditional knowledge and practices in

biodiversity conservation and use (for example, see article 8(j) of the CBD), TRIPS is constructed in ways that effectively deny this and instead rewards additions to knowledge (even if very slight and minor) made through modern technology. This different treatment for modern technology and traditional knowledge is also associated with discrimination against local community rights.

e) System of prior informed consent of states and communities (under CBD) versus unilateral patent actions by private companies and researchers (under TRIPS)

Article 15.4 of the CBD states that "access to genetic resources shall be subject to prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that Party." Thus, intending collectors of biological resources or of knowledge relating to these have to provide sufficient information of their work and how it is intended to be used, and obtain consent, before starting the work. In the draft laws of many countries (for example, the OAU Model Legislation on Access to Biological Resources and Protection of Community Rights), the prior informed consent of the state as well as the relevant local communities has to be obtained. This implies that consent can also be denied, and that consent is conditional on mutually-agreed terms for benefit sharing between the collector, the state and the local communities. The PIC requirement is thus a measure to prevent misappropriation of resources and knowledge, and to facilitate fair benefit sharing.

In TRIPS, there is no provision that applicants for patents or other IPRs over biological resources have to obtain prior informed consent. There is thus no recognition in TRIPS of the rights of the country in which the biological resource or knowledge of its use is located. Thus, patent applicants can submit claims on biological resources or knowledge to patent offices in any country (that recognizes such patentability) and the patent offices can approve the claims without going through a process even of checking with the authorities of the country or countries of origin. Thus, whilst the CBD has set up a PIC system as a check against misappropriation or biopiracy, TRIPS on the other hand facilitates the possibility of such misappropriation by not recognizing the need for and thus omitting a mechanism of PIC.

f) Differences in benefit-sharing arrangement

A key aspect of the CBD is that it recognizes the sovereign rights of states over their biodiversity and knowledge, and thus gives the state rights to regulate access, and this in turn enables the state to enforce its rights on arrangements for sharing benefits. Access, where granted, shall be on mutually agreed terms (Article 15.4), shall be subject to prior informed consent (Article 15.5), countries providing the resources should fully participate in the scientific research (Article 15.6) and, most importantly, each country shall take legislative, administrative or policy measures with the aim of "sharing in a fair and equitable way the results of research and development, and the

benefits arising from the commercial and other utilization of genetic resources with the contracting party providing such resources. Such sharing shall be upon mutually agreed terms".

Under TRIPS, there is no provision for the patent holder on claims involving biological resources or related knowledge to share benefits with the state or communities in countries of origin. In fact, there is little that a country of origin can do to enforce its benefit-sharing rights (recognized in CBD) if a person or corporation were to obtain a patent in another country based on the biological resource or related knowledge of the country of origin. While a legal challenge can be launched, such legal cases are prohibitively expensive. Even if a state has the resources to legally challenge a patent in another country, it may not have the resources to track down and challenge every patent that it believes to be a case of biopiracy against it, nor is there a guarantee of success. Thus, if the patent laws, the administration of approvals, or the courts of a particular country operate in a context that is favourable to granting such patents, there is little that can be done by a country of origin to ensure that biopiracy does not take place, or that if it takes place that it can get a remedy.

g) Treatment of the environment

Protection of the environment is at the heart of the rational and provisions of the CBD. The objectives of the Convention are "the conservation of biological diversity, the sustainability use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" (Article 1). Countries are obliged to develop strategies and plans to conserve and sustainably use of biodiversity in sectoral and cross-sectoral plans and policies (Article 6); to carry out *in situ* and *ex situ* conservation (Article 8, 9); to minimize adverse impact on biodiversity whilst also carrying out remedial action in degraded areas (Article 10); and to conduct environmental impact assessment on and minimize adverse effect of projects (Article 14). In particular, Article 19 asks parties to consider the need for an international biosafety protocol (which has been established—The 2000 Cartagena Protocol on Biosafety) to deal with the safety aspects of biotechnology and international transfer of genetically-modified organisms.

TRIPS does not have environmental protection as part of its objectives. Unlike the CBD, the promotion of environmental goals is not part of its rationale. It does, however, have provisions that enable members to exclude patents on environmental grounds as stated in Article 27.2 (see above).. This provision provides some scope for members to take the environment into account in their IPR policies. Article 27.3(b) of TRIPS also allows for exclusion from patentability of plants and animals other than microorganisms, and essentially biological processes other than microbiological processes. Whilst the article at first reading enables the exclusion of patentability for plants and animals, in fact it has opened the door to worldwide patenting of genes and micro-

organisms, and patenting of genetically-modified organisms, including modified plants and animals. Many environmental groups and scientists are concerned that patents granted on life forms would hinder the process of scientific research by researchers that do not own the patents; and also that the incentive of providing monopoly rights to companies to produce GMOs would contribute to the proliferation of genetic-engineering application that have adverse effects on biodiversity.

3.4 Farmers' access to AKST vs. Breeder Rights

The importance of the conservation and sustainable utilization of plant genetic resources (PGRs) for food and agriculture is broadly recognized today. One of the areas for global action relates to farm conservation. Farmers not only use seeds and related AKST; they are key players in the process of conservation and improvement of plant varieties. Their activities ensure crop evolution whereby new varieties arise through genetic recombination, mutation and hybridization within and between cultivated and wild plant populations (Brush, 1994, p.7).

With the importance of farmer protection and public interest protection from the patent regime in agriculture, many developing countries like Thailand, Zambia, Bangladesh and Costa Rica provide farmer rights in their legislations. The Indian Protection of Plant Varieties and Farmer Rights Act, 2003 also provides for farmer rights to use, reuse, exchange, and even sell (unbranded) seed, has researcher exemption, creates a national gene fund, and provides for compulsory licensing in case of public interest. Farmers' rights are valuable as they promote equity, conservation, and preservation which are so crucial for sustainable agriculture. But so far as protection of farmer varieties is concerned, there are problems of identifying one from another, duration of protection and passing on the benefits to community (Alam, 2004).

A recent comparative analysis of the protection to plant varieties and farmer rights in the patent laws of the various Asian countries shows that only India and Malaysia recognize the protection of farmers' interests as one of the objectives of the law, and almost all the countries have based their definition of plant variety and essential derived variety on the UPOV[3] with only Bangladesh, India, Malaysia and Thailand excluding microorganisms expressly and only China and South Korea not defining EDVs. On definition of breeders again, except India and Thailand, other countries specifically recognize 'discovery' as a ground which could hurt farmer interest as any breeder could discover a variety which rightfully might have been invented by farmers. Only India and Malaysia recognize 'evolution' and 'genetic manipulation' as one of the criteria for breeders respectively. Surprisingly, most of the countries except India, do not define farmers as they are not given any rights. This is due to the fact that UPOV has been followed which only provides

[3] The Convention on the Protection of Plant Varieties

breeder rights. Indian definition of farmer is broad enough. Except India, Malaysia and Thailand which accommodate farm varieties to some extent, mostly UPOV laws have been followed for criteria for granting protection to plant variety which is NDUS – new, distinct, uniform and stable. TRIPS requires protection of plant varieties as against new plant varieties under UPOV. Breeders have exclusive rights over agricultural and horticultural varieties and even export and import is in the hands of breeders. Most countries provide Plant Breeders Rights (PBRs) for 20-25 years for trees and 15-20 years for other plants except India which has initially shorted protection but extendable and Malaysia which is biased against farmers' varieties. In all cases, the PBR can be forfeited if variety does not fulfil the claims made or if it is detrimental to the environment or the public order with Bangladesh even going further by making provision for invoking food security, monopolies or rights of the communities. Most of the countries also provide exemption to the rights granted to plant breeders but not as wide as in case of India. The exhaustion of breeder right is provided by Pakistan, Sri Lanka, South Korea and Philippines which is UPOV style while others are silent on this but this provision may have implications for sale for seed from harvested crops or subsequent sale of variety after it has been put into the market by the right holder. Most importantly, so far as farmer rights are concerned, India provides very comprehensive rights which encompass saving, sowing, resowing, exchanging, sharing or selling his/her farm produce including seed of a protected variety provided that farmer is not entitled to sell branded seeds of a protected variety. A farmer in India is also entitled to registration of his newly developed variety like a breeder and for reward under the Gene Fund for conservation of genetic resources of land races and wild relatives of economic plants. But, most other countries have not granted rights to farmers. Further, India and Pakistan also safeguard farmers against sold variety failing to perform but no other country has such provision. Most countries have compulsory licensing of a protected variety provision in public interest. Indian law also prevents terminator technology. Further, only Bangladesh, India and Thailand provide for community rights and benefit sharing and common gene fund (Kumar and Sahai, 2003).

Also, implementation of TRIPS can have a negative impact of farmers' access to AKST. Article 27.3(b) of TRIPS is a major driving force of the biotechnology industry and provides the legal protection for the development of GMOs, which are patented. Furthermore, countries like the United States allow patents on plants and animals and there is enormous pressure on developing countries to adopt similar standards for IPRs. All these have implications for farmers around the world. Patented seeds cost more and threaten farmers' rights to save, reuse, exchange and sell seeds, or even access to the seeds. This is already evident in the case of BT cotton seed in India as discussed below.

Monsanto-Mahyco Biotech Limited is charging Rs. 1250 per 450 gm packet of BT cotton seed from its licensees as trait value of seed which is nothing but royalty for transfer of BT technology to about 20 Indian seed companies, for which it has a patent under the TRIPS regime. It also collected Rs. 50 lakh from each of its sub-licensees as non-refundable fee which is illegal as per MRTP commission that monitors trade practices in India. MRTP has already initiated investigations against the company for overcharging for BT cotton seed, which is considered an unfair trade practice by a monopoly as the company is the only BT cotton seed seller in India. In US, it charges a royaly of only Rs. 573 per acre (Janaiah, 2006). The real cost of seed is said to be Rs. 500. The company on its own reduced the trait value fee to Rs. 900 per packet after the initiation of the case, but in US, the company charges only Rs. 108 per packet which is much lower than its rate for India (Times of India, New Delhi, April 21, 2006). The BT cotton seed costs only Rs.550 per packet per acre in China, Rs. 250 in South Africa and Rs. 1000 in Mexico. Only in India and Argentina, it is priced very high, i.e. Rs. 1800 and Rs. 1900 per acre respectively (Janaiah, 2006). The company has its patented technology based BT seed being sold in India with the help of many licensees. Thus, TRIPS has already become a barrier due to high price of the BT cotton seed so far as poor farmers are concerned. There are conflicting reports on the performance of the new seed in India and it has been banned in Andhra Pradesh for three years due to poor performance. It is due to this prohibitive high price of BT seeds that some farmers in India have resorted to illegal and spurious BT cotton seeds being sold by local traders and farmers, especially in Gujarat where the so called BT seed is available for Rs. 300-800 per packet. Thus, large proportion (50%) of total BT cotton area in India is under illegal and spurious varieties. The Supreme Court of India has recently asked the company to bring its trait value to levels which it charges in China within a month. Thus, Monsanto may have to slash its trait value fee to Rs. 40 per packet from Rs. 900 per packet of 450 grms of BT cotton seed. But, the company is likely to appeal against the order.

In several developed countries, patenting of plants, plant varieties and traditional knowledge associated with their use is already taking place and has been accelerating since TRIPS. In that process, “biopiracy” or the misappropriation of biological resources and traditional knowledge is taking place, as plants and seeds originating in developing countries are being patented, usually without the knowledge or consent of these countries of origin.

According to ActionAid (1999), between 1985 to 1999, about 11,000 patents on plants had been registered in the US. In the European Union, patent law has been extended to microorganisms and genes of plants, animals and humans. Thus, if a company has a patent on a gene from a rice variety, it can obtain a patent on new rice plants engineered with that gene.

The ActionAid study stated that techniques to decode and identify the best plant genes are accelerating and the biotechnology industry is racing to map the genomes of the world's staple food crops with a view to patenting the vital and most interesting genes. The farmers of developing countries that developed the world's food crops would have no effective rights over the varieties, due to the patenting being carried out by the transnational companies.

According to the study:
"Only 10 per cent of seed is bought commercially in the developing world and many poor farmers buy seed only once in five years…We believe the right to livelihood – a basic human right – is threatened by patents on life in food and agriculture. Our analysis is that these patents pose a threat to farmers' livelihoods and global food security. They may decrease farmers' access to affordable seed, reduce efforts in public plant breeding, increase the loss of genetic diversity and prevent traditional forms of seed and plant sharing."

The study also found that companies were seeking patent protection on gene sequences, proteins, plants and seeds. Three quarters of patents on plant genes were by the private sector, and almost half of 601 patents on plant DNA were filed by just 14 multinational companies. The study commented:

"Although patented plants and genes may have evolved in developing countries, there is no system of informed consent to notify the communities involved of the intentions of genetic collectors. This is the case even if the "invention" relies upon the knowledge and insight of local people. This is characterized by countries in the developing world as 'theft' of knowledge and natural living material."

In assessing cases of patents involving "biopiracy", the study lists in two tables patents that have been claimed for naturally occurring compounds, genes or gene sequences with a variety of functions. They include:
1) 62 patents on genes or natural compounds from plants which are traditionally grown in developing countries. The plants include rice (34 patents), cocoa (7), cassava (2), millet (1), sorghum (1), sweet potato (2), jojoba (3), nutmeg, camphor and cuphea (4), and rubber (8); and
2) (ii) 132 patents on genes in staple food crops which originated in developing countries but which are now grown globally. The crops include maize (68 patents), potato (17), soybean (25) and wheat (22).

In some of those countries where there are patents on plant varieties, farmers are being prosecuted for alleged violation of IPRs. These developments could be reproduced in developing countries in the future.

In 1998, a statement was issued by many farmers' organizations, people's movements and NGOs in South-East Asia to the WTO Ministerial Conference held in Geneva in May. The joint statement criticized the extension of patent system through TRIPS that gave global corporations the right to claim monopoly IPRs ownership over rice, citing specific cases. The statement made a number of demands, including that WTO member states should recognize that farmers' and community rights have precedence over IPRs and that IPRs destroy biodiversity. Member states of the Association of South-East Asian Nations (ASEAN) were urged to resist the extension of IPRs system and instead to develop community rights at the local and national levels. The Filipino farmers led group MASIPAG (involved in community-managed breeding and conservation efforts throughout the Philippines) helped to organize the above statement. Its own position was that its own work (involving 50 trial farms maintaining 500 collections of traditional and improved traditional varieties as well as 534 farmer-bred lines and 75 selections of rice being grown and improved by over 10,000 farmers) would be threatened by misappropriation by corporations or research agencies if TRIPS is implemented. "As far as MASIPAG is concerned, these plant varieties belong to the communities and should never to be subject to private monopoly rights like IPR…Patenting life conflicts with the values which have upheld biodiversity as part of the common history and ancestry of the Filipino people" (MASIPAG 1998).

3.4.1 Public and private sector research and development

How has IPRs, especially the availability if IPRs for living organisms affected public and private research and development in AKST?

As UC Davis researcher Paul Gepts summarized (Gepts, 2004), "A first observation is that it has shifted the center of gravity of plant breeding since the early 1980s from the public to the private sector" for soybean, wheat, cotton and for plant biotechnologies where 75% of the patents originate in the private sector (Atkinson et al., 2003). There is evidence to suggest the shift occurred with the introduction of TRIPS and in agriculture input segment has coincided with consolidation of agribusinesses resulting in integrated companies controlling agrochemicals, seeds and biotech traits (Lesser and Mutschler (2002); UNCTAD 2005). For agrochemicals, the three leading corporate groups alone are estimated to represent approximately half of the market, (see Table 3.11), however for seeds four corporations have about thirty percent of the market share (Table 3.12), but the figures may mask much stronger market concentration for major crops in specific regional markets. In addition, UNCTAD notes that the figures ".. obscures the

outstanding degree of consolidation in some of the major seed country markets. This is notably the case of the United States, whose seed industry has undergone major structural changes since the early 1970s (a 2004 USDA publication acknowledges the following four-firm concentration ratios for US commercial seed industry, 1998: 67 per cent for corn; 49 per cent for soybean; and 87 per cent for cotton). [4]Similarly, the overall ratio does not give account of the share enjoyed by individual companies across crops. Monsanto's branded seed business – including the Dekalb and Asgrow brands – would hold approximately 16 per cent of the US corn market (following the Channel Bio crop acquisitions); through its Holden's/Corn States licensing business, Monsanto is estimated to provide germplasm and traits to independent seed companies and distributors who reach 35 per cent of the market. With the acquisition of Seminis, Monsanto is estimated to account for roughly 40 per cent of the US vegetable seed market. " The same study also points out that there is a strong potential for demand complementarity between agrochemical and seed businesses (Box 3.1).

Another structural change has been increased coordination with a trend towards heightened strategic cooperation amongst large competitors in the agricultural biotechnology sector and vertical coordination upward and downward along the food chain described in the introduction (UNCTAD 2005)

The incentives for extensive mergers along with "… the breadth of protection accorded to the patent holder (in many cases the seed or biotech company), concentration in agricultural biotechnology is giving the largest corporations unprecedented power vis-à-vis growers and other stakeholders. In particular, the privatization and patenting of agricultural innovation (gene traits, transformation technologies, and seed germplasm) have supplanted the traditional agricultural understandings on seed and farmers' rights, such as the right to save and replant seeds harvested from the former crop" UNCTAD 2005). In some cases, this has resulted in a drastic erosion of traditional farmers' rights, and changed farmers from "seed owners" to mere "licencees" of a patented product (UNCTAD 2005)

The synergy and vertical integration offered by the alliance of traditional seed industry and biotech have facilitated a race to buy seed companies by the biotech and agrochemical giants.

