Food Security, Biotechnology and Intellectual Property

Unpacking some issues around TRIPS

A Discussion Paper

by *Geoff Tansey*

Commissioned by the Quaker United Nations Office (QUNO), Geneva, with financial assistance from the Directorate General for International Co-operation, Netherlands Ministry of Foreign Affairs

Preface

Will biotechnology and the minimum standards of intellectual property rights (IPRs) required of members of the World Trade Organisation (WTO) affect food security? Variations on this question have arisen in discussions with negotiators in Geneva in the Quaker UN Office programme (QUNO) on the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). This paper provides some ideas of how that question might be answered. To do so, requires a greater degree of speculation than in QUNO's earlier discussion papers. This paper briefly considers:

- food security, biotechnology and IPRs within the context of a dynamic and changing food system;
- how the regulatory framework affecting this area is being developed in various international fora;
- the potential impact of this framework on various factors affecting food security;
- the elements of the TRIPS Agreement that might be affected; and
- how Official Development Assistance (ODA) might make a contribution to dealing with the issues raised.

The paper is written for trade negotiators and government policy makers dealing with these issues as well as civil society groups and agencies with a special interest here. The aim is to contribute to informed public debate about, and policy making concerning, food security, biotechnology and intellectual property.

QUNO's core work in Geneva on trade, development and TRIPS was initiated and supported by the Environmental Intermediaries Programme of Quaker Peace and Social Witness of Britain Yearly Meeting from 1999-2001. It links traditional Quaker concerns for peace and justice with a concern for the environment. So far, QUNO has published four discussion papers, hosted a series of informal, off-the-record meetings to facilitate dialogue amongst and between those with different interests, and a series of occasional papers. QUNO has received support from various donors since 2001, and gratefully acknowledges the support from the Directorate General for International Co-operation, Netherlands Ministry of Foreign Affairs, in funding production of this discussion paper.

Publisher

Quaker United Nations Office, Geneva, July 2002
Quaker House, Avenue du Mervelet 13, 1209 Geneva, Switzerland.
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ISBN: 2-9700323-2-5

Acknowledgements

I am grateful to those who have commented on various drafts of this paper, in particular to the participants in a QUNO seminar in Jongny-sur-Vevey in May 2002 and to Fred Abbott, John Barton, Michael Blakeney, Carlos Correa, Peter Drahos, Graham Dutfield, Derek Eaton, Brewster Grace, Patrick Mulvany, Tasmin Rajotte, Dwijen Rangnekar, Tim Roberts, Pedro Roffe, Clive Stannard, Carl-Gustaf Thornstrom and Rene Velvee for their specific comments. The views expressed in the paper are, however, my own.

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Series editor: Geoff Tansey

Design and typesetting: frogs graphic design, Hebden Bridge, West Yorkshire, UK.

Printed by: PRINTOUT, Halifax, West Yorkshire, UK on 75% recycled paper.

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Electronic edition
This colour pdf version of the paper has active weblinks. It has minor differences from the printed version to make it more economic to print on a desktop colour printer.

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Executive summary

Food security, biotechnology and intellectual property rights (IPRs) are each complex areas in themselves. Section 1 discusses briefly food security, insecurity and food sovereignty and outlines the background to the food system in which modern biotechnology and IPRs are being applied. This is a system in which there is an increasing concentration of market power across various sectors. IPRs have contributed to the development of biotechnology in agriculture and to a restructuring of the market and centralisation of firms. Both IPRs and biotechnology have played a part in the growing concentration in the seed business. The changing nature of agricultural research, especially that geared to poor people's food and farming, is also a matter of concern.

These changes are being accompanied and influenced by restructuring of the global regulatory framework for biological and genetic resources, which are examined in Section 2. TRIPS has introduced the requirement for IPRs to be extended into agriculture for the first time in many developing countries, with the provisions of Article 27 in general and 27.3(b) in particular likely to have most impact on agriculture in developing countries. The Convention on Biological Diversity (CBD) also refers to IPRs in relation to biological and genetic resources but does not deal with the specific needs of food and agriculture. This has been dealt with at the FAO in negotiations that led to a new International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) in November 2001. Other bodies, such as the International Union for the Protection of New Varieties of Plants (UPOV) and the World Intellectual Property Organisation (WIPO), also have an impact on this area. This mix of bodies itself is a problem for many countries in trying to develop some consistency in policy making over IPRs and its impact on food security.

Section 3 examines a number of concerns. These include the level and nature of responsibilities of states to ensure food security; the role of the creation of public goods through agricultural research to bring social benefits, at a time of growing privatisation of R&D and extension of IPRs over research tools and products; the potential problems for international and national agricultural research aimed at poor people's food sources; the potential differential benefits and costs of plant variety protection on seed provision, and the extension of patents into this area. The differing visions behind future agricultural development patterns are outlined as well as environmental concerns, with a brief look at other IPRs such as trademarks, trade secrets and geographical indications.

Some dimensions relevant to TRIPS are discussed in Section 4 and conclusions drawn in Section 5. One concerns the need to see the balance of rights and obligations in TRIPS in a broader context than the agreement itself. Another is to avoid pressures, contrary to Article 1, for countries to adopt rules or interpretations of TRIPS stronger than necessary. Lessons should also be learnt from the experience with TRIPS and Public Health and any necessary measures developed ahead of potential problems. For example, developing differentiation in application of the agreement, especially in the light of the Doha Ministerial Declaration on taking account the development dimension and special and differential treatment. The review of Article 27.3(b), and the provisions of Articles 30, 31 and 40, deserve particular attention, while the impact of the tightened copyright regime should also be examined to see if it adversely affects R&D. TRIPS should not be looked at in isolation, however, either from other agreements in the WTO affecting food security or those arrived at in FAO, the CBD and other fora. While some of these still need full implementation, avoidance of international, regional or bilateral agreements that might limit the necessary flexibilities in TRIPS, for example through negotiation on patent law in WIPO, is necessary.

There are challenges for donors, some of whom may have internal policy conflicts and inconsistencies, especially those countries relying on strong IPRs to promote their own economic interests. A number of suggestions are made for donor support to activities that build capacity to effectively implement and interpret TRIPS rules in the interest of food security, develop alternatives and negotiate changes where necessary as well as draw in a broader range of interests in developing these rules.

1. Three worlds intersect

"The International Treaty on Plant Genetic Resources for Food and Agriculture is at the crossroads where agriculture, environment and trade meet."

Dr Jacques Diouf, Director-General, FAO, Rome, FAO Conference, 3 Nov 2001

Negotiations and agreements in a range of international fora affect our future food security. So too do various aspects of modern biotechnology, such as genetic engineering, that are being used to redesign the plants and animals we rely on. These in turn are influenced by changing rules on intellectual property rights (IPRs). All are subject to often heated debate.This paper looks at these issues in relation to the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)which is one of the most controversial in WTO. It requires WTO members to adopt minimum standards of intellectual property protection (IPP), including in agriculture, and removes from developing country members options used historically by developed country members to adopt varying levels of IPRs according to their development needs. For many developing countries TRIPS extends IPRs for the first time into their agricultural system. Yet, a range of work shows that the effects of IPRs are far from clear and that rule-making processes are still too narrowly-based and leave much to be desired[1]. Before examining the possible connections between IPRs, biotechnology and food security, we need to briefly discuss what these terms mean – or can mean – and the food system context.

1.1 Food security

"In societies at peace, poverty and marginalisation are the root causes of hunger"

FAO, 1999, p 28

Food security is difficult and complex to achieve. Food insecurity is easier to see (Box 1). Unfortunately, there is no simple recipe for food security. It has many ingredients and dimensions and it is the interaction of these that affect individuals' and nations' food security.

The dimensions range from personal, household, and community levels to regional, national and international levels. The mix of ingredients that help ensure food security include available land and water, storage facilities, farm equipment and inputs, processing capacity, infrastructure, resource management arrangements, environmental factors such as soils and climate, distribution capacity, appropriate research and development activities, access to markets, money, credit and information, the nature of government policies, and legal and political structures[2]. All of these enable people to make their livelihoods in a wide variety of environments and circumstances. Where that is not possible hunger may or may not follow, depending upon what broader arrangements governments, on their own or under public pressure, make at both national and international levels – from work scheme entitlements in India to provision of emergency food aid internationally. All our food security depends upon sustainable farming and food production systems, and, depending on circumstances, our ability to grow, exchange or purchase our food needs as part of maintaining our livelihoods. Food, and food security, are not simply physical concerns but affect the many needs food satisfies in human lives. These are not only physiological – food for body maintenance – but also psychological, social and cultural.