The combination of biotech and seed companies has been crucial to the market penetration of GM varieties. The UNCTAD study gave an example (see details in (UNCTAD 2005, p11-12) how

[4] Jorge Fernandez-Cornejo, *The Seed Industry in U.S. Agriculture: An Exploration of Data and Information on Crop Seed Markets (by), Regulation, Industry Structure, and Research and Development* (Washington, DC: U.S. Department of Agriculture, Economic Research Service, February 2004).

some of the largest agricultural biotechnology companies in Europe and the United States have emerged as significant players in the rapidly growing Brazilian seed market. By these acquisitions the largest biotech companies have established global corn and oil-seed business through which to commercialize crop enhancement products in Brazil, a country that had for long resisted GM crops. ESAP countries are a major market for the global biotech and agrochemical giants, thus it is conceivable they would employ similar strategy in ESAP regions. While the synergy and vertical integration can be good thing for business, it raises serious concerns for AKST development. The companies' overriding profit-seeking motives may not always be compatible with the goals of poverty/hunger reduction and sustainable development.

The recent development in IPR regime is also a driving force of market consolidation and concentration in the sector. Led by changes in US patent system, growing proprietary rights have been granted to agricultural innovation. This leads to increasing number of patents, patents being increasingly issued on fundamental technologies, multiple claims over various aspects of a technology. Due to these reasons, even giant companies often find it difficult to avoid infringing patents when conducting product development research. As the UNCTAD study points out, "Monsanto and DuPont, DuPont and Syngenta, Monsanto and Syngenta, Syngenta and Dow have all filed suits against one another involving claims of patent infringement…Besides litigation, "defensive patenting" (companies tend to patent as much as they can to deter litigation though the threat of reciprocal suits) has become common practice within the industry." This thus creates a need to consolidate patent portfolios, thus acts as an incentive for the extensive mergers and acquisitions in the agricultural biotechnology and seed businesses.

The asymmetries between the developed and the developing world in aspects like agricultural systems, market institutions, and research and regulatory capacity which raise transaction costs for the latter, raise doubts whether poor can benefit from the biotechnology development in terms of spill over or trickle down effects. China is the only country to have developed GM technology in the public sector with other developing countries depending on imports or local adaptations of imported varieties. Further, GM crops are not targeted at poor farmers and marginal environments as they are not attractive to the private sector agencies involved in this technology (Pingali, 2005). In India, the policy towards GM crops was more of preventive nature in terms of IPRs and trade, precautionary in terms of biosafety, and permissive on food safety and consumer choice while being promotional on public research investment (Paarlberg, 2000).

The crowding of IPRs and the increasing concentration of them in corporations is also jeopardizing research. According to the UNCTAD study, "Academic scientists engaged in agricultural research report problems of access to important technologies due to an overlapping

set of intellectual property (IP) rights on research tools and genetic contents[5]. The reasons would lie in the increasing number of patents being issued, increasing patent breadth and uncertain ownership of rights, all resulting in IP congestion and uncertainty. The accumulated transaction costs involved (tracking down owners, conducting negotiations, and multiple royalty payments to administer) have created a major access obstruction that is hampering agricultural research, according to some commentators[6]."

Gepts (Gepts, 2004) used the case of golden rice to explain the problem, "The development of the pro-vitamin A-rich, "golden" rice (Ye et al., 2000) provides a stark example of how quickly an invention can get lost in a "thicket" of IP rights. An analysis of the situation by Kryder et al. (2000) revealed that 70 IP or tangible property rights belonging to 32 companies and universities had been used in the development of this rice line. In addition, MTAs(material transfer agreements) further complicated the situation. The integration of the high pro-vitamin A trait into cultivars adapted to farming in regions with vitamin A deficiencies required that these IPR issues be resolved, i.e. that breeders as scientific users and farmers and consumers as potential beneficiaries of the technologies would be able to use it without infringing on IPRs ("freedom to operate," or FTO). This was achieved by providing a license to a large biotechnology company, Zeneca, covering not only the pro-vitamin A pathway in rice but also in any other crops, in exchange for a humanitarian use (defined as a maximum of U.S. $10,000 revenue from golden rice) in developing countries (Potrykus, 2001). Clearly, such a solution was made possible in part because of public relations concerns on the part of the major holders of IPRs, mainly large, multinational biotechnology companies. However, this "segmentation" of the potential market did not solve fundamentally the issue for researchers, farmers, and consumers in developed countries."

Gepts also points out the negative impacts and challenges by the IPRs regime on public research: "Public institutions are faced with similar "thickets of IPRs," despite the fact that they have been responsible for much of the basic research leading to the initiation and continued development of biotechnology in the first place (Atkinson et al., 2003). The fragmentation of IPRs covering technologies (so-called "enabling technologies") and plant materials among many companies and institutions also created FTO problems. Biotechnology companies have dealt with these problems by developing their home-grown technology, licensing technology from other companies, and by acquiring or merging with other companies and, thus, assembling a complete

[5] Their concerns are expressed, for example, in the proceedings of a 1996 forum at the National Academy of Sciences
(Natural Research Council, *Intellectual property Rights and Plant Biotechnology*, Proceedings of a Forum Held at the National Academy of Sciences, 5 November 1996 (Washington, D.C.: Natural Research Council, 1997).
[6] Taylor and Cayford (2004), *supra* note 9, at 347-349.

IP portfolio allowing them to commercialize new technologies, including transgenic cultivars of major field crops such as maize, soybean, and cotton. Left out of this equation are many horticultural crops or specialty crops with smaller markets in developed countries and subsistence crops in developing countries. A recent initiative from some leading public universities and private foundations promises to address the FTO issue. The Public-Sector Intellectual Property Resource for Agriculture (PIPRA; www.pipra.org) intends to establish "best practices" encouraging the greatest commercial application of publicly funded research, while also retaining rights to allow public institutions to fulfill their responsibilities toward the public at large. It will also establish a database providing an overview of IPR currently held by public institutions, with up-to-date information on the licensing status of these IPRs. In addition, it will also attempt to pool patents or other IPRs to develop "technology packages" of complementary patents, which would provide FTO to public sector researchers and reduce transaction costs associated with obtaining licenses to develop transgenic cultivars (Atkinson et al., 2003)…While actions such as those proposed by PIPRA attempt to address the FTO issues, they do not fundamentally alter the framework in which current public research has come to operate. The public-sector research "culture" has a long tradition of open sharing of genetic resources, germ plasm, and research findings. This has led, among other things, to extensive genetic resources collections with broad availability. This tradition of open sharing and exchange is now severely challenged and raises several concerns with regard to the availability of biodiversity for research and cultivar development."

In response to bioprospecting by corporations, the gene banks of the centers belonging to the Consultative Group for International Agricultural Research (CGIAR), such as the Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT; Mexico), the International Rice Research Institute (IRRI; The Philippines), and the Centro Internacional de Agricultura Tropical (CIAT; Colombia), which hold more than 500,000 germ plasm accessions, have instituted an MTA (http://www.sgrp.cgiar.org/MTA_E.pdf). This MTA seeks to protect the germ plasm or breeding lines and associated information distributed by the CGIAR center from ownership or IP claims by the recipients of this material. Obviously, this MTA does not cover further breeding uses leading to improved materials. It is noteworthy that most of the germ plasma in these gene banks were donated by Southern countries, and has been and continues to be accessible on an open access basis. Yet the genes and improved varieties derived from such material (usually developed by Northern corporations or agents) often enjoy proprietary protection under the current IPR regime. In the growing enclosure of genes and biodiversity, the developing countries are getting the raw deal.

3.4.2 Technology dissemination and transfer

A strong IPR system is normally advocated to stimulate innovation. However, for most developing countries, the extra innovations generated by stronger PIPRs (private IPRs) would be meager, as agents in these countries possess poor innovative capabilities according to IPR criteria. As even Primo Braga (1996), who is quite sympathetic to TRIPS, admits, there is little evidence that stronger PIPRs encourage greater R&D in developing countries. Thus, one of the main concerns of developing countries with the adoption of the TRIPS agreement has been the extent to which the new rules will affect the transfer of technology, a vital element to foster economic development. As 97% of world patents are hold by developed countries (UNDP, 1999, p.68), the cost from paying royalties may significantly outweigh the benefits from (the insignificant) additional knowledge that the system extracts from nationals of developing countries[7].

It has been argued that higher standards of IP can lead to transfer of technology, as foreign corporations would be encouraged to invest in developing countries and make use of their technologies. However, there is also a counter-argument that foreign firms that have obtained patents in developing countries are able to make inroads and profits in these countries without having to produce the patented products there, as they can import the products and sell them at monopoly prices.

There are several ways in which a strong IPR regime can hinder access of developing countries to technology (see Khor 2002: pp.87-101). Obstacles to technology transfer make it difficult for developing countries and their corporations to upgrade productivity which is necessary for them to compete successfully. They thus impede competition.

Firstly, a strict IPR regime can discourage research and innovation by locals in a developing country. Where most patents in the country are held by foreign inventors or corporations, local R&D can be stifled since the monopoly rights conferred by patents could restrict the research by local researchers. Strict IPR protection, by its apparent bias, may actually slow the pace of innovation in developing countries, and increase the knowledge gap between industrial and developing countries. In such situations, the IPR system favors those who are producers of proprietary knowledge, vesting them with greater bargaining powers over the users (Oh 2000). The CIPR report (2002: pp.126-130) also provides analysis and examples of how the patent system might inhibit research and innovation.

[7] Indeed, the TRIPS implicitly acknowledges this problem, since it allows exceptions for the least developed countries and to a lesser extent to the developing countries.

As pointed out by Dr Gahuur Alam (1999): "The proposed changes to the IPR policies of developing countries have raised a number of important issues. One of the most important of these is the likely impact of these changes on a developing country's ability to undertake research and development in agriculture. We are particularly concerned about the impact of a strong IPR system on research aimed at the development of new plant varieties and genetically engineered plants."

In relation to biotechnology research, Dr Alam states: "The research in this area is completely dominated by firms in developed countries, while public sector research institutions (both international and national) are very weak. The adoption of an IPR system which includes patents for biotechnology based techniques and products will be extremely detrimental to local research.

As some study of cotton and rice research in India has shown, most of the important techniques and genes used in the development of genetically engineered plants are already owned by firms in developed countries. As these patent rights are not applicable in developing countries, local researchers are able to undertake research on local problems. However, once these rights become applicable in developing countries, research and its commercialisation will face serious problems."

Secondly, a strict IPR regime makes it difficult for local firms or individual researchers from developing or making use of patented technology.

Thirdly, should a local firm wish to "legally" make use of patented technology, it would usually have to pay significant amounts in royalty or license fees. As pointed out earlier, TRIPS increases the leverage of technology-suppliers to charge a higher price for their technology. Many firms in developing countries may not afford the cost. Even if they could, the additional high cost could make their products unviable. Moreover, there could be a large drain on a developing country's foreign exchange from having to pay foreign IPR holders for the use of their technology. Many developing countries with serious debt problems will be unable to afford to pay the cost of using the technologies.

Fourthly, even if a local firm is willing to pay the commercial rate for the use of patented technology, the patent holder can withhold permission to the firm, or impose onerous conditions, thus making it impossible or extremely difficult for the technology to be used by the firm. Patent holders can refuse to grant permission to companies in the South to use the technologies, even if they are willing to pay market prices; or else the technologies may be made available at high

prices (due to the monopoly enjoyed by the patent holders). Companies in the South may not afford to pay at such prices, and if they do their competitiveness could be affected.

3.4.3 Indigenous, traditional and institutional knowledge

Local or traditional knowledge (TK) refers to information held by local or indigenous people with regard to biodiversity in this case (Brush and Stabinsky, 1996). Indigenous people are defined as descendants of preconquest, traditional people of a certain geographic area, with a common history, culture, language, and customary law. TK encompasses information about, for example, crop landraces and their agronomic or culinary characteristics or the medicinal qualities of native species. TK is an essential aspect of an indigenous group's cultural survival; it has been developed through generations of intimate contact with the biological materials (Mauro and Hardison, 2000). It is transmitted in many ways, including apprenticeship with elders and specialists and oral tradition (including poems, songs, and music; Posey, 2002). Although indigenous people comprise only some 5% of total world population, they have a disproportionately large role in the maintenance of and knowledge about biodiversity because they are located primarily, although not exclusively, in biodiversity centers. Furthermore, with regard to crop biodiversity, indigenous or local farmers play an important role in in situ (on farm) conservation of landrace varieties (Brookfield et al., 2002). TK is not, however, limited to the knowledge of indigenous people but encompasses knowledge (and associated heirloom varieties) of local, nonindigenous communities in modern societies as well (e.g. Bérard and Marchenay, 1996).

Traditional knowledge is now widely recognized as having played and as still playing crucial roles in economic, social and cultural life and development, not only in traditional societies but also in modern societies. Even today, the majority of the world's population depend on traditional knowledge and practices for food and medicines. According to RAFI (1997, p4), 80 percent of the world's people rely on indigenous knowledge for their medical needs and half to two-thirds of the world's people depend on foods provided through indigenous knowledge of plants, animals, insects, microbes and farming systems. This recognition has heightened in recent years as a result of the increased awareness of the environmental crisis; the role of some modern technologies, production methods and products in contributing to this crisis; and a growing appreciation that local communities (especially in developing countries) have a wide range of traditional knowledge, practices and technologies that are environmentally sound or "friendly" and that have been making use of the manifold and diverse biological and genetic resources for food, medicines and other uses. The knowledge of local communities, farmers and indigenous peoples on how to use the many forms and types of biological resources and for many functions, as well as on how to conserve these resources, is now recognized as being a precious resource that is

critical to the future development or even survival of humankind. At the same time, this precious knowledge is maintained and thrives in the context of the traditional ways of social and economic life and customary practices of the traditional communities. Their rights to their knowledge, to the use of their knowledge and to the products arising from such use must be recognized. The misappropriation of their resources, their knowledge or the products of their knowledge would not only violate their rights, but also adversely affect the conservation and use of the knowledge and of biodiversity (as the IPRs obtained by corporations and other institutions may erode the communities' rights to continue using their resources or to continue with their traditional practices as discussed in earlier subchapter).

The above summary of the position of traditional knowledge and the rights of local communities is now widely accepted. There is acknowledgment: (i) of the role and importance of traditional knowledge; (ii) that for traditional knowledge to be maintained, the social and economic context in which it developed and is applied has to be maintained; (iii) that for this context to be maintained, the rights of local communities to their resources and knowledge have to be recognized and respected; and (iv) that misappropriation of these rights can erode the basis of traditional knowledge and thus adversely affect the prospects of sustainable development.

Whilst these principles may be widely acknowledged, there are debates and disagreements on many issues, such as the interpretation of the rights of local communities and what constitutes "misappropriation". Moreover, discussions are proceeding on what measures can or should be taken, at multilateral, national or community levels, to protect traditional knowledge and promote community rights.

The CBD has several provisions that acknowledge the contribution and nature of traditional knowledge, and also that aim at protecting community rights, the key provision being Article 8(j). However, the contribution and nature of community knowledge and community rights are not recognized in the TRIPS agreement. Instead, the patent system endorsed by TRIPS favors private individuals and institutions, enabling them to acquire "rights", including rights over the products or knowledge, whose development was mainly carried out by the local communities. TRIPS and the enactment of patent laws relating to biological materials in some countries have facilitated the misappropriation of the knowledge and resources of indigenous and local communities, and the number of "biopiracy" cases has been increasing at a rapid rate. This misappropriation is counter to the principles and provisions of the CBD that oblige countries to recognize local community rights and fair benefit sharing. Indeed, one of the main objectives of establishing the CBD was to counter the possibility of misappropriation or "biopiracy", whilst one of the effects of TRIPS has been to enable the practice of such misappropriation.

There are proposals to encourage countries to use their options under TRIPS and the CBD in favor of sustainable development. Each country should interpret the agreements in ways that are most appropriate to it, maximizing the creative use of provisions of each agreement to suite the country's chosen policies. Under this approach, WTO members could draft their patent laws in ways that fully take into account the flexibility enabled by the following clauses in TRIPS:

- Article 8, which states that "Members may, in formulating or amending their national laws and regulations, adopt measures necessary to protect public health and nutrition, and to promote the public interest in sectors of vital importance to their socio-economic and technological development, provided that such measures are consistent with the provisions of this Agreement".
- Article 27.2, which states that "Members may exclude from patentability inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect ordre public or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment, provided that such exclusion is not made merely because the exploitation is prohibited by domestic law".
- Article 27.3(b), which permits exclusion from patentability of plants and animals and of essentially biological processes.
- Article 27.3(b), which also states that members must provide for protection of plant varieties either by patents or by an effective *sui generis* system or a combination of both. Countries have the flexibility to choose a *sui generis* system that protects traditional knowledge, farmers' rights and local community rights.
- Article 31 provides for national legislation to grant compulsory licenses, and there are no limits to the kind of grounds on which this may be done.

A major drawback of this approach is that developing countries in general have limited capacity (in terms of policy-making, legal and administrative expertise) to analyze the international agreements and to formulate national policies and draft legislation with the sophistication required. Thus, they may not be able to make full use of the flexibilities in TRIPS and the CBD. Also, for this approach to work, developed countries would have to allow the developing countries to make use of the flexibilities in the agreements, and not unduly put pressure on them when they do so.