Today, hundreds of millions of people still go hungry and lack food security. Environmental change, probably brought on in part by human activity, threatens future food security as weather patterns become more unpredictable and climatic extremes more frequent. Inadequate planned response mechanisms to these probable climatic

[1]See Dutfield – DFID bibliog 2001 /policy paper 2001, Braithwaite and Drahos, 2000

[2]FAO, 1992

1. Food – security, insecurity and sovereignty

The UN's Food and Agriculture Organisation (FAO) uses the following definitions:

"**Food insecurity**: A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active, healthy life. It may be caused by the unavailability of food, insufficient purchasing power or the inappropriate distribution or inadequate use of food at the household level. Food insecurity, poor conditions of health and sanitation and inappropriate care and feeding practices are the major causes of poor nutritional status. Food insecurity may be chronic, seasonal or transitory.

Food security: A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life."

On present trends, the internationally agreed target from the World Food Summit of 1996 to halve hunger by 2015 will not be met, despite progress in some countries. FAO's estimates suggest 815 million people were undernourished in 1997-99: 777 million in developing countries, 27 million in transition countries and 11 million in the industrialised countries. Even if the target is met, it would still leave 400 million people undernourished.

Many non-governmental organisations are calling for a broader concept of **food sovereignty** to be used to guarantee the rights of small producers to provide and of poor consumers to eat food. They produced a plan of action involving trade, genetic resources, agroecology and implementing an international, legally-binding right to food at the NGO forum at the World Food Summit – Five Years Later in Rome in June 2002

Source: FAO, 2001; 2002 Rome NGO/CSO Forum

"The current favorable dynamic balance between overall food supply and demand was not inevitable; neither was it a triumph of Adam Smith's invisible hand. Nor should it be taken for granted that it will persist. It has been the result of successful interactions among farmers, input suppliers, and an overwhelmingly publicly supported research and extension system that furnished innovations and relevant knowledge for free….

Complacency has crept in, too: some question the need for continued public funding, thinking the world's food problems are solved or constrained by things other than R&D or that the private sector will do the job. None of these views is correct."

Pardey and Beintema, 2001, p 1

uncertainties could lead to future food crises. Yet there is a considerable degree of complacency about food in the industrialised world, where the key agricultural problem is overproduction not underproduction, overnutrition not undernutrition. The world's population is still growing – to an estimated 8-10 billion by 2050 – and where people are becoming more affluent demand for livestock products is also booming[3]. Even in some countries where there is hunger, there is now also a growing problem of obesity among some sections of the population.

While food production must increase, simply increasing it will not end food insecurity. Famine can happen in the midst of abundance, and around 800 million people are undernourished today in a world with enough food for everyone. Distribution, equity and access, as well as availability of food, matters. And those are not simple technical questions but political, and concern who has what power to feed themselves by what means. But power – whether economic purchasing power, or political power or the power to influence the direction of research and development geared to their needs – is something poor people lack. IPP rules can influence who has what power to influence the future direction of the food system – and so who is likely to benefit and who to lose from change.

1.2 A changing food system

The current drivers of change come from the industrialised world whose food system is being globalised in an increasingly urban world (Box 2). Within this system, there is a struggle going on within and between various groups of actors – farmers, input suppliers, traders, manufacturers/ processors, distributors, caterers and consumers –

- for who will have what power and control over the future supplies of food; and
- how the risks and benefits from different activities will be distributed among the different actors.

Of course, no group of actors is homogeneous and there are differences of interests within any group, eg between small and large farmers or retailers and manufacturers. There is also a growing concentration of market power within any sector of the food system[4].

In industrialised countries there is a fundamental constraint, which may seem ironic in a world where not all are fed, of limited demand. People can have two cars, three or four TVs, but they cannot increase their food consumption two, three or four fold and survive for long without major health problems. Some developed countries' food systems are becoming dysfunctional, and are helping produce nations with growing levels of obeisty as the pressures grow on people to overeat given their lifestyles. The limited demand we have for food – healthy diets are possible from a relatively limited range and amount of basic ingredients – means businesses in the food system face pressures identified over 30 years ago by the OECD:

- of increased competition for the money spent on food,
- to increase use of technology to generate greater returns to investment,
- to seek increased productivity from the labour and capital employed, and also

[3]IFRPI study, UNFPA figures

[4]Tansey & Worsley, 1995

2. The food system

The food system is a complex web, not a simple chain, connecting the:

• **Biological:** the living processes used to produce food and their ecological sustainability. We rely on a well-functioning biosphere for the system's success but human activity is having an increasing impact on the biosphere. Some technological optimists seem to think, but not explicitly say, that we do not need to worry about the biosphere since we humans can invent our way out of any environmental problem or change we might cause. Another, perhaps more romantic, view seems to envisage some idyllic, untouched environment before human hands reshaped it and oppose any interventions in 'nature'.

• **Economic and political**: the power and control which different groups exert over the different parts of the system. Today's food system has a history – it is as it is now due to the interplay of different political and economic forces. It is a history in which globalisation –of useful plants and animals – has taken place over thousands of years, but especially since the European conquests, and is now continuing in new forms. Much food crop development has been based on a sharing of knowledge and materials among farmers.

• **Social and cultural**: the personal relations, community values and cultural traditions which affect people's approach to and use of food. Our human needs and wants, physiological and psychological, social and cultural, are played out through food. These needs are complex, many-sided and interact; they are not simply for nutrients. However, as Manfred Max-Neef argues, food should be seen not as a need in itself but as a satisfier of the more fundamental human need for Subsistence. This along with Protection, Affection, Understanding, Participation, Creation, Leisure, Identity and Freedom, form a set of universal needs[a] which requires people to be actively involved in satisfying them. The legal framework governing relationships in the food system results from the way particular interests are able to shape it.

Source: Tansey and Worsley, 1995

[a]Manfred Max-Neef, 1992

• to diversify their activities[5].

It also leads them to look beyond their saturated markets and expand into global markets and to seek ever better tools for control over their activities.

1.2.1 Tools for control

The various actors use whatever tools they can to control their operations and cope with the pressures they face, including:

Science and Technology - these are not the same thing. Technological innovation does not necessarily depend on a correct scientific understanding of why something works. Trial and error invention produced many new technologies before the science behind them was understood, especially in agriculture. It is still the basis of much innovation. However, advances in scientific understanding may underpin development of new technologies, as in nuclear power and biotechnology.

"In many important ways, the world's markets are also becoming more alike. Every corner of the free world is increasingly subjected to intense and similar communications: commercial, cultural, social and hard news. Thus, people around the world are today connected to each other by brand name consumer products as much as by anything else."

Roberto Goizueta, chairman, Coca Cola, early 1990s

Information - the ability to monitor, use and control information is one key to success – from weather conditions and market prices to consumer profiles and concerns. Information technology now provides a degree of complexity, immediacy and control undreamt of only a few decades ago. Consumers and farmers tend to rely on publicly available information while other, larger actors, such as traders, manufacturers and retailers, use more private sources, including R&D results, market research or expert advice. Their capacity to gather, interpret and use information is much greater than that of a farmer or consumer. The global media, broadcasting similar images across the world, help fuel product globalisation and reinforce brand images, which are usually protected by trademarks or copyright.

Management - The technologies and understanding of people's behaviour developed in the past 100 years have affected the way production is organised and processes and people managed in industrialised societies. Work organisation has shifted from craft-based, small-scale production through a large-scale, mass production, which is still dominant, to a newer lean, but still mass production phase, which is likely to dominate in the future. This latter uses just-in-time manufacturing and stocking techniques, similar practices to those pioneered in the car industry.

Laws, Rules, and Regulations - The challenge for societies, for consumers acting as citizens through political processes, is to set the framework within which the actors work and how they use the tools available. It is through this political process that laws, rules and regulations emerge which govern the actors – although the laws themselves can also be tools that benefit actors differentially. Some actors have been created by other laws, eg, limited liability companies, which reduce the risk of those involved, and given rights as judicial persons as if they were real persons. Some of these laws were rapidly developed during the industrial revolution to promote investment and innovation but may not deal with responsibility for adverse consequences of innovation. Other laws and rules are presently being hammered out in international fora like the World Trade Organisation (WTO), the Convention on Biological Diversity (CBD) and UN Food and Agriculture Organisation (FAO).

The various actors make use of a range of IPRs in their operations. Those most involved in product production make the most use of patents, PVP, trade secrets and trademarks. Those closest to the consuming public make greater use of trademarks, and increasingly of databases, while some specialist producers in particular use geographical indications. As the reach of the market, increasingly globalising, goes further into developing countries so too will the major actors make use of IPRs there as part of their business strategies as well as a new tool with powerful technological control capacities – modern biotechnology.

1.3 Modern biotechnology

Biotechnology uses biological processes to produce products – for example microorganisms causing fermentation help produce leavened bread and beer. Modern biotechnology encompasses a number of different areas of varying controversy (Box 3) and it stems from a revolution in the history of the biological sciences about the way in which living organisms operate as deep and profound as that introduced by Einstein in the physical sciences. It began, perhaps, with the demonstration that DNA was the "stuff" of which genes are made, ran through the discovery of the structure of DNA in 1953 and continued with the demonstrations that DNA could be isolated and manipulated at will, and that it could be introduced back into organisms. The development of molecular

[5]OECD, 1971

"…we create integrated solutions that bring products and technologies together to improve productivity and to reduce the costs of farming",

Monsanto, 2002

biology has increasingly revealed the genetic basis of living organisms and the way in which information encoded in genes determines many biological functions. For the scientists involved it is exciting, cutting edge work that is exhilarating to do, as Daniel Charles account of the development of agricultural biotech illustrates[6].

For others, modern biotechnology provides new tools to use to further their particular interests. Its potential to open up new market opportunities all over the world lay behind the expansion of private sector interest in agricultural research in developed countries. Firms saw opportunities for major breakthroughs that could transform the basic inputs into agriculture – the plants and animals farmers grow. This drew new players into the business of seed production, largely from the chemical and pharmaceutical industries, which have invested billions of dollars over the past two decades in agricultural biotechnology R&D and want to see returns on this investment. By re-engineering animals and plants they could link their structure and properties more closely to the interests of food processors or retailers as well as to proprietary chemicals that might be used to trigger specific traits or be used without damaging the crops. These firms have a long history of using patents as business tools and require some form of control over their rights to both the research tools they have developed and to prevent reuse of their products, such as seeds, without their permission or further payment. They were one of the important interests pushing for changes in IPRs rules to allow for patenting of living organisms[7]. Who does what research and why, however, matters for our food security.

1.4 Agricultural R&D and biotech innovation

Most R&D in agriculture over recent decades has focused on capital intensive, high input types of farming. Historically, much agricultural R&D has been done to produce results that are then freely extended to farmers. They, because of their small size and limited resources, cannot invest in formal R&D but have always engaged in trial and error experimentation. More recently, many industrialised country governments have withdrawn from near market research and concentrated on basic research, leaving it to private firms to do more market-oriented research. This is increasingly conducted by the agricultural biotechnology industry. There has also been a switch in funding away from the farm level to other areas of the food system (Box 4).

Technological innovation has long been a way of entering an industry and genetic engineering in particular has allowed new firms to enter into the seed industry and promote innovations in agricultural production. Moreover, patent-protected innovation has been used as a means of gaining legal quasi-monopolistic control of certain products and sectors since the 19th century. Even then, by institutionalising innovation in R&D labs, "large corporations sought to control technological change as a means of protecting

[6]Charles, 2001; see ESRC, 1999, for a view of broader issues raised

[7]See Peter Drahos, 1995 and 2002 (forthcoming)

3. Modern biotechnology – more than one tool

A range of techniques are often lumped together when people say 'biotechnology', meaning modern biotechnology. Briefly these include:

Cloning – *The process of producing genetically identical individuals from part of an organism*. Nearly all cells in any given organism contain the same genetic information, so it is theoretically possible to produce an identical copy of the organism from any one of its cells. Simply taking cuttings from a plant is a form of cloning, as it involves the regeneration of an entire organism from a small part of it. More sophisticated techniques used in modern agricultural biotechnology include deriving many identical copies of plants from individual cells which are grown in culture (tissue culture), and cloning by nuclear transfer (the process used to produce Dolly the sheep), where a nucleus from a single cell is transplanted into a recipient cell which has had its own nucleus removed, and the resulting cell allowed to develop into a mature animal.

Marker assisted breeding – *The use of DNA markers, rather than characters or traits, to speed up the process of selective breeding of plants or animals for agricultural use*. Traditionally, selective breeding involves repeated crossing of plants or animals which have desirable traits, and breeding (often through many generations) from those progeny which possess those traits in the highest degree. Much of this process also involves selecting against undesirable traits. Although very powerful (and nearly every plant or animal in agricultural use derives from this process), it is slow and imprecise. Marker assisted breeding requires a knowledge of genetic markers. These are specific sequences in DNA, which are close to but not the same as those regions in the DNA which encode the desirable traits, and which are inherited with them. By selecting for inheritance of these markers (which is a very rapid process, involving DNA screening rather than looking at the traits of the progeny) rather than the desirable traits themselves, breeding can be done without the need to screen for the presence of the traits. This is much quicker than classical breeding and can be carried out an a larger scale.

Genetic engineering (transgenics) – *The broad term given to all the techniques which are used to isolate specific genetic material (DNA) from one organism and introduce it into another one*. The recipient organism is then said to be transgenic. Genes may be introduced because they give the recipient organism traits which are seen as being desirable, such as herbicide resistance or drought tolerance. In theory (and in practice), because the basic nature of the genetic material is the same in all organisms, there are no restrictions on the source of the DNA: it is perfectly possible to produce transgenic plants which contain genes from human and other animals and where the product of these genes (which will be a protein) is made by these plants.

Source: Dr Peter Lund, School of Biosciences, Univ of Birmingham

4. Changing nature of agricultural research

Developed countries expanded their funding of agricultural research at quite high annual growth rates after the Second World War but these rates have fallen considerably since the early 1980s. About half of agricultural R&D is now financed from the private sector in the OECD countries whereas overall scientific R&D funding is about 75% private and 25% public. In agricultural R&D the public sector has tended to focus more on farm-level technologies to increase agricultural productivity than the private sector, which focuses more on food and kindred products and animal health and agrochemicals. In 1993, for example, about 12% of private R&D was focused on farm-level technologies, compared to 80% for publicly funded R&D. More recently, the focus of publicly funded research has shifted from enhancing agricultural production to including more post harvest and food safety concerns. There has also been a move away from public funding for applied agricultural research in some developed countries, notably the USA, UK and the Netherlands, with that being left to the private sector, and a greater focus on basic research. In the USA, the focus of private agricultural R&D has changed from agricultural machinery and post-harvest food-processing research (about 80% of the total in 1960) towards plant breeding and veterinary and pharmaceutical research. Some 70% of the chemical research related to agriculture is done in just three countries – the USA, Japan and Germany.

Developing countries now account for about half of publicly funded agricultural R&D. Between 1971-91, research expanded most rapidly in East Asia and the Pacific Rim countries, including China, West Asia and North Africa but much more slowly in Sub-Saharan Africa and Latin America and the Caribbean regions. More recently, similar factors to those in the OECD countries may have led to reductions in these growth rates.

Source: Phil Pardy *et al*, 2001

"Industry consolidation in pursuit of economies of scale will continue. Research in biotechnology, with seeds as the key platform for delivering biotech traits, offers opportunities for higher-value, higher-quality outputs and increased returns in future…Finally, consolidation at the dealer and distributor levels will continue"

Heinz Imhof, Chairman on the Board, Syngenta, 2002

and fortifying their positions in the industry"[8].

Modern biotechnology may shift the balance of power in the food system towards the providers of seeds and stock to farmers. In this private industry-led development, biotech firms need a suitable set of rules and regulations to permit them to secure benefits from their R&D. Companies naturally want to stop others from copying – or buyers reproducing – new products if they can. This can be done either by legal means, through IPRs where they can be enforced, or technologically, through attempting to develop technologies that will stop seeds germinating or specific traits being activated without a purchased input – these genetic use restriction technologies (GURTS) have been dubbed 'terminator' and 'traitor' technologies by critics.

IPRs are closely linked to today's biotechnological innovations and have clearly contributed to the development of biotechnology. They have[9]:

- underpinned its development by private industry as they offer the prospect of private profits.
- contributed to a restructuring of the market and centralisation of firms. The seed industry, once the preserve of small firms, has become dominated by five major firms – in part as a response to litigation over broad patents awarded in the early days of transgenics in the USA. Mergers and acquisitions were the easiest way to resolve some of these disputes, and also represent the ultimate in cross-licensing.
- increased investment in product development. This also requires stronger marketing ability, bigger markets and the legal capacity to defend your interests, with firms putting considerable effort and money into both.

The biotech firms are interested in the major grains and industrial crops in developed and major developing countries, such as India, Brazil, Argentina and China, and they control many of the advanced technologies needed to reshape them. The major crops being marketed so far are the key traded feed and fibre crops of transgenic cotton, soya beans, rapeseed(canola) and maize with traits of most interest to farmers (Tables 1&2). Future generations of GM crops will include characteristics of more interest to processors and retailers and possibly consumers, such as longer keeping qualities and altered nutritional characteristics.