This approach is an attempt to harmonize the traditional knowledge system and western IPR system. There are already some existing cases that are noteworthy. For example, India has already seen its practice in Kerala state where Jeevani – a drug with anti-fatigue properties – has been patented by TBGRI under a benefit sharing formula with Kani Tribe. The drug was extracted from a plant called arogyapacha in local language and was developed based on lead knowledge

given by the tribe. For this kind of development, it is important that the system of protection takes into account the ethical norms of the community involved, intention of protection (trade or health), GI protection and benefit sharing mechanisms for cumulative innovations (Harilal, 2006).

Meanwhile, many representatives of indigenous communities are advocating rejection of the application of an IPRs system based on their worldviews. In June 1999, a group of 114 indigenous peoples' organizations from many countries around the world, as well as another 68 indigenous peoples' support groups, issued a joint indigenous peoples' statement on the TRIPS agreement (Tebtebba Foundation 1999). Some of the key points of the statement are as follows:

I. Nobody can own what exists in nature except nature herself… Humankind is part of Mother Nature, we have created nothing and so we can in no way claim to be owners of what does not belong to us…[W]estern legal property regimes have been imposed on us, contradicting our own cosmologies and values.

II. We view with regret and anxiety how, Article 27.3b of the Trade-Related Aspects of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO) Agreements will further denigrate and undermine our rights to our cultural and intellectual heritage, our plant, animal, and even human genetic resources and discriminate against our indigenous ways of thinking and behaving. This Article makes an artificial distinction between plants, animals, and micro-organisms and between "essentially biological and microbiological processes" for making plants and animals…[A]ll these are life forms and life creating processes which are sacred and which should not become the subject of proprietary ownership.

III. IPRs as defined in the TRIPS Agreement are monopoly rights given to individual or legal persons (e.g. transnational corporations) who can prove that the inventions or innovations they made are novel, involve an innovative step and are capable of industrial application. The application of this form of property rights over living things as if they are mechanical or industrial inventions is inappropriate. Indigenous knowledge and cultural heritage are collectively and accretionally evolved through generations. Thus, no single person can claim invention or discovery of medicinal plants, seeds or other living things.

IV. The inherent conflict between these two knowledge systems and the manner in which they are protected and used will cause further disintegration of our communal values and practices. It can also lead to infighting between indigenous communities over who has ownership over a particular knowledge or innovation. Furthermore, it goes against the very essence of indigenous spirituality which regards all creation as sacred.

V. TRIPS will lead to the appropriation of our traditional medicinal plants and seeds and our indigenous knowledge on health, agriculture and biodiversity conservation. It will undermine food security, since the diversity and agricultural production on which our communities depend would

be eroded and would be controlled by individual, private and foreign interests. In addition, the TRIPS Agreement will substantially weaken our access to and control over genetic and biological resources; plunder our resources and territories; and contribute to the deterioration of our quality of life.

The indigenous peoples put forward the following proposals for the review of Article 27.3 (b) of the TRIPS:

I. This Article should be amended to categorically disallow the patenting of life forms. Thus, the revised Article 27.3b should clearly prohibit the patenting of plants and animals including all their parts, meaning, genes, gene sequences, cells, proteins, seeds, etc. It should also prohibit the patenting of natural processes involving the use of plants, animals and other living organisms and their parts and processes used in producing variations of plants, animals, and micro-organisms.

II. The provision for the protection of plant varieties by either a patent, a *sui generis* system, or a combination of both should amended and elaborated further: It should:

- Disallow the use of patents to protect plant varieties.
- Ensure that the *sui generis* system which may be created will protect the knowledge and innovations and practices in farming, agriculture, health and medical care, and conservation of biodiversity of indigenous peoples and farmers.
- Build upon the indigenous methods and customary laws protecting knowledge and heritage and biological resources.
- Ensure that the protection offered to the indigenous and traditional innovation, knowledge, and practices are consistent with the Convention of Biological Diversity (i.e. Articles 8j, 10c, 17.2, and 18.4) and the International Undertaking on Plant Genetic Resources.
- Allow for the right of indigenous peoples and farmers to continue their traditional practices of saving, sharing, and exchanging seeds; and harvesting, cultivating, and using medicinal plants;
- Prevent the appropriation, theft, and piracy of indigenous seeds, medicinal plants, and the knowledge around the use of these by researchers, academic institutions, and corporations, etc.
- Integrate the principle and practice of prior informed consent, which means that the consent of indigenous peoples' as communities or as collectivities should be obtained before any research or collection of plants will be undertaken. The right of indigenous peoples to veto any bioprospecting activity should be guaranteed. Mechanisms to enforce prior informed consent should be installed.

- Prevent the destruction and conversion of indigenous peoples' lands which are rich in biodiversity through projects like mines, monocrop commercial plantations, dams, etc. and recognize the rights of indigenous peoples to these lands and territories.
- This statement was endorsed by a large number of indigenous peoples' organizations and support groups around the world, and is thus one of the most representative presentations of views of indigenous people's communities on IPRs and TRIPS to date. It is important to note not only that the signatories are of the view that the IPRs regime threatens the rights, way of life and knowledge of indigenous peoples, but also that they reject the application of an IPRs system of indigenous peoples which is based on collective innovation and collective rights. Thus they are advocating that the international agreements need to modify to include diverse worldviews. This was also presented in a statement on behalf of indigenous peoples at a roundtable on Intellectual Property and Traditional Knowledge at the World Intellectual Property Organization (WIPO) in November 1999. According to the statement: "We believe that the challenge for WIPO and governments, as well as other international multilateral organizations, is to maintain an open mind and be more daring in exploring ways and means to protect and promote indigenous and traditional knowledge outside of the dominant IPR regimes. WIPO should not insist in imposing that the IPR regime it is implementing, particularly patents, is what should be used to protect traditional knowledge. Other forms of protection should be explored and developed in partnership with indigenous peoples and other traditional knowledge holders. Any effort to negotiate a multilateral framework to protect indigenous and traditional knowledge should consider indigenous practices and customary laws used to protect and nurture indigenous knowledge in the local, national, and regional levels." (Tauli-Corpuz 1999)

3.4.4 National and regional responses, impact on developing countries

There is a trend for bilateral free trade agreements (FTAs) between developing and developed countries (especially the United States) to oblige the countries concerned to allow for the patenting of plants and animals, and this is often under pressure from the developed countries.

In the case of new plant varieties, there are pressures for developing countries to adopt the 1991 International Convention on the Protection of New Plant Varieties (UPOV) as the "sui generis" system, but this is more like a patent and favors commercial plant breeders at the cost of small farmers and even public researchers. Malaysia and Thailand have adopted sui generis plant variety protection laws that strike a better balance for small farmers, but in on-going negotiations of bilateral FTAs with the United States, they are pressured to take on UPOV 1991. China became a Member of UPOV 1991 on 23 April, 1999. As a WTO Member, China also has TRIPS obligations and the challenge is to ensure that the flexibilities and safeguards are maximized so that the public interest and long-term sustainable development of the country are assured.

The shortcomings and inherent inequities in existing intellectual property systems, especially patents, are increasingly acknowledged. A comprehensive assessment and the net adverse impact of IPRs on developing countries can be found in the report of the International Commission on Intellectual Property Rights, entitled “Integrating Intellectual Property Rights and Development Policy” (2002). This Commission was initiated by the UK government and chaired by a leading US lawyer, Professor John Barton. Literature survey, commissioned papers, consultations and country visits were undertaken to “incorporate voices from both developed and developing countries: from science, law, ethics and economics and from industry, government and academia” [for a full report, see www.iprcommission.org]

The former chief of trade policy research in the World Bank, Michael Finger (2002), estimates that the obligations on developing countries to implement TRIPS will result in increased payments by them in US$60 billion a year. A report by the World Bank (2002) estimates that the net annual increase in patent rents resulting from TRIPS for the top six developed countries in this field will be US$41 billion (see also Table 3.3 and 3.4) —with the top beneficiaries being the US with $19 billion, Germany $6.8 billion, Japan $5.7 billion, France $3.3 billion, UK $3 billion and Switzerland $2 billion. Developing countries that will incur major annual net losses include South Korea ($15.3 billion), China ($5.1 billion), Mexico ($2.6 billion), India ($903 million) and Brazil ($530 million). Weisbrot and Baker (2002) argue that the World Bank’s patents rents estimates, already high enough, significantly understate the actual costs to developing countries, as these only measure the direct outflow of patent rents from these countries. In addition there are economic distortions as the IP protection causes goods to sell at prices far above their marginal costs, thus given rise to “dead-weight cost”. Citing other studies, they estimate the deadweight costs to be twice the size of the estimated patent rents.

In addition, there are costs for administering and enforcing IP laws and policies, requiring law reform, enforcement agencies and legal expertise. According to Finger (2002), World Bank project experience indicates that it will cost a developing country $150 million to get up to speed on three new WTO areas (IPRs, SPS and customs valuation). He notes that this amount is more than a full year’s development budget in many LDCs.

Many analysts believe that the developing countries received a bad deal in accepting TRIPS in the Uruguay Round. “Through TRIPS developing countries took on as legal obligation a cost of $60 billion per year, but there is no legal obligation in the agreement on any Member to provide anything in exchange” (Finger 2002: p.11). Finger adds that the Uruguay Round “grand bargain” was that developing countries would take on obligations in the new areas and in

exchange developed countries would provide better access to their markets, particularly on agricultural products and on textiles and clothing.

He concludes that compared with the outcome of the market access negotiations, the TRIPS amounts (i.e. net rents) are big money. The US obtained 13 times more benefit from annual patent rents arising from TRIPS than from liberalization of industrial tariffs with Germany, France and UK gaining 3.6 times more. Conversely, the loss from TRIPS obligation is 18 times greater for Korea than gains from Uruguay Round tariff liberalization, and the costs outweigh benefits 7 times for Mexico and 4.7 times for China.

Well-known trade economists who advocate free trade have also written harshly on the imbalances of TRIPS and the adverse effects on competition caused by the upward harmonization of IP standards induced by TRIPS. Jagdish Bhagwati (2001), the economics professor at Columbia University, in a letter to Financial Times argued that the WTO must be about mutual gains in trade whereas IP protection is a tax on poor countries' use of knowledge, constituting a wealth transfer to the rich countries. "We were turning the WTO, thanks to powerful lobbies, into a royalty-collecting agency by pretending, through continuous propaganda that our media bought into, that somehow the question was 'trade related'." He advocated that the TRIPS Agreement be removed from the WTO.

T.N. Srinivasan (2000), economics professor at Yale University also advocates taking TRIPS out of WTO altogether or at least renegotiating some of its provisions. The arguments put forward as benefits to developing countries of high IP standards are that this would encourage local innovation, and foreign enterprises would be more willing to transfer technology and to invest.

"These a priori arguments are based on the premises that first IPR protection of the type imposed by TRIPS is needed to encourage innovation and second that foreign enterprises place a significant weight on the strength of IPR protection regime. The theoretical justification for and even more importantly the empirical evidence in support of both these premises is not at all strong….It would appear that patent protection as a spur to innovation does not appear to be powerful in the real world. And the cost to the general public of restricting access to new technology through patenting may be high."

In relation to balance of gains and losses and to the effect on competition, Sreenivasan states: "Most of the gainers from TRIPS are in rich developed countries and only a few, if any, in poor countries. This being the case, even if gains outweigh losses, international transfers would be needed to compensate losers. No such transfers from gainers to losers are envisaged as part of

TRIPS. Besides, TRIPS, unlike tariff reductions, involves the creation or strengthening of the monopoly position of developed country producers in the markets of poor countries. Thus, TRIPS creates a distortion of monopoly in developing countries, the rents from which accrue to the rich. Besides, any acceleration of innovative activity, which is the only rationale for granting monopoly rights, if it comes about at all, will take place mostly in rich countries. Whether some of the benefits from any acceleration of innovation in the rest of the world will accrue to poor countries is arguable. In any case the benefits, if any, are uncertain and in the future, but the costs to developing countries are concrete and at the present."

3.4.5 Conclusion

The shortcomings and inherent inequities in existing intellectual property systems, especially patents, are increasingly acknowledged, with concerns over the net adverse impact of intellectual property rights (IPRs) on developing countries, who remain net IPR importers. The WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) sets global minimum standards on IPRs. There is debate over the role of IPRs in development, with some claiming that high IPR protection is necessary to ensure returns to research investment and innovation. Yet, evidence shows that the monopoly of knowledge afforded by IPRs can be detrimental to development goals. Historically, IPRs were applied mainly to mechanical inventions, or to artistic creations, however the assignment of IPRs to living things is of relatively recent origin in developed countries. While these issues are still being debated and not fully addressed yet, regrettably, higher protection of IPRs, even going beyond that required under the TRIPS Agreement, is increasingly advocated in free trade agreements, particularly with developed countries like the United States.

IPR standards under trade agreements have contributed to a shift in AKST, by facilitating private sector dominated research and consequently privately-generated and owned AKST. Patents, and to some extent plant variety protection (PVP), have played a part in the major consolidation of the global seed and agricultural input corporations, many of which are also developing transgenic crops. The need to consolidate patent portfolios and hence ensure freedom to operate appears to have created incentives for this consolidation. In this private sector dominated context, market forces rather than food security needs have dictated the direction of research in general. At the same time, public sector research is either stagnating or declining, and also faces barriers in terms of IPRs preventing access to research materials, tools and technologies. Public sector research needs to be strengthened and better funded. The objective should be to ensure that research is oriented to address the needs of poor and small farmers. There is a need for governments to consider the use of competition law (e.g. anti-trust) to respond to the high level of concentration in the private sector. While some national level action has been taken to break

monopolies and encourage competition, there is no international mechanism to deal with such issues.

The international trade regime raises issues of relevance, adequacy, affordability and access to AKST; in particular, IPRs may restrict access to plant material for farmers and threaten farmers' rights. For farmers and rural producers, knowledge is increasingly becoming an economic good for which they are willing to pay and are paying significant costs. However, IPRs may restrict access to plant material for farmers. Patented seeds cost more as patent owners have a monopoly and can charge high prices. There are considerable dangers to food security if seeds are overpriced to the exclusion of poor and small farmers. The consolidation of the global seed and agricultural input corporations and their subsequent monopoly over the agricultural chain also results in high prices for agricultural inputs.

The spread of private IPRs is also considered to be a threat to the rights of farmers to save, use, exchange and sell seeds that have been subject to proprietary claims, even though it is farmers who have played a crucial role in conserving, developing and making available plant genetic resources that are the basis of food and agriculture and these are the very practices that have formed the basis of their traditional role in conservation and development. IPRs can thus stifle local innovation and research. Furthermore, Genetic Use Restriction Technologies (GURTs) or "terminator" technologies can be used to biologically prevent seeds from germinating in order to protect proprietary claims of IPR-holders. This has tremendous impact on small farmers and indigenous communities, and has been heatedly debated under the Convention on Biological Diversity, under which a de facto moratorium on field-testing and commercialization of GURTs exists.

Currently, farmers' rights are not yet adequately protected through effective means, both domestically and internationally. The International Treaty on Plant Genetic Resource for Food and Agriculture is a start, as it acknowledges the role and contribution that farmers have played in conserving and developing plant genetic resources. Parties have an obligation to protect and promote farmers' rights, including the right to save, use, exchange and sell farm-saved seed/propagating material. However, these rights are subject to national law. Implementation of farmers' rights at the national and international level is critical to ensure continued conservation and maintenance of agricultural biodiversity and associated AKST, and provide an important counterbalance to the rights accorded to formal plant breeders under PVP and patents**.**

3.5 Trade and Technology Options

This subchapter provides some examples of technology options that also impact and are impacted by trade. Pesticides and genetic engineering provide examples of technology options in agriculture that largely exemplify a flow of trade from developed to developing countries. On the other hand, fisheries, aquaculture and forest products are examples of technology options being implemented in developing countries and of the products being traded from developing to developed countries.

3.5.1 Pesticides

At the most basic level, pesticides are intended to kill organisms. The US Environment Protection Agency defines a pesticide as “any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest”. Pesticides include herbicides, insecticides and fungicides, as well as algicides, insect and animal repellents, antimicrobial and cleaning products, wood and material preservatives, and insect and rodent traps.

Besides harming target insects, weeds and fungi, pesticides also affect wildlife and human health. Some have immediate lethal effects including death, some cause acute illness at even minute levels of exposure, and others have been found to cause chronic (long-term) health and environmental harm.

Today, organochlorine pesticides, organophosphorus pesticides, pyrethroids, herbicides such as 2,4-D, glyphosate and paraquat, and fungicides are commonly used. With increasing evidence of negative effects, efforts have been undertaken to ban or restrict some pesticides, but in general, their use in developing countries is still widespread.

3.5.1.1 The Green Revolution in ESAP.

National and global concerns over food security drove the intensification of agricultural production in the South, epitomized by the Green Revolution and the adoption of synthetic chemical pesticides. Pesticide reliance became widespread across much of Asia and Latin America, where the Green Revolution had been widely embraced (Rosset et al., 2000).

The Green Revolution in ESAP drove widespread shifts in the agricultural sector from subsistence and low external input agriculture to monocropping with high yielding varieties (HYVs). It focused on areas with existing potential for high yields, e.g. well-irrigated areas with good soil, often to the exclusion of other areas. This agricultural paradigm required the adoption of a ‘package’ of inputs, including irrigation, chemical pesticides and fertilizers, and hybrid seeds bred for disease resistance and high yield. Participants often enjoyed access to credit and agro-

processing facilities, transport and roads, machinery, marketing infrastructure and government price supports.

By the 1970s, Green Revolution-style farming had replaced the traditional farming practices of millions of developing country farmers. By the 1990s, almost 75% of Asian rice areas were sown with these new varieties. Overall, it is estimated that 40% of all farmers in developing countries were using Green Revolution seeds by this time, with the greatest use found in Asia, followed by Latin America (Rosset et al., 2000; Shiva, 1991).

The World Food Conference (1974) highlighted the importance of pesticides, and urged developed countries to increase their availability to developing countries. Public sector actors involved included the Consultative Group on International Agriculture Research (CGIAR) centres, National Agriculture Research Organisations (NAROs) and agencies such as the World Bank, the United States Agency for International Development (USAID) and Japan International Cooperation Agency (JICA). They provided direct supplies of pesticides, and agricultural credit was tied to adoption of input packages (Ishii-Eiteman and Ardhianie, 2002; Jain, 1992; USAID, 2006). The World Bank's structural adjustment programs also required countries to shift production towards non-native export crops that are susceptible to pests and - in the absence of effective training - typically resulted in increased pesticide use (Hamburger and Ishii-Eiteman, 2003; Hammond & McGowan, 1992; Korten, 1995).

3.5.1.2 Pesticide use trends.

The spread of Green Revolution-type agriculture throughout most developing countries was accompanied by a rapid rise in pesticide use (Rosset et al., 2000). Along with the CGIAR, the agricultural research and development agencies and universities of many countries focused on breeding seeds to increase plant uptake of nitrogen, so as to boost yields, which frequently required increasing pesticide use to control pest outbreaks.

However, promising increases of yield were offset by rising costs associated with increased use of chemical inputs. In the Central Plains of Thailand, yields went up only 6.5%, while fertilizer use rose 24% and pesticides jumped by 53%. In West Java, profits associated with a 23% yield increase were virtually cancelled by 65% and 69% increases in fertilizers and pesticides respectively (Rosset et.al., 2000).

While multinational chemical companies based in the US or Europe account for the bulk of worldwide production and sales, local pesticide industries have also expanded, growing rapidly in countries favoring high input agriculture. For example, the pesticide industry in India is now the

fourth largest in the world and second largest in the Asia-Pacific region after China. Estimates of its total market value vary between US$ 850 million and US$ 911 million. According to the Pesticides Manufacturers and Formulators Association of India, there are around 55 basic producers and 300 pesticide formulators, as well as numerous small-scale manufacturers. Around 200-odd generic pesticide products are made in India (CSE, 2001).

3.5.1.3 Drivers of pesticide use and resource allocation.

Pesticide manufacturers are the most direct drivers of pesticide use, acting on their own as well as through public agencies. They have increased pesticide sales through extensive marketing, advertising, supply to extension agencies or workers and local or district leaders, and through partnerships.

Policy drivers include decisions by many developing countries to focus on export-led agricultural growth, which is typically accompanied by high pesticide use. Many governments also focused on increasing yield through adoption of Green Revolution technologies. Extension workers and government media channels like television and radio with high penetration into rural areas have been used to disseminate pesticide application related information. States shifted to a more 'science-led' rather than farmer-led agriculture, and also linked farmers' access to credit and capital to their acceptance of Green Revolution packages of seeds, fertilizers and pesticides. National quotas, priorities and directives for farmers were established in many regions (e.g. wheat and sugarcane in India, rice in Indonesia). National government research and extension systems removed farmers' decision-making power through direct state intervention in pest management via calendar spraying regimes and enforced control methods (Meir and Williamson, 2005).

Technological drivers include both public and private research and development of new technologies in seeds, machinery, fertilizers and pesticides. Institutional arrangements that contributed to the development of Green Revolution technologies included the international research community (e.g. CGIAR), the national agricultural research systems (NARs), academic institutions, research stations and the private sector. International donor agencies and bilateral agencies have also indirectly supported the spread of pesticides by supporting shifts towards Green Revolution technologies, and/or have supplied pesticides directly in agricultural aid packages (Shiva, 1991; USAID, 2004).

International financial institutions such as the World Bank have contributed directly to increased pesticide dependence, traditionally providing them in fixed packages of inputs that farmers are required to use by the terms of their contract (Ishii-Eiteman and Ardhianie, 2002), or indirectly, by imposing structural adjustment conditions on borrower countries that require shifts towards high

value export crops that result in increased pesticide dependence (Hammond and McGowan, 1992; Korten, 1995; McGowan, 1997; Oxfam America, 1995); by promoting intensified production without offering training in Integrated Pest Management (IPM) and leaving pest control advice up to pesticide companies (Hamburger and Ishii-Eiteman 2003), or by providing emergency rehabilitation or reconstruction loans that encourage or promote increased pesticide use (Karel, 2004).

Recent external reviews of World Bank lending have found that a majority of projects likely to affect pesticide use failed to provide plans for introducing or implementing IPM in a meaningful way, and were considered more likely to increase farmers' dependence on pesticides (Karel, 2004; Tozun, 2001). Past reviews also acknowledge the Bank's difficulty in implementing its IPM policy, but suggest that compliance is likely to improve in future (Liebenthal, 2002; Sorby, et al., 2003). The World Bank's "poor record of compliance" with its pest management policy has been linked to its practice of "actively open(ing) the door" to pesticide companies through programs geared towards modernisation of agriculture, liberalisation and privatisation (FAO, 2001). Nonetheless, other UN agencies like the FAO have helped the move towards IPM, providing examples of how developing countries have been able to adopt AKST beneficial to farmers in the face of powerful trade interests (see next subchapter for more details).

Partnerships and linkages between the pesticide industry and public agencies, have also encouraged the opening of new markets for industry products. The French pesticide company, Rhône-Poulenc Agro, for example, joined a World Bank program in West and Central Africa in the late 1990s, in order to "break into the cocoa, coffee, rice and vegetable [pesticide] markets which account for around 40% of the crop protection market in [West Africa]" (Rhône-Poulenc, 1998).

Social drivers include perceived inefficiencies in low external input farming as compared to Green Revolution agriculture. Changing food consumption preferences and patterns, with a shift towards more meat and grain in many regions, have led to increased production of specific crops such as wheat and rice. As newer generations of farmers lost much of traditional AKST in countries that embraced the Green Revolution, they naturally resorted to the Green Revolution technologies that surrounded them (Meir and Williamson, 2005; Rosset et al., 2000; Shiva, 1991).

In China, the situation is slightly different. Self-sufficiency in food formed a central component of national policy. The agricultural systems focused on the use of external inputs and mechanization of agriculture to increase yields (Xiaoyun et al., 1997). Agriculture was characterized by extensive monoculture, and use of HYVs, chemical fertilizers, pesticides and biotechnological products. The collectivization model of agricultural production was followed until the mid 1980s, afterwhich the

Household Production Responsibility System emerged (Wen, 2005; Xiaoyun et al., 1997), within which technological change has become the primary engine of agricultural growth.

China relied heavily on chemical fertilizers and pesticides to achieve short term yield gains. Central planning offices compelled the planting of Green Revolution crops, thus increasing the demand for pesticides to control the associated pest outbreaks (Xiaoyun et. al., 1997). Widespread loss of traditional AKST, including non-chemical approaches to pest management, occurred among peasant communities, who were required to adopt the collectivization model and expert advice of agricultural scientists (Hamburger, 2002).

Since 1975, the value of pesticide imports into China has grown from US$76 million to $293 million in 1994 (Pretty, 1995). A more recent spur for the growth of the Chinese pesticide industry has been the growth of pesticide exports and collaboration with multinational pesticide companies since the opening up of the Chinese economy. During this period, the Chinese Ministry of Chemical Industry signed cooperation agreements with Dupont, Ciba-Geigy, Bayer, BASF, and Rhône-Poulenc, and established joint ventures with Dupont, Ciba-Geigy, Zeneca and Agrevo to produce herbicides and insecticides. The Chinese government has also supported the pesticide industry by subsidizing importation of raw materials (although this type of assistance is decreasing quickly), tax exemption, lower costs for raw materials allocated through the central planning mechanism, and preferential electricity rates and bank loans (US Embassy Beijing, 1996).

According to data from Nanshen Pesticide Company, China produced 250,000 tons of pesticide active ingredients in 1995, equivalent to 1.5 million tons of formulated product (PAN-UK, 1996). Data from 2000 indicate that China is the second largest producer in the world of agrochemicals by volume, of which 35% is exported (Dinham, 2005). In 2004, China's pesticide industry experienced high production and growth in exports (China CCM, 2005). Domestic use of pesticides in Chinese agriculture has continued to grow, and China has become one of the primary exporters of cheap pesticides to Asian markets.

3.5.1.4 Technology choice for sustainable agriculture: integrated pest management.

As the Green Revolution model of agriculture began to break down in ESAP, with increasingly evident health and environmental impacts, farmers, scientists, and governments began to look for alternatives, including Integrated Pest Management (IPM). IPM is generally understood to focus on maintaining pest populations at economically acceptable levels through a systems approach that can include: cultural practices, soil, field and habitat management, use of resistant varieties, biological and sometimes chemical control strategies (Shennan et al., 2005). Organic farmers

have taken IPM a step further, and have eliminated synthetic pesticides from farming practices. This is also known as non-pesticide management (NPM). Pest management among organic farmers can range from simple input substitution (e.g. use of biopesticides) to more comprehensive ecological approaches.

Advances in ecological understanding of pest population and community dynamics in rice fuelled the development of a more nuanced and comprehensive approach to pest management (Kenmore et al., 1984; Settle et al., 1996). FAO's paradigm-shifting work in Asia in the late 1980s provided (a) the scientific demonstration that pesticide-induced pest outbreaks were, at times, responsible for crop failures in rice; (b) the ecological evidence that removing pesticides would restore yields and system stability; and (c) the policy insight that a number of directives (e.g. ban on pesticides, removal of pesticide subsidies and national support for IPM) could transform the situation.

Participatory field-based educational processes in pest management replaced conventional "transfer of technology" methods (Röling and Wagemakers, 1998). IPM programs that utilize non-formal education methodologies and build on - rather than replace - farmers' traditional knowledge, have longer lasting success in farmers' adoption of and innovation in AKST, than training methods that disseminate fixed instructions for input use and pest control (Mangan and Mangan, 1998).

The IPM Farmer Field School (FFS) methodology pioneered in Southeast Asia typified this knowledge process, and was subsequently adapted by governments, NGOs and farmers' associations. As such, IPM has evolved from a classical and technological insect management approach towards one in which the focus is on education and social change, whereby farmers develop the scientific research skills to test hypotheses and manage pest populations (Matteson, et al., 1994; Ooi, 1998).

Meanwhile, demand for pesticide-free, organic and fair-trade produce in export markets is growing, and has created new markets for Southern producers (IFOAM, 2003), although farmers must negotiate complex and costly certification processes. Burgeoning consumer interest in "green" and "pesticide-free" products, particularly in countries with growing middle class populations (e.g. Thailand, China, India), has supported the emergence of new domestic markets that encourage transition towards IPM.

IPM has met with significant success in rice producing Asian nations like Indonesia, Vietnam, China, India and Sri Lanka (Pretty, 1995; Pretty 2001). Millions of farmers have reduced pesticide

use through IPM, without experiencing reduced yields (Barzman and Desilles, 2002; Heong and Escalada, 1998; Mangan and Mangan, 1998). Yield advantages of IPM have been particularly strong in the South, and thus have significant policy implications for food security in developing countries.

Some actors have questioned the ability of pesticide-free IPM methods - and sustainable and organic agriculture more generally - to produce adequate quantities of food. However, a growing body of literature demonstrates the high productivity of both organic and low-external input systems, particularly when the production of multiple outputs is calculated (FAO, 2002; Parrot and Marsden, 2002; Pretty, 2000; Pretty and Hine, 2000).

In Northern countries, organic yields are slightly or negligibly lower, whereas yield gaps completely disappear in developing countries. The largest survey of worldwide sustainable agriculture (covering 208 cases in 52 countries, and 8.98 million farmers) found improvements in per hectare food production averaging 93%, with yield gains attained in over 89% of the area (Pretty et al., 2003). Most of the yield gains were achieved through introduction of regenerative approaches such as IPM.

The community-wide economic, health and environmental benefits of IPM have been widely documented. IPM Farmer Field Schools, in particular, have led to improved farm profitability and yields; significant reductions in pesticide use; improved occupational health, reductions in medical costs and lost working time caused by pesticide poisonings; reduced environmental harm; positive social impacts at the individual farmer and community level; better returns on government investments in extension and longer-term advances in food security (Mancini, 2006; ter Weel and van der Wulp, 1999; van den Berg and Jiggins, 2006).

It is clear that IPM is an example of AKST that not only provides an alternative to harmful pesticides, but that also brings benefits in its own right. The challenge is to mainstream its adoption, while providing the necessary policy support. A growing number of bilateral donor agencies are investing in ecological IPM strategies. The Global IPM Facility, FAO and EU have provided considerable technical and policy assistance to countries seeking to develop national IPM programs and to establish favourable policy environments.

3.5.2 Genetic engineering

Genetic engineering, also called modern biotechnology or genetic modification, is a departure from conventional breeding, involving the transfer of genetic material from one organism to

another, often unrelated, species. This results in a transgenic organism containing new genes or novel combinations of genes.

The introduction of genetically engineered (GE) crops (biotech crops, genetically modified crops or transgenic crops) has been accompanied by controversy over the role of genetic engineering in addressing agricultural problems in both developing and developed countries. Advocates cite potential yield increases and reductions in pesticide applications, among other factors. Critics point to environmental and health risks and widening socio-economic disparities as significant drawbacks.

According to the industry-associated International Service for the Acquisition of Agri-Biotech Applications (ISAAA), the global area of approved GE crops in 2006 was 102 million hectares or 252 million acres (James, 2007). Although GE technologies have the potential to affect both traded and non-traded products, most applications to date have involved highly traded agricultural commodities (Diaz-Bonilla and Robinson, 2001). Agricultural commodities such as soybean, maize and canola, for the purposes of food, feed or processing use, are the major genetically modified organisms (GMOs) that are currently traded internationally.

As such, commercially available GE crops have been almost exclusively limited to these crops of major economic importance – soybean, maize, cotton and canola. GE soybean was the principal GE crop in 2006, occupying 58.6 million hectares (57% of global GE crop area), followed by maize (25%), cotton (13%) and canola (5%).

In addition, two GE traits – herbicide tolerance and insect resistance – have thus far dominated the market. In 2006, herbicide tolerant crops accounted for 68% of the global GE crop area, insect resistant (Bt) crops, 19%, and stacked genes for the two traits, 13% (James, 2007). Almost four out of every five hectares of GE crops are engineered to withstand the application of proprietary herbicides sold by the same company that markets the GE seed, and thus have little, if any, relevance to farmers in developing countries who often cannot afford to buy these chemicals (FOEI, 2007).

GE crops are limited in their distribution, and have largely bypassed all but a few developing countries (Falcon and Fowler, 2002), with approximately 88.4% of global GE crop area confined to just four countries. In 2006, the US was the principal adopter of GE crops globally, with 54.6 million hectares (53.5% of global GE crop area), followed by Argentina (17.6%), Brazil (11.3%) and Canada (6%) (James, 2007).

In 2006, the global market value of GE crops, as estimated by industry market research, was $6.15 billion, representing 16% of the $38.5 billion global crop protection market and 21% of the approximately $30 billion global commercial seed market (James, 2007). This market comprised of $2.68 billion for GE soybean (equivalent to 44% of global GE crop market), $2.39 billion for GE maize (39%), $0.87 billion for GE cotton (14%), and $0.21 billion for GE canola (3%). The market value of the global GE crop market is based on the sale price of GE seed plus any technology fees that apply. Trade statistics do not differentiate between GE and non-GE agricultural crops and products; hence it is not possible to give an estimate of the annual global trade of GE crops.

The major exporters of GE crops and their products are the US, Argentina and Canada, with Brazil recently joining the ranks. Analyses show that in 1961/1963 developing countries as a whole had an overall agricultural trade surplus of US$ 6.7 billion, but that this has gradually disappeared so that by the end of the 1990s trade was broadly in balance. The outlook to 2030 suggests that the agricultural trade deficit of developing countries will widen markedly, reaching an overall net import level of US$ 31 billion (FAO, 2003). Given the current limited distribution and traits of GE crops, it is likely that the major GE crops importers will continue to be developing countries, with the exception of a few large agricultural developing country exporters. Furthermore, the cautious stance of the European Union towards GMOs, and the overwhelming public opposition there, has led to the domestic market in the EU being largely GE-free, or at the very least, only allowing GMO products that are clearly labelled for consumer choice.

3.5.2.1 Research trends and resource allocation.

While currently, the major GE crop exporters are developed countries, with the exception of Argentina and Brazil, many other developing countries are increasingly lured by the promised benefits of GE crops. For example, the press has reported that Vietnam has recently launched a US$ 63 million program to develop and apply biotechnology, particularly genetic engineering, in agriculture and rural development over the next 15 years (Vietnam News/Vietnam Economic Times, 2006). One stated objective is the establishment of a biotechnology market to promote the production, marketing and trade of key biotechnology/GMO products in Vietnam.

The changing focus to trade in agricultural commodities and export-oriented agriculture may have serious ramifications for developing countries. As farmers and peasants directly link to the market economy, economic forces increasingly influence the mode of production characterized by genetically uniform crops and mechanized and/or agrochemical packages (Altieri, 2003). This situation is expected to be aggravated by genetic engineering, whose development and commercialization is increasingly concentrated in a few corporations, accompanied by the

increased withdrawal of the public sector as the major provider of research and extension services to rural communities.