[8]Reese V Jenkins, 1975

[9]John Barton, 1999

Table 1. Global area cultivated with transgenic crops (million ha)

Crop	1996	2001
Soybean	0.5	33.3*
Maize	0.3	9.8
Cotton	0.8	6.8
Rapeseed	0.1	2.7
Others	1.1	~0.0
Total	2.8	52.6

* Excludes transgenic soybean grown in Brazil on more than 1 million ha

Table 2. Dominant transgenic crop/trait combinations in 2000

Crop	Trait	Transgenic Area as % of Global Area
Soybean	Herbicide tolerant	36 %
Maize	Insect Resistant (Bt)	7 %
	Herbicide Tolerant	
	Bt + Herbicide Tolerant	
Cotton	Herbicide Tolerant	16 %
	Bt + Herbicide Tolerant	
	Bt	
Rapeseed	Herbicide Tolerant	11 %

Note: In 2001, four countries grew 99% of the global transgenic crop area - the USA 68%, Argentina 22%, Canada 6% and China 3%
Sources: Tables taken from FIS/ASSINSEL web site (using ISAAA figures) http://www.worldseed.org/statistics.html#dom%20com%20mark and note from ISAAA http://www.isaaa.org/press%20release/Global%20Area_Jan2002.htm

2. Restructuring the regulatory framework

Pressures grew in the 1980s to revise the regulatory framework governing biological resources, partly due to the technological developments which had become possible[10]. The regime affecting IPRs was important because of the role IPRs play in underpinning private sector led innovation and in establishing and maintaining market power. Three new agreements are important – the Agreement on the Trade-Related Aspects of Intellectual Property Rights (TRIPS), the Convention on Biological Diversity (CBD) and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPG) – as well as work in the International Union for the Protection of New Varieties of Plants (UPOV) and the World Intellectual Property Organisation (WIPO).

2.1 TRIPS

TRIPS Article 7 Objectives

"The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations"

The TRIPS Agreement specifically says IPRs are private rights and:

- creates minimum standards of intellectual protection that all WTO Members must recognise in seven areas;
- ensures that states make available to rights holders institutional procedures to enforce their IPRs; and,
- provides a procedure for regulating disputes between states concerning their obligations under the agreement.

TRIPS originated from a small number of major business interests, the US film and pharmaceutical industries in particular[11]. A handful of corporations and lobbyists were responsible for crafting its terms and pushing, via various developed country governments, the agreement through the Uruguay Round and into the WTO. As a result of strong resistance from a few developing countries, various modifications were made to provide some degree of flexibility in its implementation.

In general, however, the current international IPRs regime, unlike, for example, that in the environmental arena, has been developed by a narrow set of actors with relatively little involvement of civil society as a whole. These actors have been drawn mostly from the legal and industrial fields and, as 'epistemic communities', are very influential in shaping the global regulatory framework, as John Braithwaite and Peter Drahos show[12]. Such communities are "composed of professionals (usually recruited from several disciplines) who share a commitment to a common causal model and a common set of political values.[13]" In the IPRs field, it is a relatively small group, representing powerful corporate interests and a profession in whose interests it is to have strong IPRs, that has driven the development of the current regime.

The apparent flexibilities negotiated into TRIPS include the lack of definition of any terms and exclusions to the all-encompassing patent requirements of Article 27 in Article 27.3(b)[14], which gives discretion to WTO Members about whether or not they allow plants, animals, biological processes for the production of plants or animals and plant varieties to be patentable. Members are required, however, to provide patent protection for micro-organisms and non-biological and microbiological processes for the production of plants and animals. Members must also either grant patent protection for plant varieties or provide protection by means of an effective *sui generis* system or both[15]. This requirement to introduce some form of plant variety protection (PVP) requires considerable change in many developing countries. There has been little progress, however, in the mandated review of Article 27.3(b) that began in 1999 with a wide range of views on what should happen and whether specific interpretations or amendments are needed. Many proposals have been put on the table. They include the extension of exclusions from patentability to all lifeforms and extension of the timetable for implementation, prevention of biopiracy, respecting use of traditional knowledge and farmers' rights, amendment in the light of the CBD and International Understanding (now Treaty, see 2.3), and over types of *sui generis* systems of PVP to calls for deletion of the exclusion and no lowering of standards of protection[16].

While the provisions of article 27.3(b) on patents and PVP impinge most directly on food security, through their direct effect on agriculture, other provisions, such as those on trade marks and geographical indications, may also have a bearing in so far as they affect poor people's livelihoods and access to food.

[12] Brathwaite and Drahos, 2000

[13] E B Haas, 1990, pp 40-41

[14] "(b) plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof. The provisions of this subparagraph shall be reviewed four years after the date of entry into force of the WTO Agreement"

[15] Tansey, 1999

[16] See Table 1 in Correa 2002, and http://www.grain.org/publications/trips-countrypos-en.cfm

2.2 The Convention on Biological Diversity

In the CBD:

Biological resources includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.

Genetic resources means genetic material of actual or potential value.

The CBD is a framework agreement that leaves parties free to implement it through their own legislation. It expressly reaffirmed the sovereignty of states over their genetic resources. It requires countries to take measures to ensure the conservation of biological diversity, sustainable use of its components and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources. It also made access to these subject to prior informed consent – of the state rather than the community involved. The CBD developed from an approach which equated riches to be found in compounds in plants with minerals in the ground. Some developing countries felt they had undervalued wild biodiversity of use to developed countries and industries, such as pharmaceuticals, which had been making use of them in patented products bringing enormous returns. For agriculture, this mining, winner-takes-all mentality towards the exploitation of wild biodiversity pays scant attention to the differing nature of agricultural genetic resources, which have been developed, exchanged and mixed up around the globe for millennia. Indeed, some 'wild' biodiversity rich countries like Brazil, are agriculturally biodiversity poor, depending for most of their food on crops that came from elsewhere.

Article 8 (j) of the CBD recognises the need for *in situ* conservation of biodiversity and to protect indigenous knowledge. States must preserve the knowledge, innovations and practices of indigenous and local communities insofar as that knowledge, innovation and practice serves the goals of conservation and sustainable use of biodiversity. In agriculture, this happens if it is used and developed in farming communities. Thus, the impact of changes brought about by IPRs-protected innovation in agriculture on those communities is an issue. The CBD also requires states to diffuse that knowledge, innovation and practice with the cooperation of the holders of that knowledge and encourage the sharing of any benefits that arise from such diffusion.

The Convention requires the equitable sharing of benefits arising from the commercial and other use of communities' biological resources and local knowledge (Art 15.7). It also requires that access to generic resources is subject to 'prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that party' (Art15.5). At the sixth meeting of the Conference of the Parties (COP) in April 2002, parties agreed to a set of voluntary guidelines on access and benefit sharing (ABS) that aim to facilitate access to genetic resources on 'mutually agreed terms' (MAT) and on the basis of the country of origin's 'prior informed consent' (PIC) by providing guidance to parties in the development of ABS regimes while promoting capacity building, transfer of technology and the provision of financial resources[17].

A section in the Decision on the role of IPRs in implementing ABS arrangements, invites parties to encourage the inclusion of disclosure requirements in IPR applications and requests the CBD Executive Secretary and WIPO to provide further information on this issue. The Decision also requests the Executive Secretary to renew the application for observer status of the CBD Secretariat on the TRIPS Council.

In the CBD, which the USA has signed but not ratified, parties agree to undertake to provide and/ or facilitate access and transfer of technologies to other parties under fair and most favourable terms (Art 16.1 & .2). Such technologies include biotechnology and others 'that are relevant to the conservation and sustainable use of biological diversity or make use of genetic resources and do not cause significant damage to the environment' (Art 16.1). Access to such technologies must be 'on terms which recognise and are consistent with the adequate and effective protection of intellectual property rights'(16.2). This language mirrors that in TRIPS.

It also aims to enable developing countries which provide genetic resources to have access to technology which makes use of those resources, on mutually agreed terms, including technology protected by patents and other IPRs (Art 16.3). The parties to the treaty should also cooperate to ensure that patents and other IPRs 'are supportive of and do not run counter to' the CBD's objectives (16.5). This reflects disagreement about whether or not IPRs support the CBD's objectives, and implicitly accepts that conflicts may well arise between IPRs and the CBD. A study for the EU argued that legally TRIPS and the CBD are not in conflict but that conflicts may arise when they are implemented[18], however, this is not universally accepted.

As part of the requirements to minimise the environmental impact of biological innovations a separate Biosafety Protocol to the CBD was negotiated, with difficulty, and finally agreed in Montreal in 2000. This sets out arrangements for the transborder

[17]Reported in Bridges, Weekly Trade News Digest, Vol 6 No 15, 23 April, 2002, http://www.ictsd.org

[18]CEAS Consultants *et al*, 2000

transfer of living modified organisms (LMOs) but leaves the issue of liability to be sorted out within four years of the protocol coming into effect (Box 5). This will occur when 50 parties have ratified the convention.

2.3 The ITPGR

In the Nairobi Final Act establishing the CBD and in decisions of the Conference of the Parties (COP) members recognised the special needs of agriculture. COP supported the renegotiation of the then existing International Undertaking on Plant Genetic Resources for Food and Agriculture(IU) agreed in 1983 at FAO , which was premised on germplasm as a common heritage of humankind, to be in harmony with the CBD. The IU recognised that today's crops have been developed by the activities of farmers all over the world, and through the exchange back and forward of these crops between cultures and regions, over 10,000 years. The result of this is that countries are "interdependent", that is, most depend for their food security on crops that originated elsewhere. Renegotiating the IU began in 1994 and concluded in November 2001 when an International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) was agreed at the FAO conference in Rome. The Treaty will enter into force 90 days after being ratified by 40 Parties.