Even if the rural poor benefit from GE crops, because GE crops are mainly traded cash crops, this benefit would be likely reduced. As Santaniello (2003) points out, technological crop improvements tend to lower the market price and therefore the value of the farmer's marketable surplus. Moreover, the great majority of GE crops cultivated today are used as high-priced animal feed to supply rich nations with meat. GE crops have therefore not addressed the main agricultural problems and challenges facing farmers in most countries, neither have they proven to be superior to conventional crops (FOEI, 2007). It remains to be seen if large-scale production and trade of commodity GE crops has positively affected overall food security, although the opposite has been argued for some countries.

For example, in Argentina, one of the main exporters of GE soybean, adverse impacts have been observed, including the loss of food diversity and food sovereignty (Pengue, 2005). In the last 5 years, GE soybean production has displaced 4,600,000 hectares of land previously dedicated to other food production systems such as dairy, fruit trees, horticulture, cattle, and some grain. In 2005, more than 50% of the whole production of the agrifood sector (73,000,000 metric tons) came from the soybean sector. The impact of such displacement on food security could be considerable.

Furthermore, the export-oriented, commodity-production system is most likely to drive smaller farmers that are not able to face uneven competition out of business. Thousands of small- and medium-scale farmers in Argentina have been forced out of the production system, due to the expansion of GE soybean (Pengue, 2005). This phenomenon is not new or unique to Argentina. In many developing countries, due to historical and colonial inequalities, rural food-producing societies have been pushed off the best land most suitable for farming, into marginal areas (Rosset, 2005). The best lands were converted to production for export, and this trend has continued post-independence. Land is increasingly concentrated in the hands of the wealthy, leaving the rural areas in many developing countries today characterized by extreme inequities in access to land, security of tenure and quality of land farmed.

The marginalization of the majority then leads to narrow and shallow domestic markets, leading land-owning elites to orient their production to export markets where consumers have purchasing power. In an ever-vicious cycle, elites become less interested in the well-being or purchasing power of the poor at home. By keeping wages and living standards low, this pre-empts the

emergence of healthy domestic markets, and thereby reinforces export orientation (Rosset, 2005).

In the Makhathini Flats of South Africa, where Bt cotton has been planted by small farmers since 1998 and heralded as a 'success story' in GE crops adoption, closer examination reveals that the enthusiasm around GE technology is misguided (Witt et al., 2006). In fact, the adoption of GE cotton by farmers is driven by the lack of choice facing them and does not reflect farmers' endorsement of the technology. Yield levels before and after the adoption of GE cotton were more or less constant, and while pesticide application to control boll-worm has fallen, this has been offset by increased pesticide application to control secondary pests, which have substantially increased since the introduction of GE cotton. The political economy of cotton production puts the Makhathini Cotton Company in a position in which it seeks to increase its land holdings, resulting in sleight profit-sharing arrangements for some, coerced eviction for others, and widespread indebtedness for many. This results in the exclusion and disempowerment of the very farmers Bt cotton is intended to empower.

This increased focus on agricultural export commodities, particularly GE crops, influences the type of AKST that is generated. The potential implications of technologies for agro-ecological stability and for sustainability and equitability have fundamental consequences for the planning of future agricultural research strategies (FAO, 2003). Reluctance to challenge the belief that GE crops can benefit the small farmer and relieve world hunger has led to massive investments in GE technology to the neglect of other more promising but less glamorous approaches (Jordan, 2002). This has led to a disproportionate focus on GE research and investment into those technologies.

Already, in the last decade, national government and international donor support for agricultural research has declined significantly. While more and more funds go into biotechnology research, including GE, other key areas into agricultural alternatives, such as organic research, attracts only a fraction of investment compared to conventional and biotechnological approaches (Parrott and Marsden, 2002). Research in ecology and natural resource management, as well as socio-economics, are trailing behind (FAO, 2003).

Within this context, the situation is exacerbated because GE innovations are largely concentrated in the private sector (see subchapter 3.3), whilst public research, extension, and public seed companies are in a perilous state or have been largely dismantled (Santaniello, 2003). As a result, public sector research often faces "thickets of IPRs", and a radically changed framework in which to operate (Gepts, 2004).

In this private sector dominated context, market forces rather than food security needs have dictated the direction of research in general, as well as GE research into cash crops. The private sector is the dynamic element in agricultural research and development, but little of its effort is of direct relevance to poor farmers in developing countries (CIPR, 2002). Furthermore, mergers and acquisitions linking seed and chemical businesses, has directed a strong focus on research linking GE technology to chemical inputs (Falcon and Fowler, 2002), traits which have limited benefit to the poor (CIPR, 2002; FAO, 2004).

The dominance of the private sector in biotechnology research is evident when public and private research expenditures are compared. The world's top ten transnational bioscience corporations spend about US$3 billion per year on agricultural biotechnology research and development (FAO, 2004), whereas the CGIAR system's total crop improvement budget is one-tenth that amount, and only about one-tenth of that is devoted to biotechnology. Among developing countries, the three largest national agricultural research programs (Brazil, China and India) have total budgets of less than US$500 million each, of which about 5 to 10 percent goes to biotechnology research.

Furthermore, a number of recent World Bank loans are facilitating the introduction of GE crops in Southern borrower countries (Ishii-Eiteman, 2002; Karel, 2004). Through these loans, the Bank is financing the research, development, field-testing and mass release of newly created transgenic crops (World Bank 2002). Other Bank loans with implications for developing country uptake of GE technology have focused on introducing or revising IPR laws around genetic resources and/or have included research contracts or grants in support of biotechnology (Karel 2004; World Bank 1999a; World Bank 1999b).

While some analysts argue that all this means that more efforts should be made to redirect research focus towards public sector agricultural biotechnology research, including on genetic engineering (e.g. FAO, 2004), others call for a reassessment of research priorities, so that more resources and research are directed towards alternative and proven approaches, that could better meet the needs of the poor, such as sustainable or organic agriculture, or agroecology (e.g. Jordan, 2002; Parrott and Marsden, 2002; Rosset, 2005).

In addition, a particular situation has developed with respect to research on GE crops. While there has been a large research focus on GE technology advances such as developing GE crops that may bring benefit, there has been rather less focus on biosafety research, that is, looking at the health, environmental and socio-economic risks. This is important, as in determining research priorities, it is critical to understand how new technologies, including GE, affect and influence the

lives and livelihoods of the poor (FAO, 2003). While the potential benefits need to be considered, so do the potential risks.

In spite of the obvious need, few studies investigating the effects of GE food/feed on animals or humans have been published in peer-reviewed journals (Domingo, 2000). While many opinions and comments have been offered, these are not based on experimental data. In 2003, a review on *in vivo* studies on possible health consequences of GE food and feed found that a total of only ten studies had been published on this issue (Pryme and Lembcke, 2003). Furthermore, the few studies that have been designed to reveal physiological or pathological differences demonstrate a worrying trend: studies conducted by industry find no differences, while studies by independent researchers show differences that merit immediate follow-up. This lack of published scientific papers, particularly by independent researchers, means that a reliable database of safety cannot yet be established for GE food and feed (Pusztai et al., 2003; Pusztai and Bardocz, 2005), still leaving many unanswered questions, uncertainties and gaps in knowledge with regard to GMOs (Lim, 2004; Traavik and Heinemann, 2007; Wilson et al., 2006).

More recently, concerted effort has been made to look at the potential environmental effects of GE crops (e.g. Squire et al., 2003), particularly with the discovery of introgression of transgenes in Mexican maize landraces (Quist and Chapela, 2001). The gaps in scientific knowledge as to environmental impacts are also increasingly being acknowledged (e.g. Lim, 2004; Snow et al., 2003; Wolfenbarger and Phifer, 2000).

It is clear that any introduction of GE crops must assess not just potential health, environmental and socio-economic impacts, particularly in the longer-term, but must also take into account structural, regulatory, and economic evaluations that relate economic, political, social and scientific context of GE crops to their region of adoption.

3.5.2.2 Technology choice for sustainable agriculture: a pro-peasant research agenda.

The increasing shift to private sector-driven, GE technology research and knowledge generation privileges farmers that can take advantage of GE crops, and these are unlikely to be small or poor farmers in developing countries. Would GE crops be able to increase crop production and, at the same time repel pests, resist herbicides, and confer adaptation to stressful factors commonly faced by small farmers? According to Jordon (2002), thermodynamic considerations suggest that they cannot.

Traits important to indigenous and small farmers (such as resistance to drought, suitable quality for food or fodder, competitive ability, performance on intercrops, compatibility with household

labor conditions, and more advantageous maturity, storage quality, taste or cooking properties, etc.) could be traded for transgenic qualities that may not be important to farmers (Altieri, 2003). Under this scenario, risk will increase and farmers may lose their ability to adapt to changing biophysical environments and to produce relatively stable yields with a minimum of external inputs, while supporting food security.

The introduction of GE crops would further accelerate the loss of indigenous knowledge and culture that make traditional systems sustainable (Jordon, 2002). Marginal rural communities have been successful in generating and maintaining diverse crop genetic resources, and this cannot be replicated with uniform and highly productive systems in more favourable lands (Altieri, 2003). Diversity is key as a buffer against natural or human-induced variations in production conditions. Already, adoption of GE crops, coupled with the availability of IPRs over these crops, has resulted in a reduction in the number of cultivars grown by farmers, as transgenes tend to be introduced in closely related cultivars, rather than locally adapted genotypes (Gepts, 2004).

Because many of the poorest farmers practice an agriculture that is complex, diverse and risk-prone (Chambers et al. 1989), they have rarely benefited from top-down, formal institution research and technologies such as those brought by the Green Revolution (Rosset, 2005). If the Green Revolution, which was developed and applied with public sector funding, failed to reach effectively poor farmers living in agro-ecologically diverse rainfed environments, it is apparent that biotechnology-related research led by the private sector will be even less likely to do so (CIPR, 2002). The current research and extension structures and methods - the same structures that are used for GE varieties - are not able to handle the vast complexity of physical and socio-economic conditions in most developing countries. Formal research and breeding concentrates on a single yield measure, and varieties are selected individually for discrete traits then crossed to combine these individual traits. This is at odds with complex rural realities.

The lack of recognition and acceptance of indigenous knowledge has regrettably led to many scientists ignoring traditional farmers' rationales and instead imposed conditions and technologies that have disrupted the integrity of native agriculture (Altieri, 2003 – see also subchapter 3.3.6). Such farmers have actually tailored their agricultural technologies to variable but unique circumstances (e.g. local climate, topography, soils, biodiversity, cropping systems, market insertion, resources). Thus, it is argued that what is needed is participatory breeding by organized farmers themselves, which takes into account the multiple characteristics of both seed varieties and farmers. In such contexts, genetic engineering is seen as the antithesis of participatory, farmer-led research (Rosset, 2005).

Altieri (2003) further contends that a pro-peasant research agenda should comprise the following elements: creation of safeguards against homogenization, and in situ conservation and rural development in GMO-free centres of origin. The maintenance of pools of genetically diverse material, geographically isolated from any possibility of cross-fertilization or genetic contamination by uniform GE crops, is necessary as genetic uniformity or changes in the genetic integrity of local varieties could have considerable impacts. Moreover, biological and cultural diversity, and the associated local skills and resources, are needed for rural populations to maintain or recover production processes.

Furthermore, it is argued that the maintenance of traditional agroecosystems is the only sensible strategy to preserve in situ repositories of crop germplasm (Altieri, 2003). However, this cannot be done in isolation from the maintenance of socio-cultural organization, including of the need to organize small farmers into groups to strengthen their collective bargaining positions, particularly in facing corporate players (see subchapter 3.4.5 for further discussion). The process must be linked to rural development efforts that give equal importance to local resource conservation, food self-sufficiency and some level of market participation. In order for peasants to have a competitive edge, they need to be able to produce “unique” agricultural crops (i.e. GE-free) for niche markets. Such “uniqueness” is crucial for maintaining the stability of local farming systems in times of uncertainty.

AKST for sustainable agriculture should thus fully involve farmers, and develop technologies that are low-cost, readily available, and responsive to diverse local conditions, without posing risks, particularly to the diversity base of poor farmers. It is difficult to see how traded GE commodity crops can meet these criteria.

3.5.3 Fisheries and Aquaculture

The liberalization of trade has led to a big increase in exports of fish and fish products from developing countries, as a whole, and Asia in particular. Fisheries now generate more foreign exchange than any other traded food commodity, such as rice, coffee, tea or cocoa (FAO, 2004, p. 40, Box 3).

In 2002, world trade of fish and fish products was US$58.2 billion, which was a 45 percent increase over 1992 (p. 43). The major Asian exporters are:

- China, which in 2002 overtook Thailand as the world’s largest exporter of fish, with exports of $45 billion. There has been an 11 percent increase in China’s exports of fish over the period 1992 to 2002 and a 24 percent increase in 1999-2002 (p. 43).
- Thailand had exports of $3.7 billion, which was 9 percent lower than in 2001 and 16 percent lower than in 2000 (p.43).

- With Norway, US, Canada and Denmark in between, Vietnam was the 7th largest exporter with exports of $2.0 billion in 2002, a 29 percent per year increase since 1999, when fish exports were $0.3 billion (p. 48).
- Other major exporters of fish and fish products in Asia are India, Bangladesh, Indonesia, the Philippines. As a proportion of total exports fish is important for small countries, like Bangladesh and even more so for the island economies.

Shrimp continues to be the main fish in value terms, with about 18 percent of the total. Others are ground fish, like Alaska Pollock, (10 percent); tuna (9 percent) and salmon (8 percent). [FAO, 2004, p. 51]

The flow of world trade in fish and fish products is largely from the developing to the developed countries, though there is substantial cross-border regional trade within Asia, which often is unrecorded in official statistics. But the major importing regions are the EU, Japan and the US, accounting for about 74 percent of the value of imports in 2002.

However, there are changes within this trade, though the geographical pattern remains the same. First, there is the shift from export of raw material to be processed in developed countries to export of processed fish. The development of fish processing capacity and knowledge in developing countries of Asia has enabled them to bring about a shift in the location of processing. The lower wages in Asian countries compared to the former processing countries (EU, Japan and US) has facilitated this shift in location. Moreover, the highly perishable nature of fish also favours the shift of processing to the source of raw materials. There is also a learning or capability-building process, whereby labor and management in Asia have learnt and invested in the technology of processing.

Second, there is also a shift to exports of live fish. Most of it is for ethnic markets in the developed countries. The migration of large numbers of Asians has led to the growth of a market for live fish from their countries of origin. Some of the live fish is also of the ornamental variety for aquariums. In both cases, the development of transport and logistics technology have enabled a growth in this sector of trade, which now accounts for about 10 percent of fish trade.

3.5.3.1 AKST's role in addressing the effects of trade.

With the growing world fish trade and the possibility of reasonably elastic export earnings, there were initial trends towards over-exploitation of fish resources. At least 25 percent of fish varieties in the world are reported to be substantially over-exploited. There was an increase in the proportion of overexploited and depleted stocks from around 10 percent in mid-1970s to about 25

percent in early 2000s (FAO 2004,, p. 32). Besides bans on fishing, often brought about by the collapse of certain sectors, such as cod in the North Atlantic, there have also been technological shifts towards aquaculture, both of the freshwater and marine varieties. This is a very major technology change in response to the growing demand for fish along with the relatively fixed fish resource available.

The first form of aquaculture was that of the harvesting of wild seed for on-growth in ponds, etc. This, in a sense, is not aquaculture proper. In fact, as in the case of shrimp, it leads to over-harvesting of wild seed and its subsequent scarcity.

The second step of aquaculture, one which makes it culture properly so called, is that of the substitution of wild seed by hatchery-reared fry. This has been developed for many varieties of both freshwater and marine species. In Asia, the various carps are now cultured in hatcheries and it has enabled a substantial spread of the industry. Products from aquaculture accounted for an estimated 22 percent of export quantity (FAO, 2004, p. 51). The rapid growth of Vietnam's fish exports is largely based on aquaculture.

Aquaculture has grown more rapidly than all other animal food sectors. It has grown at an average 8.9 percent since 1970, while capture fisheries has grown at 1.2 percent per year and terrestrial farmed-meat has grown at 2.8 percent per year in the same period (p. 14).

In this shift from capture to culture fisheries, Asian countries have played a very prominent role. The top six aquaculture producers in the world are all from Asia: China, India, Indonesia, Japan, Bangladesh, and Thailand. Asia accounted for 91.2 percent of quantity and 71.2 percent of the value of aquaculture production. China alone is reported to produce 71.2 percent of quantity and 54.7 percent of value of world aquaculture production.

While the conduct of aquaculture has its own problems, which will be dealt with later, it has certainly enabled a growth of production without endangering available stocks of wild fish, as trade based on capture fisheries tends to do. So far, in Asia, aquaculture has developed substantially for freshwater fish. Hatchery-based marine aquaculture is not as developed. Most marine aquaculture, as for prawn and seaweed, still depends on collection of seed from the wild. The jump to true aquaculture, with hatchery rearing of fry, has yet to be developed for many marine species. The type of marine aquaculture developed for salmon and trout has yet to be developed for the fishes of Asia. Recently, Japan has developed technology for sustaining bluefin tuna broodstock in offshore cages, leading to the first closed-cycle breeding of tuna. In Indonesia,

fishers are replacing cyanide harvesting of reef fish with hatchery-raised juveniles of aquarium fish.

3.5.3.2 New trade concerns.

As pointed out earlier, most of the global fish trade is from developing to developed economies. There are some technology and production concerns arising from this specific nature of trade. There are also other concerns arising from other aspects of global trade.

Two concerns that arise from the developing to developed nature of the trade relate to the meeting of quality standards, particularly those of Sanitary and Phytosanitary Standards (SPS) – see also subchapter 3.2. A not entirely unrelated matter is that of traceability, something insisted on by the developed country fish retail chains, who have to contend with supplier responsibilities.

SPS problems have led to many temporary bans on imports of fish from Asian countries, particularly shrimp from various countries. Fish and fish products represented the largest category, above 25 percent, of food safety and quality alerts in the EU. Frequently there have been bans on imports of fish from various Asian countries. Initially they were met with cries of trade barriers. But after some time, the various Asian countries have begun to take measures to comply with these SPS standards. While they add to cost, the reduction of pesticide or veterinary drug residues or elimination of growth hormones are certainly desirable in themselves.

With a large part of Asian aquaculture being carried out in small farms, traceability is certainly a problem. But as an example from Bangladesh (the Noakhali Gold project) shows, this can be tackled along with that of meeting SPS standards by linking groups of small producers with the larger processing and packaging units. The meeting of SPS, and traceability, however, is more a matter of management methods than one of technology.

Consumers in many parts of the world are concerned about the ecological impacts of different types of fishing and aquaculture. Endangered and charismatic species, like the sea turtle, often a by-catch (or collateral damage) of tuna fishing have aroused concern. This has led to the attempts to develop technologies that are more specific to the species to be harvested and eliminate or substantially reduce by-catch.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) requires certificates of origin for cultured species on the endangered list, before they can be traded.

A trade issue that has come up recently and is likely to play a more important role in the coming period, is that of “dumping” (see subchapter 3.2). With not only lower wages, but also more efficient and large-scale processing and production techniques, Asian countries are low cost producers in a range of fishery products. Their exports at sustained lower prices threaten livelihoods of producers in developed economies.

Not only lower wages and larger scale of production, but more so, successful aquaculture can reduce costs of production. For instance, costs of production of farmed salmon are lower in Norway and Chile than in other countries. So long as prices are high enough to cover the normal costs of higher cost producers, the low cost producers will receive a rent above normal profits. But if the low cost producers attempt to increase their market share by exporting at lower prices and reducing their rents, it often leads to charges of dumping. It is indicative of the changing balance in world trade that developed countries are bringing charges of dumping against developing countries. The US, for instance, has accused Brazil, China, Ecuador, India, Thailand and Vietnam of dumping shrimp.

The US in 2003 imposed anti-dumping duties of 37 percent to 64 percent on Vietnamese catfish (basa). Vietnamese exports to the US fell by 50 percent but the supplies were diverted to Southeast Asian and Australian markets, and led to a substitution there of cheaper Vietnamese catfish for other freshwater fish (FAO, 2004, 55).

3.5.3.3 Sustainability and environmental concerns.

With growing demand for fish and fish products (fish is a superior good, in that its consumption increases as world per capita income rises), capture fisheries obviously cannot meet market demand. The attempts to increase the quantity of capture fish has frequently led to the collapse of various fisheries, most spectacularly North Atlantic cod fishery. Aquaculture has developed as a technology that can increase production beyond the natural limits of capture fisheries. It can help reduce pressure on wild stocks and thus help ecosystem rehabilitation. However, aquaculture too has its own ecological problems.

The best-known ecological problem is related to marine shrimp culture. For one, it has been based on collection of fry and juveniles from the wild, leading to an over-collection of such stocks. With numerous individuals collecting wild fry in an open access manner, there is no way in which sustainable harvesting limits can be maintained.

More important, however, has been the degradation of coastal environments by shrimp farming. Mangrove forests, important as the spawning ground of numerous species of fish, have been

destroyed in the course of shrimp farming. Saline water intrusion has further degraded coastal lands. The inability to sustain productivity in shrimp farming has further led to the financial collapse of shrimp farming in many areas and a locational shift to other areas.

There are other impacts of aquaculture, including marine aquaculture. There are concerns about escape of cultured into wild stocks, spread of pathogens from the former to the latter, discharge of effluents and solid wastes, and so on. Some of these concerns have been met by improved site selection and improved management practices.

There is also the matter of dependence on fish meal prepared from “trash” fish, with the likely depletion of these stocks. This is the case for carnivorous fish, like salmon and shrimp. But, with the exception of marine shrimp, the bulk of aquaculture production in Asia comprised omnivorous/herbivorous fish, while 74 percent of aquaculture production in developed countries was of carnivorous species. There is a need to develop feed feeds that reduce dependence on fish meal. This would reduce dependence on capture fisheries.

3.5.3.4 New directions in fisheries.

With pressure to increase production per hectare of the earth’s surface, and to increase the incomes of small cultivators, there has been an extension of aquaculture into systems of rice monoculture. This extension tries to utilize the synergies between rice and fish, either in simultaneous or in alternating systems of cultivation. While this is a new system of production, it is, however, a new management practice rather than a new technology.

Fisheries has seen little of the genetic improvement of stocks to increase yields. These have yielded spectacular results in agriculture, with wheat yields going up by 50 percent and rice yields by 25 percent. In terrestrial animal raising, there have been higher yields of milk or meat with genetically improved stocks.

In fisheries the attempt to genetically improve stocks, through selection and breeding, was first undertaken in the North Atlantic for salmon and trout. Such an attempt was then made for tilapia, a fish of African origin, but now widely cultured across Asia. The genetic improvement of Tilapia was undertaken in the public sector, with the WorldFish Center playing the leading role. This attempt resulted in what is known as GIFT (Genetically Improved Fish Tilapia), which was then distributed to various countries in Asia. The improvement in the rate of growing in GIFT as compared to other Tilapia, however, was just 10 percent. Possibly this rate of increase in yield is not enough to result in its widespread adoption by small farmers, as the increase in yield could easily be negated by poor management or insufficient inputs.

The success of the GIFT project, however, illustrates that it is not necessary, as some argue, that research and development of new technology be undertaken in the private sector and that the incentives of high rents from patents or licenses are essential to provide the incentives for investment in research and development. Scientists and officials working in public sector institutions can as well develop new technologies.

While GIFT itself is in the public domain, it is intriguing that its further development has been handed over to a Norwegian private sector company. Having made the necessary initial breakthrough there seems no reason why the further development of GIFT could not have been left also in the public domain.

The question of the relation between public and private domains is also raised by a new marine based medical development. Australian firms are testing the use of brown seaweed (Undaria pinnatifida) as an anti-viral agent, including its use in treating HIV. The medical use of Undaria, however, is an established practice, at least, in the Korean peninsula. This possibly is the original knowledge on the basis of which an innovation is being developed. What should be the relation between the original knowledge and the likely subsequent patent?

3.5.4 Forestry

In the ESAP region, a net loss of forests of about 792 000 ha per year in the 1990s was reversed into an annual gain of 1 million hectares, largely due to increased plantation activity in the region, particularly in China. However, in South and Southeast Asia there continued to be an annual net decline in forest area of about 2.7 million hectares per year (Table 3.13).

3.5.4.1 Trade in forest products and technology change.

With the growth of trade in timber, there was an initial (up to the 1990s) increase in wood extraction from forests. The revenue from timber was an important source of central government revenue in a number of countries, like the Philippines and Indonesia. This revenue was largely used for accumulation and infrastructure development outside of the forest areas themselves. The indigenous peoples who lived in and around these forests were marginal in the political equations of these countries. Consequently, forest revenue was not reinvested within the forest-based communities themselves, but outside for national interests.

Moreover, extraction did not take account of sustainability considerations. Clear-felling resulted in the destruction of trees that were not the object of extraction and thus increased the extent of deforestation.

The extraction of timber was later followed by the transformation of forests into plantations, the best example being palm oil plantations in Malaysia and more recently in Indonesia. This has, however, had implications for biodiversity and the ecological services that forests supply. Along with this, there was the development of tissue culture in order to propagate trees on a large scale.

The one country in which wood extraction was linked to local ownership of the forests is China. After the late-1970s reform, large areas of forest were handed over to either local collective ownership (i.e. village-based) or household ownership under the household responsibility system. Of course, under neither system of collective or household ownership did the owners have the right to sell or mortgage the forests, i.e. they had the right to manage the forest and the right to the income from it, but could not dispose off the forest. This truncated property right meant that forests could not become real estate, subject to speculation as, for example, urban land is.

The result of this property reform was that the immediate owners had an interest in sustainably harvesting the timber from the forests. This has led to China playing a leading role in the development of plantation forests, i.e. a subset of planted forests consisting primarily of introduced species. Thus, the technology change, from extraction from natural forests to the planting of forests for extraction, came about not just through the increased demand made by economic growth and trade but also by the change in property or institutional system. Had there been merely a change in availability due to depletion of natural forests, as has occurred in most other countries, there would have been just a shift in the origin of supply of timber to other countries that still had available forests. There need not have been a shift to plantation forests, as has not happened in India.

The shift of supply, however, is also one of the responses of the Chinese and Indian markets. Both countries have instituted some forms of “logging bans” in the aftermath of devastating floods in the late 1990s, and have shifted to importing timber to meet local demand. The difference between the two is that, as pointed out above, in China there has been a growth of plantation forests, in India there has not been such a change.

With the technology of extraction of forest products one of extraction, costs are also restricted to those of extraction. Further, with the ownership of the forests in the hands of the state, the external diseconomies that are borne by forest-dwellers, are not part of the relevant cost economies. This problem can be taken care of by the above-mentioned institutional change whereby property rights are allotted to the forest-dwellers.

There is yet another problem of costs that is related to technology change. As mentioned the costs of extraction are the relevant costs so long as extraction is the method of production, if it can be called that. But such extraction in the face of growing external demand and the attempts of the producers to maximize their own incomes, leads to the depletion of the resource, certainly where the resources are extracted in an open access property situation. This has been frequently observed in the case of medicinal plants and herbs. There is often a sudden increase in demand, as the modern pharmaceutical industry discovers ways of utilizing indigenous knowledge to develop new kinds of drugs and medicines. This then leads to an increase in demand for the raw material, which the forest dwellers also collect in the largest possible quantities in order to maximize their own incomes, and a consequent rapid depletion of the resource.

The way out of this situation has often been the domestication and thus planting of the required plant material. This then means a shift in production from collection to growth or culture of the plant material. This technology shift is necessary to be able to provide supply in a sustainable manner. This has occurred in numerous Non-Timber Forest Products (NTFP). A change in technology enables a shift to sustainable production for the market.

FAO (2005, p.xxxvii) tells us that deforestation continues at an alarmingly high rate, but that the net loss of forest area is slowing down thanks to forest planting, landscape restoration and natural expansion of forests on abandoned land.

Forests are increasingly being conserved and managed for multiple uses and values, and they play a crucial role in climate change mitigation and in the conservation of biodiversity and of soil and water resources. If managed sustainably, forests also contribute significantly to local and national economies and to the well-being of current and future generations (Table 3.14).

3.5.4.2 Technology change and traded fuel.

While Asia reported a decrease in wood removals in recent years, Africa reported a steady increase. It is estimated that nearly half of the removed wood was fuelwood.

The question of fuel use, specifically that of use of wood for fuel, is usually seen in energy models as a function of household income. This is incorrect. Sample studies have shown that in many areas the proportion of wood as fuel does not go down with income in rural areas. This is so when fuel is not purchased on the market, but is collected with household labor. This household labor is basically that of women and it has a low opportunity cost, i.e. its possible alternate uses yields very low income. It is this low-cost or even non-costed women's labor that is the cost to the

household. As a result, unless income earning opportunities for women increase and their opportunity cost goes up, there is not much saving of women's labor in such activities.

In order to bring about the desired energy transition, i.e., away from wood to other commercial fuels, what is crucial is the increase in the income earning opportunities for women. This, for instance, has happened on a large-scale in China, where women are part of what is called the labor force, participate in income earning activities. As against this, in India, the participation of women in the labor force in much lower in many parts, even higher income areas, but there is still a high reliance on collected fuel.

Along with the entry of women into the labor force, the household shift from collected to purchased fuel seems to play a role in the energy transition. Where a household begins to buy fuel, then the economies of inferior goods comes into play, and as income rises, the proportion of wood as fuel goes down.

This analysis points to the importance of entry into the commercial world of trade, both as income earning producers and as buyers of fuel, for bringing about a change in technology adoption. A technology change, from wood as fuel to gas or other commercial fuels, depends on the gendered economic factors of women's income earning and household purchase of fuels.

3.5.5. Organic agriculture and fair trade

There are increasing opportunities in organic and fair trade products, which are emerging as important niche markets that are growing at a high rate around the globe. Asia alone has 20 countries producing organic produce with 60,000 enterprises and 0.6 million hectares under it, which is 15% of all farms and 2.6% of total area under organic farming worldwide (Raynolds, 2004).

Organic and fair trade movements contribute not only to environmental and economic sustainability, but also help rural livelihoods in a sustainable manner. Organic farming is one form of sustainable agriculture with maximum reliance on self-regulating agro ecosystems (Browne et al., 2000).

3.5.5.1 Challenges for developing country producers.

In globalised markets, whether or not local producers can gain access to global value chains and at which point, is likely to be an important factor in determining whether they will benefit from trade liberalization (Eapen et al., 2003). This has meant that the access of developing countries

to enter developed world markets is dependent on their ability to enter the global value chains or production networks of lead firms.

The newly emergent organic produce supply chains tend to exclude small producers due to reasons of high certification costs, smaller volumes produced, and tighter control by the chain leaders in the absence of any local market outlets for the organic producers (Raynolds, 2004; Singh, 2006a).

There is therefore a need to mainstream organic and fair trade movements to ensure the participation of large number of producers in developing countries in these markets, without bringing in the ills of conventional chains. Thus, there is need for policy thrust and support for such market-oriented sustainability and livelihood initiatives.

It is argued that organic production is suited for small farmer participation as it is labor intensive and compatible with traditional peasant practices. However, export of organic products involves certification, documentation, record keeping and auditing which makes it industrial in nature and counters the traditional norms and practices of peasant producers. Also, price premiums are likely to decline as economies of scale are attained in marketing and the supply base expands at a rate unmatched by market expansion (Krissoff, 1998).

The organic value chains are very complex due to the process importance in being organic. But, the farmers and the laborers are the weakest links in the chains driven by importers, exporters and retail chains (Kabeer and Mahmud, 2004; IDS, 2003). It is only the fair trade and alternative trade networks which still provide some scope for participation of the small and marginal organic producers (Yussefi and Willer, 2003; Raynolds, 2004).

Further, in international markets, increasingly, organic trade and ethical and fair trade concerns are beginning to overlap (Raynolds, 2004). An increasing number of fairly traded goods are also organic (70%) and the organic movement is moving towards including social rights and ethical trade in its standards. If there is consumer pressure for this overlap, then there would be considerable implications for the volume of trade, the developing country producers' ability to meet the requirements, and for the working conditions and livelihoods of producers (Browne et. al., 2000). Whereas ethical trade is people centred, environment focused and animal centred, the fair trade approach emphasizes partnerships with producers for improving the status of disempowered groups through alternative trading organizations. It works though Self Help Groups (SHGs) for provision of fair price to primary producers, with focus on gender equality, market access, and long term relationship (Tallontire, 2001).

An institutional approach to understanding the organic products sector, which defines institutions by their values, norms, practices, and rules, has not been attempted (Michelsen, 2002; Raynolds, 2004). Rather, the organic produce trade sector has seen mainstream agro-industrial conventions like efficiency, standards, and price competitiveness, which seem to threaten the very purpose of the sector itself.

The organic movement was, to begin with, committed to domestic and civil values, rooted in personal trust, local knowledge, ecological diversity, and social justice. This has happened as organic produce is increasingly being traded through large conventional supermarkets to a significant extent in most of the Western countries though natural food and speciality stores are another major source of supply, besides direct sales. This has implications for the governance of international and domestic organic produce chains and supply networks. Further, though scholars and policy makes have remarked on the rising international organic trade, it has received little academic analysis. More recently, a commodity chain or network approach has been used for analysing organic produce markets (Raynolds, 2004; Singh, 2006a).

3.5.5.2 Successfully mainstreaming organic trade for developing countries.

The exclusion of small farmers from participating in global food chains does not appear to be, in any way, automatic. There have been cases of success when public or private assistance to the growers in terms of technical assistance and supply of input credit was made available. In some places in Brazil, small dairy farmers have gone for collective tanks to meet the scale requirement, though the large farmers will still have an advantage, as they do not face the transaction cost involved in collective use of physical assets. The dairy companies and cooperatives encourage the use of collective tanks, even by financing or facilitating credit for milk producers in some cases (Farina, 2002). Similarly, NDDB in India is implementing a clean milk production program with price incentives, in a small dairy cattle holder context.

Market access for small producers depends on: (a) understanding the markets; (b) organization of the firm or operations; (c) communication and transport links and (d) an appropriate policy environment (Page and Slater, 2003). In so far as the role of the government in the commodity chain is concerned, it can proactively help the stakeholders in the chain to identify the opportunities and threats in the global commodity chains. It can also assist producers to enter the chains (Kaplinsky, 2000). If, in a given country, a few chains command majority of the organic sector, then development policies and programs need to learn how to deal with this handful of big companies.