The treaty creates a mechanism that avoids the high transaction costs involved in bilateral exchanges of breeding material for food crops and establishes a multilateral system to facilitate access and benefit sharing. It aims to ensure future food security by facilitating exchange of these materials through this system which will use material transfer agreements (MTAs). Such exchange is a necessity for future breeding work. A rather limited range of 35 crops and 29 grasses and forages are included as well as the *ex situ* collections of those crops held by the International Agricultural Research Centres (IARCs) belonging to the Consultative Group on International Agricultural Research (CGIAR). These crops, however, provide about 80% of the world's food calories from plants. It does not cover animals although there is much working going on with them too and many breeds are threatened with extinction.

Through the treaty, countries pool their resources of these crops. This multilateral approach means that the sharing of the benefits, too, must be on a multilateral basis. The treaty includes a provision that recognises that should any germplasm[19] be taken out of the general pool available for further breeding by having patents taken out on it then this would create a loss to society as a whole that should be compensated by some payment into a fund to promote the use of plant genetic resources for food and agriculture (PGRFA) (Box 6)[20]. Exactly what this means remains to be seen. Considerable work is still needed to determine exactly how the various provisions of the treaty will be implemented. This is true also for Farmers' Rights, which the treaty recognises in Article 9 but leaves to parties to realise as they wish. Governments should include at least three measures in their attempts to promote Farmers' Rights, according to Article 9.2:

- protection of traditional knowledge relevant to PGRFA;
- right to equitably participate in sharing benefits from the utilisation of PGRFA;
- right to participate in making decisions, at the national level, on matters related to the conservation and sustainable use of PGRFA.

[19]The ambiguous phrase "in the form received" is used to qualify the word germplasm

[20]Some feel patents automatically take germplasm out of the breeding pool, while the industry view is that this is only true of American patents, (Tim Roberts, pers comm, Jul 2002)

5. Biosafety Protocol and liability

"Article 27 Liability and redress

The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first meeting, adopt a process with respect to the appropriate elaboration of international rules and procedures in the field of liability and redress for damage resulting from transboundary movements of living modified organisms, analysing and taking due account of the ongoing processes in international law on these matters, and shall endeavour to complete this process within four years"

Liability was a most strongly contested issue in the negotiations and this clause was a fudge to allow an overall agreement to be reached. It is up to individual countries to decide on their own internal liability regimes for nationally developed and used LMOs. The various approaches are being surveyed to provide a background for discussion on this provision. The African group have proposed rules on transborder movements that foresee strict liability, compensation and restitution as far as possible should there be damage. These were based on the rules developed by the International Law Commission.

This area is full of thorny questions – on the areas covered by the liability regime – the environment, eg damage to biodiversity, and human health; how to define the damage; who is liable – importer, exporter, producer. Where does responsibility lie – with the developers or, if they have followed state approved regulatory procedure, then is it the state? Also the time that might be needed before subtle but damaging effects emerge may make attribution of cause difficult – so what, if any should be the period of limitation for any liability – 30, 50 100 years or what? LMOs for pharmaceutical use for humans are not covered by the Protocol even though crops may be used to produce vaccines for humans, which may have potential to cause environmental damage[a].

[a]Veljkovic & Wan Ho, 2002

Both the CBD and the ITPGR have had a wider range of civil society participation in their deliberations, both domestically and internationally, than has been the case with the TRIPS Agreement, or the other IP related bodies of WIPO and UPOV.

2.4 UPOV and *sui generis* PVP

"PVR [Plant Variety Rights] exemptions allowing farmer's privilege are particularly important for food security in those countries in which farmers save their own seed for replanting and exchange"

Blakeney, 2001, p 2

Prior to TRIPS, countries could decide whether or not to provide any form of IPP in agriculture. Most developing countries did not. Those that are members of WTO, however, must provide a *sui generis* form of PVP or allow the use of patents or both under the terms of Article 27.3(b). Members can design their own system or could choose to implement the UPOV system[21]. UPOV began in Europe in the 1960s and by early 2002 had 50 members, of which 14 were developing countries. PVP regimes have developed in response to the needs of commercial breeders and allow for the registration of a plant variety that has been discovered. UPOV defines a breeder to mean the person who bred, or discovered and developed, a variety[22]. Such a variety must be distinct, stable, sufficiently uniform and novel to be protectable. Most varieties developed and used by small farmers in developing countries and by traditional and indigenous communities do not normally meet these criteria. Various countries are trying to develop their own systems of PVP although there is considerable pressure for most to adopt the UPOV system[23]. Should a dispute arise, a WTO dispute panel might have to decide what constituted an effective set of standards and might be tempted to take UPOV as the standard of what is effective.

A very basic distinction between UPOV-style PVP and patents is that, in PVP, only the variety is protected: breeders and farmers may freely use the variety and the genes it contains for breeding, which is not possible with patents. PVPs had two major differences from the level of protection patents offered – by providing both a breeder's or research exemption, which allowed use of the protected varieties for further R&D, and a farmer's exemption or 'privilege', which allowed farmers to save and replant seed from the first harvest of the protected crop – which made them less restrictive. The scope of these exemptions has changed during the various amendments to the UPOV convention. The 1961 and the 1978 versions prohibited both patents and PVP on a variety but not the 1991 Act, and the 1991 Act no longer requires a farmer's exemption but leaves it as an option.

[21]see companion discussion paper on *Sui Generis* PVP by Dhar, 2002 for a detailed discussion of these issues

[22]Article 1 of UPOV Act 1991

[23]GRAIN, 2001

6. IPRs and the ITPGR

The key provisions on IPRs in the treaty are in Articles 12 and 13. Article 12 governs the facilitated access to PGRFA within the Multilateral System. This recognises the costs of bilateral arrangements required under the CBD (Art 15) would be better dealt with through a mutually agreed facilitated access system for agricultural crops. Article 12.3 states:

"Such access shall be provided in accordance with the conditions below:

(d) Recipients shall not claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, or their genetic parts or components, in the form received from the Multilateral System; ……

(f) Access to plant genetic resources for food and agriculture protected by intellectual and other property rights shall be consistent with relevant international agreements, and with relevant national laws;"

Article 12.4 requires the Governing Body to draw up a standard material transfer agreement (MTA) covering key provisions of the Treaty. The conditions in the MTA 'shall apply to the transfer of plant genetic resources for food and agriculture to another person or entity, as well as to any subsequent transfers of those plant genetic resources for food and agriculture.' Parties to the treaty also agree to fair and equitable benefit sharing arising from the use, including commercial, of PGRFA under the Multilateral System through: the exchange of information, access to and transfer of technology, capacity-building, and the sharing of the benefits arising from commercialization. Article 13 (b) on Access to and transfer of technology states:

"(iii) Access to and transfer of technology as referred to in (i) and (ii) above, including that protected by intellectual property rights, to developing countries that are Contracting Parties, in particular least developed countries, and countries with economies in transition, shall be provided and/or facilitated under fair and most favourable terms, in particular in the case of technologies for use in conservation as well as technologies for the benefit of farmers in developing countries, especially in least developed countries, and countries with economies in transition, including on concessional and preferential terms where mutually agreed, inter alia, through partnerships in research and development under the Multilateral System. Such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights. ….

13 (d) Sharing of monetary and other benefits of commercialization ....

(ii) The Contracting Parties agree that the standard Material Transfer Agreement referred to in Article 12.4 shall include a requirement that a recipient who commercializes a product that is a plant genetic resource for food and agriculture and that incorporates material accessed from the Multilateral System, shall pay to the mechanism referred to in Article 19.3f, an equitable share of the benefits arising from the commercialization of that product, except whenever such a product is available without restriction to others for further research and breeding, in which case the recipient who commercializes shall be encouraged to make such payment."

The first meeting of the Governing Body is to 'determine the level, form and manner of the payment, in line with commercial practice'. It may 'establish different levels of payment for various categories of recipients who commercialize such products'; and 'exempt from such payments small farmers in developing countries and in countries with economies in transition' if it wishes. It may also, within a period of five years from the entry into force of the Treaty, decide 'whether the mandatory payment requirement in the MTA shall apply also in cases where such commercialized products are available without restriction to others for further research and breeding'.

Source: FAO

For countries with traditional and indigenous farming communities, the International Plant Genetics Resources Institute (IPGRI) suggests that a *sui generis* approach to PVP, differentiating between the traditional and commercial sectors would be more appropriate than simply to adopt the UPOV model[24]. The OAU has developed a model law on this and India has adopted legislation that attempts to implement a new model and which encompasses Farmers' Rights as outlined in the ITPGR[25].