However, it is equally important to promote good business practices that optimize retailer-supplier relations, protecting both sides. This can be initiated by establishing or improving contract regulations and business rules of practice some of which are already available in the form of legal provisions in the US and Argentina. These practices can also be forced by private sector codes of practice. These changes and the basic requirements they impose on growers are conditions that will have to be met if the growers are to be able to tap the powerful market of the supermarkets. Therefore, it is crucial that government and donor agencies help small farmers and entrepreneurs to make the investments in equipment, management, technology, commercial practice and the development of strong and efficient organizations to meet the market requirements.

Global buyers can have a role to play in assisting suppliers to improve practices and become compliant. The standards need to be flexible and interwoven with local conditions if they are to benefit poor workers. They must also involve local stakeholders who reflect the interests of workers in the process of standards setting and monitoring. The policy challenges on standards include standard setting, monitoring compliance, providing assistance to achieve compliance, and sanctions on non-compliance. Much depends on how standards are implemented, monitored, and verified (IDS, 2003).

Thus, major conditions for successful interlocking between agribusiness firms and small producers include increased competition for procurement instead of monopsony, guaranteed market for farmer produce, effective repayment mechanism, market information for farmers to effectively bargain with companies, large volumes of transactions through groups of farmers, for lowering transaction costs, and no alternative source of raw material for firms (Kristen and Sartorius, 2002).

Further, for the sustainability of company-farmer partnership schemes, it is important that the company is able to successfully market its products so that farmers do not suffer from lack of market (Bauman, 2000; Haque, 2000). Building of relationships of trust with farmers through company reputation rather than marketing gimmicks is crucial. This requires mutual respect, fair and transparent negotiation processes, a realistic assessment of benefits, long-term commitment, equitable sharing of risk, and sound business plans (Mayers and Vermeulen, 2002). Innovative pricing mechanisms like a bonus at the end of the processing cycle, shares in company equity, dividends, producer's fixed price, and quality based pricing, which reward performance, can help contract performance.

The main requirements of small farmers in this changing environment are better access to capital and education. Management capacity is as important as physical capital but is the most difficult

thing to provide. Further, collective action to deal with scale requirements needs to be designed to satisfy new product and process standards or to avoid exclusion from the supply chain. Collective action through cooperatives or associations is important not only to be able to buy and sell at a better price but also to help small farmers adapt to new patterns and much greater levels of competition (Schwentesius and Gomez, 2002).

Small farmers also require professional training in marketing and in technical aspects of production. There is also a need to strengthen small farmer organizations and provide technical assistance to increase productivity for the cost competitive market, provide help in improving quality of produce, and to encourage them to participate more actively in the marketing of their produce in order to capture value added in the supply chain.

On the other hand, regulation of super market chains to control or mitigate their market power can be an effective tool to ensure the presence of small growers in value chains as seen in the case of the banana trade regime in the pre-WTO period in the EU policy, single channel (monopoly) exports by producer bodies in some exporting countries like South Africa, and regulation of domestic import markets in France (Gibbon, 2003).

Though there are concerns about the ability of the small farms and firms to survive in the changing environment of agribusiness, there are still opportunities for them to exploit product differentiation with origin of product or organic products and other niche markets. However, the major route has to be through exploitation of other factors such as external economies of scale through networking or clustering and such other alliances like contract farming (Kirsten and Sartorius, 2002). The experience of contract farming across the globe suggests that it is not the contract per se which is harmful as a system but how it is practiced in a given context. If there are enough mechanisms to monitor and use the contract for developmental purposes, it can certainly lead to a betterment of all the parties involved, especially small and marginal farmers (Singh, 2006b).

Further, labor issues in organic contract farming, like in conventional contract farming (Singh, 2003), are not yet addressed. The organization of labor is an important measure to prevent or eliminate some of the ills of contract farming system for labor. The associations of contract farm labor can also be used for monitoring wage and work conditions and to benefit from fair trade premiums. In fact, there could be legal provisions to involve labor representatives when companies and growers/growers' groups decide on labor and wage issues. As a civil society intervention, there could be codes of conduct for farmers for use of labor, which can be enforced

by contracting agribusiness firms who should also work towards more ethical and human labor standards constantly.

3.6 Environmental, Health and Social Dimensions in Trade Agreements

3.6.1 Trade, environment and sustainable development

The relationship between trade, and environmental, health and social dimensions, as well as with sustainable development, is complex. Actions in one area affect the other areas, directly or indirectly. Any impact assessment of trade in agricultural products would depend on which perspective is used as the starting point, whether it is environmental protection, or resource management and biodiversity conservation, or health concerns, or trade. Another issue to take into account would be whether short-term or long-term considerations are being examined.

While environmental, health and social dimensions are acknowledged to be important, they are often perceived as potentially conflicting with trade objectives (see Koester, 2001). In this regard, there is a need to move from a simplistic and selective “balance and trade-offs” approach, which cannot deal with complex realities, towards a more holistic approach, which implies a complex integration of the various perspectives mentioned above, with recognition that there will be conflicts of interests requiring policy decisions that are in favour of long-term ecological and economic sustainability, human/animal health and safety, social justice, cultural rights and ethics. This is in line with the increasing knowledge of ecosystems and their complexities, of the threats and damage already done (by global warming, biodiversity loss, chemical pollution as well as human and animal health problems associated with environmental degradation), and of the potential risks of new technologies such as genetic engineering and nanotechnology.

Likewise, a holistic assessment of any AKST and associated technologies requires the careful and comprehensive examination of environmental, health, safety, legal, socio-economic and ethical dimensions. It also requires an understanding of the short, medium and long-term effects of a technology or intervention.

The WTO’s legally-binding rules impact on the economic and social well-being of a WTO Member, and its dispute settlement system and enforcement mechanism (including trade sanctions) make the WTO a powerful body when compared to the United Nations which also has legally binding treaties on environment and natural resources management, and on social issues such as the ILO (International Labor Organization) Conventions.

Therefore it is not surprising that “WTO-inconsistent” allegations are often made against environmental negotiators or WTO Members seeking to take strong national environmental or

health or social measures at the international level. For example, in recent multilateral environmental agreements (MEAs) such as the Cartagena Protocol on Biosafety, there were intensive negotiations over the hierarchy of agreements (Mackenzie et al., 2003). Major developed countries that are producers and exporters of genetically modified organisms (GMOs) wanted trade agreements to prevail over MEAs. Developing countries and some developed countries such as Norway and the European Union wanted to ensure the supremacy of MEAs. The result is the approach of "mutual supportiveness" between trade agreements and MEAs, with a stated preambular paragraph affirming the equal status of all the agreements.

In practice, and because of the WTO's formal and enforceable dispute settlement system, this could have the effect of creating a legal hierarchy through its decisions with respect to United Nations agreements, which was actually not the intention of countries that negotiated the trade agreements and the establishment of the WTO. Thus, the struggle between trade on the one hand, and environmental, health and social dimensions on the other hand, continues.

3.6.2 Trade at any cost?

However, the WTO is not about "trade at any cost" even though the policy freedom of Members has been reduced. WTO agreements have a context for trade. For example, the preamble of the Marrakesh Agreement Establishing the World Trade Organization (1994) affirms "…the objective of sustainable development, seeking both to protect and preserve the environment…". A number of WTO agreements also provide for various types of review and amendments, such as the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS – see subchapters 3.2, 3.3).

3.6.2.1 Article XX of the General Agreement on Tariffs and Trade (GATT) 1994.

Article XX of GATT (1994), which provides general exceptions to trade liberalization, is of crucial importance. This is because the body of WTO-related rules does not contain general exemptions of an environmental nature, nor does it provide a special status for MEAs. Article XX of GATT contains several general exceptions, among them for trade-restricting measures:

a. "necessary to protect human, animal and plant life and health";

b. "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption".

This means that WTO Members may adopt or enforce measures for these purposes, even though they restrict trade. There are, however, conditions for measures (including import bans) taken under Article XX. First, there must be no "arbitrary or unjustified discrimination between countries where the same conditions prevail". Thus a Member cannot put restrictions (on health or

environmental grounds) on an imported product, without having the same restrictions on similar domestic products. Secondly, the restrictive measures must not be “a disguised restriction on international trade”.

Thus, there is scope for WTO Members to take protective measures and to restrict trade of certain products, including agricultural products, for environmental and health purposes.

3.6.2.2 Agreement on the application of sanitary and phytosanitary measures (SPS).

The Agreement on the Application of Sanitary and Phytosanitary Measures or SPS Agreement is an elaboration of the GATT Article XX exception for measures “necessary to protect human, animal and plant life and health” (Shaw and Schwartz, 2005) (see subchapter 3.2 for more discussion).

Elements of precaution have been incorporated into the SPS Agreement. WTO Members have the right to take SPS measures (based on a risk assessment) to protect plant, animal and human health within the territory of a Member, and that are necessary to achieve the level of health and phytosanitary protection it deems appropriate (see subchapter 3.2.5 for specific measures).

Under the SPS Agreement, there is a right, albeit conditional, to take provisional measures if relevant scientific evidence is insufficient. Article 5(7) of the SPS Agreement states the following:

“In cases where relevant scientific evidence is insufficient, a Member may provisionally adopt sanitary or phytosanitary measures on the basis of available pertinent information, including that from the relevant international organisations as well as from sanitary or phytosanitary measures applied by other Members. In such circumstances, Members shall seek to obtain the additional information necessary for a more objective assessment of risk and review the sanitary or phytosanitary measures accordingly within a reasonable period of time.”

This is an example of the precautionary approach, although the term is not specifically mentioned. The precautionary measures, which must be applied provisionally, may be taken subject to these specific conditions:

- It must be imposed in respect of a situation where relevant scientific information is insufficient
- It must be adopted on the basis of available pertinent information
- The Member must seek to obtain the additional information necessary for a more objective assessment of the risk
- The Member must review the measure within a reasonable period of time

- However, jurisprudence from WTO trade disputes has limited the application of this article, mainly by limiting the scope of what insufficient evidence is.

3.6.2.3 GATT/WTO exceptions are not enough.

Despite the exceptions and special provisions in the WTO agreements, these are not enough and have limited scope in ensuring environmental protection, sustainable resource management and the safeguarding of human, animal and plant health. The current international trading system is also not able to ensure social equity.

Where there are possible conflicts between the WTO and other agreements, the situation raises even more concerns, as it could mean that the WTO could be effectively adjudicating on those other agreements. The WTO Dispute Settlement Mechanism cannot be the judge of non-WTO Agreements and may not be the best way to resolve disputes in these important areas of policy-making (Shaw and Schwartz, 2005). The difficulties were evident in the recent dispute led by the United States against the European Communities on the European approval procedures for GMOs. Although the WTO Dispute Panel did not rule on the legality of the procedures or on the right of national governments to ban GMOs or to take restrictive measures, the case illustrated the inappropriateness and even discomfort of the trading system in dealing with biosafety (and hence, environmental, health and socio-economic) issues (Bernasconi-Osterwalder and Oliva, 2006; Friends of the Earth International, 2006; Lim and Lim, 2006; Palmer 2006).

Therefore, MEAs and other social development instruments with their own compliance mechanisms are necessary (e.g. the Cartagena Protocol on Biosafety has a Compliance Committee) to ensure that these agreements are implemented fully. Trade forums are not appropriate to be the judge and arbiter of sustainability.

3.6.3 Standards for environmental, health and social dimensions

3.6.3.1 Environment and health standards.

What environmental or health standards should apply for GATT Article XX and for SPS measures to be taken, that are consistent with the WTO?

Article 3 II of the SPS Agreement states that SPS measures which “conform to international standards, guidelines or recommendations shall be deemed to be necessary to protect human, animal or plant life or health, and presumed to be consistent with the relevant provisions of this Agreement and of GATT 1994.” The international technical standard-setting bodies that are expressly recognized by the SPS Agreement are the Codex Alimentarius Commission for food safety, the International Office of Epizootics (known by its French acronym, OIE and now known

as the World Organization on Animal Health) for animal health and zoonoses, and the International Plant Protection Convention (IPPC) for plant heath.

According to the Appellate Body in *European Communities-Hormones*[8], a WTO Member's measure that conforms to the international standards, guidelines and recommendations are presumed to be WTO consistent (although it is a rebuttable presumption). This measure should embody the international standard completely. If a Member imposes a measure that adopts some, not necessarily all, of the elements of the international standard, it does not benefit from the presumption of consistency set up in Article 3 II.

For example, standards/guidelines relevant to biosafety have already been set by Codex (Codex Principles for the Risk Analysis of Foods Derived from Modern Biotechnology; Codex Guideline for the Conduct of Food Safety Assessment of Foods Derived from Recombinant-DNA Plants; and Codex Guideline for the Conduct of Food Safety Assessment of Foods Produced using Recombinant-DNA Microorganisms), and the IPPC (International Standards for Phytosanitary Measures No. 11: Pest Risk Analysis for Quarantine Pests, Including Analysis of Environmental Risks and Living Modified Organisms).

Article 3 I of the SPS Agreement says that SPS measures should "be based on international standards, guidelines or recommendations, where they exist", except as otherwise provided for. In particular, Article 3 III states that Members may introduce or maintain SPS measures "which result in a higher level of sanitary or phytosanitary protection than would be achieved by measures based on the relevant international standards, guidelines or recommendations".

In other words, while the adherence to international standards, guidelines or recommendations is encouraged, a WTO Member still has the right to set higher standards. This is possible "if there is a scientific justification", or "as a consequence of the level of sanitary or phytosanitary protection a Member determines to be appropriate" in accordance with certain criteria as contained in Article 5 (to do with assessment of risk and determination of the appropriate level of protection).

The SPS Agreement thus allows WTO Members to set their own standards, as long as the regulations are based on science, and applied only to the extent necessary to protect human, animal, plant health; and doesn't arbitrarily or unjustifiably discriminate between countries where identical or similar conditions prevail. Note that for the purposes of Article 3 III, there is a scientific justification if, on the basis of an examination and evaluation of available scientific information, a

[8] Appellate Body report on *EC-Hormones*, paras. 170-172.

Member determines that the relevant international standards, guidelines or recommendations are not sufficient to achieve its appropriate level of sanitary or phytosanitary protection.

Furthermore, while the SPS Agreement, in its preamble, promotes the use of harmonised SPS measures between WTO Members, "on the basis of international standards, guidelines and recommendations developed by the relevant international organisations, *including* the Codex Alimentarius Commission, the International Office of Epizootics, and the relevant international and regional organisations operating within the framework of the International Plant Protection Convention" (emphasis added), it is important to note that the standards of these three institutions are of a voluntary nature, and so WTO Members are not required to change their appropriate level of protection of human, animal or plant life or health. In addition, this list of three institutions is not exhaustive because of the word "including", i.e. other international standards can also be relevant.

For matters not covered by the three organizations, the SPS Agreement recognizes as international standards, guidelines and recommendations, the appropriate standards, guidelines and recommendations promulgated by other relevant international organizations open for membership to all Members, as identified by the SPS Committee. This means that international standards can be set in other relevant international organizations. In addition, standard-setting bodies could also be guided by the principles and standards established under MEAs and other social instruments.

This is important in recognizing the validity of other standard setting bodies such as MEAs. For example, during the negotiations of the Cartagena Protocol on Biosafety, many countries wanted a provision on the setting of international biosafety standards under the Protocol. Major developed countries such as the United States, Canada, Australia and Japan rejected this, arguing that standard setting bodies such as the Codex Alimentarius Commission, the International Office of Epizootics and the bodies of the International Plant Protection Convention would be sufficient.

The compromise was Article 2(5) of the Cartagena Protocol: "The Parties are encouraged to take into account, as appropriate, available expertise, instruments and work undertaken in international forums with competence in the area of risks to human health".

Therefore, the standards set in UN MEAs such as the Convention on Biological Diversity, and the Cartagena Protocol on Biosafety are arguably legitimate and thus actions taken under these MEAs are WTO-consistent. This is indeed what the European Communities argued in the WTO

dispute on biotech products; it implied that MEAs such as the Cartagena Protocol are setting international standards, and that its regulatory processes are consistent, with both WTO rules and the Protocol (Shaw and Schwartz, 2005).

3.6.3.2. Social standards.

The issue of trade and labor standards is highly controversial. The WTO Agreements do not deal with any core labor standards. But some industrialized countries believe that the issue should be studied by the WTO as a first step toward bringing the matter of core labor standards within its ambit. WTO rules and disciplines, they argue, would provide a powerful incentive for Member nations to improve workplace conditions.

On the other hand, many developing and some developed countries believe the issue has no place in the WTO framework. These countries argue that efforts to bring labor standards into the arena of multilateral trade negotiations are little more than a smokescreen for protectionism. Many developing countries believe that the campaign to bring labor issues into the WTO is actually a bid by industrialized nations to undermine the comparative advantage of lower wage trading partners.

In 1996, after heated discussions, WTO Members identified the International Labor Organization (ILO) as the competent body to deal with labor standards. WTO Members said they were committed to recognized core labor standards, and that these standards should not be used for protectionism. The economic advantage of low-wage countries should not be questioned. The WTO and ILO secretariats were asked to continue their existing collaboration. There is currently no work on the subject in the WTO.

It is apparent then that when dealing with the interface of trade and social dimensions such as labor standards, that the WTO is not the appropriate forum. Nonetheless countries must have the adequate policy space to implement labor standards and the ILO Conventions, in order to promote opportunities for women and men to obtain decent and productive work, in conditions of freedom, equity, security and dignity.

Social aspects are also relevant in MEAs. For example, during the negotiations of the Cartagena Protocol on Biosafety, which largely governs the trade in GMOs, many developing countries wanted to include socio-economic considerations (Mackenzie et al., 2003). There are many important socio-economic aspects to any technology, and genetic engineering and GMOs clearly have major impacts on a society.