2.5 WIPO

"to promote the protection of intellectual property throughout the world through cooperation among States and, where appropriate, in collaboration with any other international organization"

Article 3, Convention Establishing WIPO, July 14, 1967

WIPO is the specialised UN agency where technical discussion of IPRs takes place. Developments here could provide the basis for additional topics to be included in the TRIPS Agreement. The Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC) was set up to consider the difficult issues arising in those areas[26]. This will discuss IPRs in relation to access to genetic resources and benefit sharing, the protection of traditional knowledge (TK) and expressions of folklore. Following two meetings of the committee in 2001, the WIPO secretariat is preparing model IPR clauses for contractual agreements on access and benefit sharing (ABS), which will take into account the CBD code. In so doing, it recognises that material in the ITPGR's multilateral system is not subject to such clauses. In fact, in adopting the Bonn Guidelines on Access and Benefit-Sharing , the COP to the CBD specifically noted that this was without prejudice to the ITPGR. They are also working on documenting public domain TK to ensure patent examiners can prevent misappropriation of this knowledge, as has happened on a number of well-publicised occasions and given rise to concern about biopiracy – the unauthorised commercial exploitation of the knowledge and resources of traditional and indigenous communities in developing and developed countries[27].

"The combination of a complex international negotiation process and a complex set of issues with tremendous long term social, economic and political impact is the perfect setting for a breakdown of international consensus on the issues of genetic resources"

Petit, *et al*, 2001

Other deliberations in WIPO could affect the overall use of IPRs and remove the apparent flexibilities negotiated into TRIPS, for example through moves to harmonise requirements in national patent regimes. Harmonisation would make the patent system of countries more like each other in terms of administrative procedures and rules, enforcement standards and substantive law. As long ago as 1966, the US President's Commission on the Patent System foresaw that: "the ultimate goal in the protection of inventions should be the establishment of a universal patent, respected throughout the world… obtained quickly and inexpensively on a single application"[28]. WIPO has held negotiations on patent law harmonisation since 1985 on administrative formalities and substantive law elements. At a Diplomatic Conference in 1991, WIPO presented an ambitious draft Patent Law Treaty but the conference resulted in deadlock. The Patent Law Treaty adopted in 2000 dealt only with procedural matters. WIPO has recently drafted a Substantive Patent Law Treaty that the organisation's Standing Committee on the Law of Patents is currently debating.

A final area where WIPO may affect the nature of IPRs in developing countries is through the technical assistance provided to countries to help them frame their laws and develop expertise in these areas. There have been concerns raised by those outside WIPO that this is too narrowly focused and has not supported countries enough in using the flexibilties contained with TRIPS[29].

2.6 The problem of different fora

While TRIPS may be the main focus for trade negotiators concerned with IPRs, biotechnology and food security, clearly these issues are also relevant in the other fora. There are at least two problems. One, noted by Peter Drahos, is the use made by major players such as the USA of forum shifting as a negotiating tactic – moving discussions from one place to another in an attempt to reach its overall policy goals[30].

The other arises from the different ministries and interests involved in negotiating at these different fora and the difficulty of achieving coherence between them – or at least avoid outright conflicts or contradiction. This was highlighted in a report drafted to the World Bank entitled "Why Governments Can't Make Policy - The Case Of Plant Genetic Resources In The International Arena". It reviewed decision-making in Brazil, France, Germany, India, Kenya, The Philippines, Sweden, and the USA and found it to be a problem in all countries to various degrees. Even within the WTO, other agreements could impact on food security more generally, in particular the Agreement on Agriculture where most discussion of food security at WTO has focused.

[25]IPGRI, 1999

[26]Dhar 2002

[27]See companion discussion paper by Carlos Correa, 2001 and Dutfield 2002 for background to this discussion

[28]See web site of the Action Group for Erosion, Technology and Concentration(ETC), formerly RAFI, for ngo coverage of biopiracy cases http://www.etcgroup.org

[29]Rogan 2002 – in Dutfield

[29]MSF *et al* meeting, March 28, 2002

[30]Braithwaite and Drahos, 2000, ch 24

3. Issues and concerns

"Can you imagine a country that was unable to grow enough food to feed the people? It would be a nation subject to international pressure. It would be a nation at risk. And so when we're talking about American agriculture, we're really talking about a national security issue."

President George W Bush, 27 July 2001, Quoted in ETC Group, 2002, p 4

"Nothing is more controversial in the IPRs area than the treatment of biotechnological innovations and plant varieties"

Maskus, 2000, p 222

Food security is a cornerstone of social and economic welfare. The impact of the changing IPRs regime on food security is likely to be varied and may occur at different levels – from international to household (Box 7). Policy responses may also need to differ depending upon national circumstances such as the number and type of farming households, R&D capacity, and rural/urban balance.

Technology in the form of improved seed varieties has been thought of as contributing to improvements in food security via increased food production. Yet, as the work of Nobel laureate Amartya Sen and others has shown, increased food production does not necessarily end food insecurity for the poor. The market and social structures in food and farming matter, including things such as land tenure and access to credit, as well as lower prices and more food production if people's entitlements are to be met. Concerns about the impact of IPRs include:

- their effect on agricultural R&D as a public good and the kind of farming systems and farmers research supports;
- the balance between the incentive to produce biological innovations and the responsibility for their environmental and other consequences;
- the structure and direction of seed production;
- effects on market structures and access to food by consumers in rural and urban areas;
- control over genetic resources and pressure for intensive farming practices;
- the ethics of the extension of IPRs to lifeforms; and
- the health of the farming population.

Many effects are not simple and direct but subtle or indirect and multifaceted, in which the nature and use of specific IPRs may change market, social and cultural relationships. How these impact on food security may then become a matter of how societies can assist those who may be adversely affected by change. IPRs in agriculture are not granted, for example, with the intended purpose of improving the food security of smallholder farmers in marginal areas – yet this may be a major issues in many countries for improved food security. They are a tool of innovation policy, which in some instances is geared towards improving food security, but usually conceived of at a national level and more in terms or promoting a private seed industry or promoting biotechnology R&D.

3.1 Questions of responsibility

One of the key responsibilities of states – individually and collectively – is to ensure food security. Per Pinstrup-Andersen, Director General of the International Food Policy Research Institute (IFPRI), argues that, "Where national governments fail to take appropriate action, food security fails. Hunger persists largely because of governance and policy failure at the national level"[31]. Moreover, he suggests "the WTO should work closely with civil society and national governments to identify and remove

[31]Pinstrup-Anderson 2001, p 15

7. Levels of food security

Globally, food security depends on a range of things including:

- our ability to minimise / manage / react to climatic change and disruptions to food production by holding suitable stock levels and having emergency distribution arrangements in place.
- ensuring new technologies enhance this capacity and do not increase risk of major disruptions in food supply through unforeseen consequences on ecological viability.

Regionally and nationally it includes:

- maintaining the capacity to produce and / or import food requirements and ensuring a distribution system or entitlements that enable all people within the borders to produce or acquire the food they need (by purchase or special schemes).
- maintaining a R&D system able to deliver continued improvements to all aspects of production systems used by the full range of farmers in the country, and cope with variability and climatic changes.
- ensuring both rural and urban dwellers are able to secure their livelihoods and so have access to the food they need, either from direct production, purchase or barter.

At the community and household levels it requires:

- continued ability to maintain livelihoods that allow production / procurement of food needs in an appropriate manner.
- risk management strategies suitable to local needs and customs and systems to prevent impoverishment.
- prevention of conflicts and use of food as a weapon.
- support for those in marginal areas / environments to increase productivity, or, if forced out, for there to be alternative livelihood possibilities available.
- equitable gender and inter- and intra-household distribution.

factors that are adverse to poor people, including… intellectual property rights regimes adverse to poor people [and] barriers to access to appropriate technology by developing countries"[32].

In assessing the effects of strengthening private rights, then, a key question is whether they support the social and economic welfare of the poor and meeting the development goals to which most states have committed. To make them do so requires states with well-developed administrative and regulatory capacities to deal with any ill effects and strong judicial systems, both of which may be lacking. It may also require clear national and international liability regimes and anti-trust and competition rules as part of the balancing of interests between IPRs holders and those who might be affected by the results of innovations they promote. It also means governments need to devote sufficient resources to agricultural R&D. The US Department of Agriculture (USDA) is also wrestling with these issues. It recognises that "the empirical record concerning the economic effects of intellectual property protection in general and in agriculture is inconclusive" and that "the debate over IPR, concentration and antitrust, and public agricultural research policy will continue for years to come"[33].