Some of the socio-economic considerations related to GMOs include food security; the threat to agricultural diversity, farming systems and practices (including cultural practices) by transgenic contamination; the threat to traditional uses, knowledge, innovation and practices; the threat to organic markets via contamination; and the threat to farmers' rights to save, re-use, exchange and sell seeds, either via the spread of private intellectual property rights claims or through technologies producing sterile seed, such as Genetic Use Restriction Technologies (GURTs).

The effort to include socio-economic considerations in the Biosafety Protocol was strongly resisted by developed countries. The result is a general provision in Article 26, as follows:

a. A decision on import under the Protocol or under its domestic measures implementing the Protocol, may take into account socio-economic considerations arising from the impact of LMOs (living modified organisms, the term used for GMOs in the Protocol) on the conservation and sustainable use of biological diversity, especially with regard to the value of biological diversity to indigenous and local communities; and

b. The Parties are encouraged to cooperate on research and information exchange on any socio economic impacts of living modified organisms, especially on indigenous and local communities.

In 2005, the Second Conference of the Parties serving as the Meeting of the Parties to the Protocol made a decision relating to (b). It essentially calls for more research and exchange of information among governments, international and non-governmental organisations on the socio-economic aspects of GMOs. A compilation document will be prepared by the Secretariat of the Protocol for further discussion in 2008 at the fourth Meeting of the Parties.

It would be important for developing countries to conduct research and studies to contribute to this international process. At the national level, decision-making on GMO policy and specific GMOs would also greatly benefit from such studies. Many countries allow for socio-economic considerations to be taken into account when taking a decision on whether or not to allow the import of a GMO into the country.

3.6.3.3 Restriction of policy space by bilateral and regional FTAs.

The proliferation of bilateral and regional free trade agreements (FTAs) in ESAP countries may have implications for national policy space (see subchapter 3.1.2), making it more difficult for governments to implement and enforce environmental, social and health protective measures. Of particular concern are the FTAs between developing countries and developed countries like the

United States. These North-South FTAs are very comprehensive in scope, and extend into the realm of domestic policies (Gibbs and Wagle, 2005).

The investment chapter of US FTAs, for example, includes provisions on expropriation and mechanisms for investor-state dispute settlement. These have proved to be problematic in the NAFTA (North American FTA, which has been in force for more than 10 years) context, as foreign investors have successfully challenged government activities and public policies, such as those aimed at environmental protection (Gibbs and Wagle, 2005). It is not inconceivable that health or social measures may also be affected. Furthermore, FTAs that include compensation provisions for expropriation of investment by direct or indirect means could lead to claims against government regulations aimed at enhancing public welfare or protecting the environment, if they are perceived to affect an investor's profitability.

3.6.4 Technology choices

When we look at the range of AKST and associated technologies, on what then should we base our decisions as to whether a particular technology is appropriate? A holistic assessment of technology requires the careful and comprehensive examination of environmental, health, safety, legal, socio-economic and ethical dimensions. It also requires an understanding of the short, medium and long-term effects of a technology.

It is clear that there is increasing demand, both in developed and developing countries, for environmental, health and social protection, and that these apply to trade. There is a need to re-assess conventional approaches to production, trade and intellectual property, in favour of long term sustainability while ensuring fairness and equity for poorer, weaker and vulnerable countries, and those sectors within countries. AKST needs to rise to the challenge and generate new knowledge and technologies that can do so.

Concurrently, there needs to be a reform of international and national trade laws and policies where necessary, with courage and political will among decision-makers and implementation, with political will and commitment, of international environmental agreements and social development instruments. Finally, ensuring effective public participation and monitoring to ensure compliance with sustainable development principles, laws and programs can guide policy-makers.

3.7 Climate Change and Trade

3.7.1 Asia in the global climate change equation

Developing Asia's economic growth has largely been based on carbon-biased technologies, developed in an era of cheap carbon. Though the per capita emissions of developing Asia are still much below the levels of the USA or Europe, yet the large size of the economies, means that total emissions from developing Asia are very large.

In the pre-Kyoto discussions, the position articulated in Agarwal and Narain (1991), argued that it was the industrialized North that was responsible for carbon emissions, and that it was these countries that should take action to reduce carbon emissions. Along with this it was proposed that the developing countries should be given incentives to adopt carbon-efficient technologies, through trading based on per capita rights.

The carbon-intensive growth of developing Asia has changed the global equation with regard to actions for reducing carbon emissions. The developing world as a whole now accounts for almost 50 percent of annual carbon emissions. China is the second largest emitter, after the USA; while India is the world's fifth-largest emitter. Further, land use change resulting in deforestation itself accounts for 20 to 25% of global emissions, with Brazil and Indonesia being the two largest emitters.

In designing policies for mitigating climate change or reducing carbon emissions, two factors now stand out. First, the developed countries bear historical responsibility for the magnitude of the problem; there is question of global justice in distributing burdens for reduction of carbon emissions. Two, without the involvement of the developing countries, particularly the large economies of China and India, not much of a dent can currently be made on the scale of emissions.

This subchapter discusses four issues in the connection between climate change and international trade: (1) the nature and growth of carbon markets; (2) the market for bio-diesel; (3) the role of international trade in promoting or discouraging transition to a low-carbon using economy; (4) the question of "avoided deforestation."

3.7.2 Carbon markets

In the Kyoto Accord, targets were set for the developed countries to cut emissions, along with provision for carbon trading through the so-called Clean Development Mechanism (CDM). The carbon market, as it has since developed, has three components: (1) project-based transactions in the CDM, where the buyers purchase additionality; (2) trading of greenhouse gas emission

allowances under the cap-and-trade regimes as in the EU; and (3) voluntary carbon market, as in the US and Australia (World Bank, 2006). The carbon market was a $325 billion market in 2005.

The CDM has shifted the emphasis on making the transition to a low carbon economy from polluting industries in the developed countries to industries in the developing countries, where the costs of such transformations are supposedly lower. This does not result in any change in emissions from the developed countries, for whom it is a "business as usual" situation. Further, doubts have been raised about whether any real additionality has been achieved through CDM projects (see UNCTAD, 2006; and Carbon Trade Watch, 2007).

With regard to the EU emissions trading system, two points of criticism have emerged (World Bank, 2006)). First, the allowable emissions for each country have been set very high and therefore there has been little need to trade in or reduce emissions. In fact, the high level of carbon allowed resulted in a crash in the European carbon market, where the price of a ton of carbon fell from $30 in 2000 to just $2 per ton in 2006. Second, emission rights have been given free to industries, in what has been called a "grandfather" approach, i.e. as a patrimony. Instead of paying for emissions, polluters are given polluting rights as property (Carbon Trade Watch, 2007). This does not put any pressure on them to reduce emissions.

The carbon trade approach has not worked to stimulate investment in renewable-energy technologies. Again, as prices of carbon-using commodities are not affected, there is pressure to switch to a low carbon economy. As discussed below, another and probably more effective approach, would be that of imposing a tax on carbon emissions.

3.7.3 Market for Biofuels

The market for biofuels, while growing is still quite small when compared with the market for fossil fuel. Trade in ethanol, the major boil-fuel, was 3 billion liters in 2004, as against crude oil trade of 920 billion liters. But with various governments taking measures to increase use of biofuels (both China and India have policies for biofuels to account for at least 5 percent of total fuel consumption by 2015), the market for biofuel can only grow. The imposition of a carbon tax will, of course, give a strong boost to the market for biofuels.

Brazil is the main exporter of biofuel, ethanol. Its main export markets are the USA and India. The other internationally traded biofuel is palm oil. The palm oil consortium, headed by Malaysia, has a policy of subsidizing the use of palm oil as biofuel, whenever the price of palm oil falls in the market. In the early years of this decade there has been a surge of palm oil exports for bio-diesel to the EU (UNCTAD, 2006).

There are a number of issues that come up in this emerging biofuels market. First, is that of the conversion of forest lands into biofuel plantations. Such conversion would reduce the carbon-reducing impact of biofuels and needs to be taken into account. The second is that of the role of communities and small farmers or corporations. Forms of technical and financial assistance may also be required to enable local communities, including forest-dwelling indigenous peoples, and small farmers to benefit from the growing biofuels market. Without such safeguards the benefits of this new market could end up being monopolized by the large corporations, and thus reducing its likely contribution to poverty-reduction in developing Asia.

3.7.4 Avoided deforestation

In the current carbon trading system, carbon offsets are granted for additional growth of forests. Under the Clean Development Mechanism (CDM) of the Kyoto Protocol, payments can be made for reclaiming land to forests. But this does not take into account the incentive to clear existing forests – for the timber they provide or to convert the land to other uses, such as oil palm plantations, or, as is likely given the current emphasis on bio-diesel, to plantations for sugarcane or corn to produce ethanol or jatropha plantations.

A 15-country coalition of rainforest nations, led by Papua New Guinea (see www.rainforest.coalition.org) has proposed a change in the method of carbon credits for forests to include payment for “avoided deforestation.” Such avoided deforestation has an opportunity cost, in terms of livelihoods foregone. This opportunity cost needs to be compensated in order to provide an incentive to maintain existing forests intact. Taxes on carbon emissions can be used to pay small landowners, local communities and indigenous peoples to keep their forests in tact, as is done in Costa Rica.

The introduction of the notion of opportunity costs in terms of livelihoods foregone, is a shift from the Kyoto concern with simple costs of technologies. In the Kyoto-system, the costs of reducing a ton of carbon could be lower in the developing countries, when compared to developed countries. Consequently, a large part of CDM trade involved purchasing offsets from developing countries. But besides the cost of utilizing there is another notion of cost that comes into the picture, that is, of opportunity costs or the livelihoods foregone.

When the social costs of production are higher than private costs, there is a subsidy on the basis of non-valuation of environmental resources, which are production resources for the indigenous people and other forest-dwellers This subsidy "is paid not by the general public via taxation but by some of the most disadvantaged members of society: the sharecropper, the small landholder, or

tenant farmer, the forest dweller and so on. The subsidy is hidden from public scrutiny; that is why nobody talks of it. But it is there. It is real" (Dasgupta and Maler, 1990, 112).

The method of financing such an “avoided deforestation” initiative could be of a number of different types, including payments out of a carbon tax, or even from a new environmental financing facility, based on, say, SDRs. These SDRs could be distributed not, as now, on the basis of existing credits with the IMF but on a combination of per capita income, population and the country’s existing emissions (or non-emissions). The notion of the opportunity cost of livelihoods foregone in computing social costs (Coase, 1960), can be combined with that of the declining marginal utility of income as income increases, to argue (see Chichilnisky and Heal, 2000, and Nathan, 2003) that the distribution of rights should be proportionately higher for low income countries or peoples, such as indigenous peoples.

3.7.5 Environment and trade

Trade is conducted on the basis of prices as they exist on the market. But there are numerous factors that are not taken account of in prices. These are the externalities, positive and negative, that affect not the producer or consumer of that commodity, but others. There are negative externalities, such as carbon emissions that contribute to global warming but are not a part of cost to the producer or consumer. Market prices are then below what would prevail, if all costs were taken into account. In effect, the whole of the world, of which the direct producers and consumers of this product are a small part, subsidize the producers and consumers of this product. Further, the extent of this subsidy increases the more the product is carbon-using. As an example, the export of cut flowers from developing countries of Asia depends substantially on the low cost of air transport, a cost that does not take into account the carbon emissions, and thus the negative externalities, due to air transport.

There is often, even usually, more than one way of producing a commodity, the negative environmental effects of which are different. But the price of the commodity would be the same, irrespective of the method used in its production. For instance, coffee grown in the shade of existing forests would sell for the same price as coffee grown in plantations. If the output of the latter process were higher, then the net income from the environment-friendly coffee process would be lower than from the environment-unfriendly plantation process. From the side of the producers there would be a dis-incentive to carry on the environment-friendly process.

One way out of this disincentive situation has been to develop niche markets for the environment-friendly products, such as shade grown coffee (see Nadia Scialabba 2000). Environment-conscious consumers, who are willing to pay more for environment-friendly production processes,

pay a premium so that producers are compensated for the lower productivity of their environment-friendly processes. But, the niche markets remain just that, niche markets and the mainstream market, which is many times bigger, remains unaffected. Prices of the environment-unfriendly product remain low in comparison, and there is also a resulting over-use or over-consumption of the product as such.

Another approach has been to directly pay subsidies to producer for the environmental goods they produce, e.g. fresh water. This is the approach favored in Europe, where many producers get direct subsidies on the grounds of the multi-functionality of agriculture. But, again in this case, the market price of the commodity, such as milk, remains unaffected. This contributes to lowering the price of milk on the world market, and also enables Europe to increase its share of world milk exports.

A third approach would be that of using the “polluter pays” principle in international trade. A tax or import duty could be imposed on each commodity, depending on the amount of carbon emitted in its production, the extent of forest clearance carried out, the loss of biodiversity through the production process, and so on. The more negative externalities involved in a production process, the higher would be the import duties on its product.

This requires a recognition that processes to produce a product can have different effects, and that a product’s effects are not restricted to its quality in use. In the 1991 “Tuna-dolphin” case between Mexico and the USA, the then-GATT panel had ruled that there could not be an embargo on the way tuna is produced, i.e. whether it is dangerous to dolphins or not. Any trade action, by implication, could only be with regard to the qualities of a product itself, and not on the manner of its production. It is interesting to note that, in the same case, the GATT panel also ruled that it was not against the requirement for tuna to be labeled as “dolphin-safe.” This has implications for the current controversy, wherein the USA is ranged against the EU and many other countries, in opposing the requirement to label products as being GMOs or not.

The “product not process” approach, however, was over-turned in the more recent WTO “shrimp –turtle” involving India, Malaysia and Thailand versus the US (WTO case no. 58 and 61, http//www.wto.org/English/Tratop_e/edis04_e.htm). In this case the WTO panel ruled that the US had a right to take action to conserve exhaustible resources and could require the use of turtle-extruder devices in harvesting shrimp. Thus, action could be taken not just on the product, and its polluting content, but also the production process too. What this means is that environmental issues could be ground for international trade action; and also that such action could be taken across national borders, i.e. producing nations could be required to adopt standards. This is an

important precedent for linking environmental and international trade issues. It can be extended for the above-argued action to charge import duties on commodities on the basis of their carbon content. This could even be generalized to include other environmental effects, such as conservation of bio-diversity.

The “shrimp-turtle” case provides a precedent, as Stiglitz (2006) points out, for extending trade measures, import duties or even prohibitions, to cover various environmental externalities in production processes. There could import duties for carbon emissions, loss of biodiversity, clearance of forests, and so on. The result would be to favour commodities produced with environment-friendly processes over those produced with environment-unfriendly processes. Instead of the current situation where commodities produced in environment-friendly processes have a higher price, there would be a situation where environment-unfriendly processes result in a higher price. Products of ecologically-friendly processes The tax would be paid by those who produce in environment-unfriendly processes and those who consume the resulting products. Such a tax on the production of negative externalities could make international trade somewhat more environment-friendly than it currently is. Low carbon-using processes, e.g. that of the Chinese village of Liuminying, which has developed an integrated gas- energy-fertilizer system, based on animal and field waste, would then have a price advantage over similar products of more carbon-using technologies; or bird-friendly coffee in managed agro-forests would be cheaper than sun-coffee in plantations (ICRAF, 2006).

When the social costs of production are higher than private costs, there is a subsidy on the basis of non-valuation of environmental resources, which are production resources for the indigenous people. This subsidy "is paid not by the general public via taxation but by some of the most disadvantaged members of society: the sharecropper, the small landholder, or tenant farmer, the forest dweller and so on. The subsidy is hidden from public scrutiny; that is why nobody talks of it. But it is there. It is real" (Dasgupta and Maler, 1990, 112).

Adding carbon taxes is also likely to make certain commodities les amenable to international trade. Transport to more carbon-using destinations, such as those covered by jet transport, are likely to become less profitable than transport to less carbon-using destinations. This will promote low food-mile destinations over high food-mile destinations, affecting the existing pattern of international trade.

Further, a general carbon tax could be imposed on all commodities, whether traded or not. This could also have some effect, to the extent that relative prices make a difference, to consumption

of carbon-using commodities and stimulate consumption of low-carbon using commodities and use of low carbon-using processes of production.

Utilizing import duties and other trade instruments in order to bring various negative (and positive) environmental externalities into the picture, would require building an accounting framework for environmental factors, something in which some progress has been made; but a lot still remains to be done. (Daly, H. E. and J. Cobb. 1989; ISAR, 2004; McDonough, W. and M. Braungart. 2002; and David A. Bainbridge, 2007).

Options

The options discussed above (carbon trade, biofuels, compensation for avoided deforestation through a global fund, taxes on carbon and other environmental factors, and the required environmental accounting) together amount to a substantial shift (even a paradigm shift) in thinking on the interaction of trade and environmental issues. The big question mark is over whether the existing sets of institutions of international trade and finance can formulate and implement the required policies, or whether a new set of institutions (supranational, national and local) will be required to manage the new economic-ecological paradigm, which brings together economic and ecological issues, rather than separate them, as has so far been the basis of international trade. Further, as the Stern Review points out, with a business as usual approach, there is the very real likelihood of a world-wide depression, greater in intensity than that of the 1930s. The challenge before the global economy is whether the necessary measures and the likely institutional changes will be brought about only after such a crisis strikes, or whether these steps can be taken in advance of, and thus, mitigate or lessen the likely effects.

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