3.2 Agricultural research, farming and food security

"Counter the urban and industrial bias in development policies, and increase overall investments in rural areas…These investments will provide a long term solution to the problem of food security and poverty…Contrary to conventional wisdom, investments in low-potential lands generally produced higher returns for agricultural productivity growth than those in high potential lands…Give priority to R&D, education and roads"

IFPRI, 2002, p 4

Research by IFPRI and Indian and Chinese researchers has highlighted the importance of public investment in rural areas, especially low-potential lands in Asia and that R&D is one of the three key areas for investment. While the better-favoured areas need existing levels of investment, additional investment is needed in the less-developed areas. In many poorer countries, especially in Africa, there has not been sufficient investment in the high potential lands either. One major area of concern is the effect of IPRs on the generation of public goods through agricultural research aimed at benefiting small farmers.

A concern is whether the extension and strengthening of IPRs could inhibit the use of R&D processes and products, including biotechnological, that would benefit people in developing countries. Another is that the current focus on biotechnology is skewing the overall research effort away from other approaches to improve farming, especially for poor and marginalised farmers, from better water management to more appropriate equipment to integrated pest management techniques.

3.2.1 Role of public goods in farming and social benefits

Securing the production of global public goods through cooperative international action is an essential element in achieving sustainable human development[34]. Public goods have two basic properties – consumption by one person does not detract from that of another (non-rival) and it is impossible or very difficult to exclude an individual from enjoying the good (non-excludable). Knowledge is non-rivalrous, those sharing it lose nothing and others gain. A problem in encouraging people to expand knowledge, it is argued, is the difficulty of them capturing the benefits from doing so without some form of support. This might be direct state action, eg by paying people to do research or make artistic creations, or indirect state action to create conditions in which knowledge producers can capture benefits from its production, eg, by introducing laws that give innovators some claim over the knowledge they produce, such as patents and copyright[35].

The resources used to produce public goods are both rivalrous and excludable – if they are spent on this, they cannot be spent on something else, possibly more useful. The trick is, therefore, to ensure that these resources are used efficiently. Government subsidy cannot necessarily do this – governments are not necessarily wise, or in all cases well-meaning. The market approach may be more efficient. But government support is needed for 'market failure', and indeed to try to ensure a competitive market. Thus, there may be a role for both public and private research. Innovation in farming is not simply led by private firms, however, but by millions of small farmers and communities involved in farming. In developing new legal frameworks, the question is where the balance lies between supporting corporate actors and individuals and communities.

Farmers sharing knowledge – and seeds – gained from empirical experience has been behind innovation and development in agriculture for millennia. That experience has been supplemented and expanded by an organised, state-supported, science-based research effort for about 150 years. Agricultural research has been carried out by public bodies – and spread to farmers – largely as a public good, since

[32]Pinstrup-Anderson 2001, pp 15-16

[33]Economic Research Service/USDA, 2001

[34]Kaul *et al*, 1999

[35]Stiglitz, 1999, pp 308-325

"…if the legal staff had had its way, the scientists would have published as little as possible"

Charles, 2001, p 20

those needing its results are too small to do the research themselves, and the benefits flowing from improved agriculture go to society as a whole. Indeed, agricultural R&D has led to major yield increases over the past 150 years. Recently, the private sector has taken a growing role in the industrialised countries (section 1.4) with their small farming populations and wholly commercial farming systems, but focuses on areas where it can best ensure returns to its investment.

Joseph Stiglitz, when he was chief economist at the World Bank, pointed out two issues to consider when there is a shift in R&D to the private sector. One is that "relying on the private sector for agricultural research is likely to result in under investment from the point of view of society" and the other is that this applied research relies on continued publicly funded basic research and has greatly benefited from past university and other public sector research[36]. In other words, the public has and continues to subsidise, private R&D.

The further publicly-financed research moves away from that usable by farmers, the more the only people who can capture its benefits are those geared up to do further research to turn fundamental research ideas into applied research producing new practices and products of use to farmers. If this is left to the private sector, it will focus on those things most likely to generate returns and serve markets that can absorb those products and services. Poor farmers operating in marginal environments are unlikely to provide a significant market. If public research does not take these needs on, no-one else will. This raises questions about whether public R&D could focus on areas and on types of R&D for crops/farmers that the private sector is not interested in, such as open-pollinated high yielding maize.

The trend to proprietary science is also raising major questions about its effects on the exchange not just of germplasm but ideas, experience and techniques which

[36]Pinstrup-Andersen, 2000

8. IPRs and the IARCs

"The status of the CGIAR collections and their continued availability to assist the guarantee of food security in the South has been imperilled by the availability of intellectual property protection to permit privatisation of this germplasm" *

Sixteen International Agricultural Research Centres (IARCs) operate under the Consultative Group on International Agricultural Research (CGIAR). They receive about $340 million per year from an ad hoc group of 58 donors. This is about 4% of total public spending on agricultural research worldwide. The CGIAR aims:

"To contribute to food security and poverty eradication in developing countries through research, partnership, capacity building, and policy support, promoting sustainable agricultural development based on the environmentally sound management of natural resources"[a]

The IARCs conduct agricultural R&D in a wide range of crops and animals, techniques and policy making relevant to this and also manage a global network of genebanks. Their work is intended to support national agricultural research systems (NARS) in developing countries. Developed countries have also received benefits estimated to be worth billions of dollars to their economies from plant breeding in the major food crops, such as wheat and maize[b].

The CGIAR system holds about 600,000 accessions in its various genebanks, mostly collected before the CBD was signed. It is about 40 per cent of the global total and is the largest collection of such material. It is formally held in trust by the CG for the benefit of humankind through an agreement made with FAO in 1994 and the food crops in it will be covered by the new ITPGR. A study of germplasm flows over a 20 year period found that developing countries are net recipients of germplasm from CGIAR genebanks and averaged a ratio of 60:1 in terms of samples received to samples donated to CGIAR gene banks. For improved materials generated by the research programmes in the centres, the ratio went up to 200:1. Much of the CGIAR-held materials is distributed within the region where it was collected and more went to developing countries than developed, with minor amounts going to the private sector[c].

No IPRs can be taken out on the germplasm in the genebanks which was collected pre-CBD and is held in trust for humankind – bilateral material transfer agreements (MTAs) are used when the material is supplied. However, sometimes this requirement has been ignored. Equally, the Centres may have to sign MTAs to use, for example, DNA markers, so the developers can prevent their use by competitors.

The CG carried out IP audits of the centres to assess their position on IPRs at present[d]. A Central Advisory Service on IP and Proprietary Science has also been set up in the International Service for National Agricultural Research (ISNAR) to provide advice to the Centres and their clients. Various working groups have tried to decide what to do about IP and individual centres have very different views. As a study in 1998 noted:

"Recent unsuccessful attempts to develop an official IP policy for the CGIAR point to the difficulties posed when the views of the donors are in conflict…The autonomy of individual centres, including different boards, mandates and constituencies, makes policy formulations and development extremely difficult…The process [of dealing with IP] has been complicated by the fact that the CGIAR system has no legal status, and its members often represent opposing sides of the highly politicized debate."[e]

The International Wheat and Maize Research Institute (CIMMYT) published its IPRs policy in spring 2000, which accepted patent usage as a last resort - and has received strong NGO criticism for doing so[f]. The Centre has found that dealing with IPRs has taken up more time over the past 10 years and CIMMYT is considering hiring an IP manager. These issues do not just divide members of the CG system but all the stakeholders involved, as is illustrated in the latest, non-consensus, report of the multi-stakeholder dialogue Crucible II group[g].

Donor policies are also adding to the difficulties with some donors insisting on IPR clauses in their contracts. In part, these shift the burden onto the Centres and may also compromise the integrity of the Centres with developing countries[h].

Sources: Interviews at Global Forum on Agricultural Research, Dresden, May 2000; *Blakeney, 2001, p 5; [a]CGIAR, nd; [b]Pardey *et al*, 1996; [c]Fowler and Smale, 2000; [d]Eg, "Intellectual Property Management Review" Center For International Forestry Research; [e]Bragdon and Downes, 1998; [f]CIMMYT, 2000, and RAFI 2000; [g]The Crucible II Group, 2000; [h]ISNAR Central Advisory Service, 2000

researchers use to spark off other ideas. Basically, lawyers hate scientists talking together at conferences, 'giving away' potentially valuable knowledge. Science, on the other hand, has flourished in an open, transparent, sharing cultural environment. The use of confidentiality agreements in universities and research institutions, which are also doing more and more commissioned research, is further eroding the openness to sharing of knowledge. It is also pushing the balance between the public and private sectors towards the latter. Claims to confidentiality in data supplied to regulators for approvals, eg for new crops, are also coming under greater public scrutiny and may be increasingly challenged.

3.2.2 International agricultural research

For over 30 years there has been an international effort to generate freely shared agricultural research results that could be used by researchers in developing countries to benefit their farmers, especially poor farmers, and so promote food security (Box 8). The international work was largely funded through the CGIAR, which was established in 1971 when the free exchange of germplasm and of scientific knowledge were the norm and public funding largely underpinned agricultural research as a public good. National governments and donors together also helped fund considerable R&D nationally in many developing countries. Today, the level of donor funding, and in some countries national funding, has declined, science is increasingly proprietary and much more agricultural research is carried out privately.

The legal framework in which the CGIAR system is operating has also changed. The issue of how to handle IPRs has been dividing the IARCs for years. Their concerns have been driven by developments in biotechnology, PVP (plant breeders rights) and patenting, rather than other areas of IPRs such as copyright, although this does have implications for databases and publications. Prof John Barton argues that in this new environment the CG must rethink who it is working for and in what crops and areas, what kinds of partnerships can be made, and whether the technologies needed may be applied royalty free for the benefit of poor farmers.

Competing in the patent game requires considerable resources – both to take out and maintain patents – and legal expertise to defend them. Unless patent holders are able to defend them, at least in the major markets, then they are useless. According to Blakeney, "a single patent application, carried to completion in key markets, costs an estimated $200,000. Defending a patent application costs at least this amount again"[37]. Most small players look for larger companies to licence their inventions or buy them out, to acquire the rights to use the patent portfolios they hold. The practices of the industrialised countries, especially the USA, are causing concern among those looking at developing country needs (Box 9).

The IARCs' success has largely been built on cooperative, sharing work not legalistic and competitive activities, which the moves to more proprietary science appear to fuel. Some question how far the Centres should patent defensively or use patented technology as a bargaining chip with private companies. Similar questions arise for research in many developing countries. The Centres' spending on biotech research is a tiny fraction of that spent by the private sector – around $25-30 million annually compared to industrial spending probably hundreds of times that ($10 bn in 1998 in the USA alone according to Ismail Serageldin, former chair of the CGIAR). The Centres' legal capacity to defend patents is minimal. Infringements so far have largely been identified by small NGOs who have used publicity to try to reverse some, and helped mobilise developing country governments to defeat others. Litigation costs are high and would almost certainly detract from the basic work the Centres are supposed to do[38].

Another strategy, which some in the CG prefer, is to go public with all their information – thus destroying the claim of novelty and preventing others from patenting. This can be risky as some in the USA trawl the research literature to develop patent applications from newly published work, despite this seemingly being against the aim of patent law. They can do this by seeking to patent claims about the functions of the innovation, and without having to prove it[39]. And in the US system, the plaintiff has to initiate litigation proceedings, which is expensive, to have it overturned. There are some concerns about this in the USA and new legislation aimed to encourage both small and large inventors to use patents also includes an option to re-examine patent applications before they are granted and have to be challenged in the courts[40].

[37]Blakeney, 2001, footnote 60

[38]There are two situations, under 'defend patents'. One is where you are defending, not your own patent, but the public domain - as CIAT are doing, intervening against the 'yellow bean' patent in the USA. That particular action will be expensive, but not ruinously so. The other is defending your own patent from infringement. No non-commercial company should do this, if it can possibly avoid it. It should procure that its licensees do it. If it hasn't got any licensees, there is little point in suing. (Tim Roberts, Pers Comm, July 2002)

[39]This practice is talked about and acknowledged in patent law circles

[40]Goldman and Choi, 2000

9. US patenting practices and other options

"There are legitimate reasons to be concerned about the highly protective standards that have emerged recently in the United States and the European Union. These laws and judicial interpretations provide broad patent protection for software and biotechnological inventions. They also promote extensive rights in the formulation of databases, which could have a negative effect on scientific research. It remains to be seen whether such standards tilt the balance within those jurisdictions toward the private rights of inventors and away from the needs of competitors and users. It is not too early to claim that they are inappropriate for developing economies and net technology importers." [a]

Patenting practice in the USA – and the pressures for others to adopt similar approaches – is a concern. The granting of patents on fragments of DNA, the loosening of the definition on industrial applications, the way inventive step is applied plus an apparent willingness to leave it to the courts to decide the validity of patents, are bringing the system into disrepute. Some see a risk of the US system turning into a patent application registration system, not a patent granting system. US practice is fuelling concern and resentment globally about the acquisitive tactics of US firms and prompting industry to drive European, Japanese and other industrialised countries to follow suit. Biotechnology is seen largely as an industrial competition issue, with the USA, EU and Japan each determined to be a major player in the industry[b].

Some agricultural researchers in other countries and in the IARCs seem to regard US practice as the norm rather than the exception currently dragging the rest of the industrialised countries behind it. It is unlikely that such a system would be appropriate for most developing countries. No one is obliged to take any notice of restrictions applying to patented products or processes outside the jurisdictions in which those patents have been granted.

TRIPS allows countries to forbid the patenting of plants and animals, and some do, eg Argentina, Brazil, the Andean Pact. While microorganisms must be patentable these may be defined narrowly to disallow the patenting of naturally occurring microorganisms[c]

Moreover, agribiotech companies mostly seek patent protection in the USA, Canada, Western Europe, Japan, Australia, some countries in S E Asia like Taiwan and the Philippines, very few in Africa, and the large economies in Latin America. Things that are can be patented in the USA, such as plants and animals, are not permitted to be patented in most other countries. Thus US patents on plants and animals may have no validity in other countries, even if the rights holders in the USA applied for them, as they cover materials outside the scope of national patent law and automatically should not be granted.

Under TRIPS, however, should patented products, or products produced using patented processes, be produced in a country where these patents do not apply and then be exported to the country where they do, then those products could be barred from being imported into that country by the patent rights holder. Thus, there is a clear economic incentive not to use patented products or processes for things that will enter into export markets to countries where patents are held on those products or processes. The major commodity crops, where private R&D sees major opportunities, are likely to pose much greater difficulties for researchers in developing countries and the IARCs than crops of local, regional or subsistence significance.

If regional groupings of countries settle on the strictest interpretation of the terms for patentability, exclude discoveries, strictly define inventive step, etc – and, if relevant, support their industries to take out patents in the key industrialised country jurisdictions on things not patentable in their own – they could take advantage of many processes and products patented in those other jurisdictions and develop trade in them amongst themselves unhindered by current rules. They would not be able to export to the jurisdictions with more lax rules, however, and would probably have more difficulty in joint venture and foreign direct investment (FDI) from firms in those countries.

[a]Maskus, 2000, pp 237-8; [b]May, 2000; [c]Llewelyn and Adcock, 2000

3.2.3 Options for IARCs and NARS

The challenges facing public good agricultural R&D are a sub-set of those facing public good R&D and the circulation of knowledge for development more generally. Patent practices are still in a state of flux. The least developed countries are not obliged to follow or implement TRIPS until 2006 and may seek extensions to this deadline but an extension has already been granted to 2016 for pharmaceuticals. Many IARCs and national researchers operate in territories where the products and US or European patented research processes they might want to use are not subject to patents, either because patents have not been applied for there or because the subject matter is not patentable in that jurisdiction. Even where they are, they may wish to use them on crops or for purposes that commercial companies have no interest in. It seems inappropriate, then, for the IARCs to adopt the US reading of IPRs, especially if the countries they work in do not share it or as yet do not have to deal with it. Thus, licensing agreement language in MTAs should be carefully worded not to extend patent obligations into countries where a particular patent itself may not be valid[41]. Contract law and the capacities of parties to negotiate contracts is also an issue.

The issues raised in the discussions on access to drugs concern public good, pro-poor R&D and developing mechanisms to deliver R&D that meets the needs of poor people. There may be lessons to be learned from the concern over the Human genome project to ensure that that data produced by that remained in the public domain. The big issue for agricultural development R&D is the current level of funding. The capacity to do such R&D may be an IPRs issue if researchers are blocked from using necessary techniques by the way the new IPRs regime is working out, either on cost or access grounds.

However the IPRs regime develops, mechanisms must be found to continue to provide global public goods, ideally by making them freely available in non-exclusive ways that cannot be misappropriated. But it is probably more important to have lots of useful public goods freely available and some misappropriated than to have few freely available and none misappropriated.

[41]In a world of technology transfer and concentration of proprietary rights to technologies among a relatively small group of multinationals, there is a practical problem of how feasible it is that different standards can be implemented in different countries or different circles (IARCs). It may be feasible on paper, but will access to technologies then be denied? Patent disclosure rules in the USA. are known for being rather "simple" i.e. you cannot just get the copy of the technical material of what was filed for a biotech process and then go and do it in a developing country, for example (Tim Roberts, pers comm, Jul 2002)

3.3 Seed provision and PVP

"There is not one ideal *sui generis* system that will suit the needs of all countries."

IPGRI, 1999, p 9

"Private sector breeding tends to limit itself to high value/low volume crops and hybrids. Further, the agronomic qualities indicate that the target areas are characteristically the post-Green Revolution areas. Accordingly, it appears unlikely that the crop and agronomic needs of the wider farming populations, particularly low external-input use communities, are consistent with this research priority."

Rangnekar, 2002, p 7

Formal seed production systems linking public and private R&D and breeding companies dominate seed provision in industrialised countries. More informal seed production systems with production largely by a mixture of farmers and public institutions exist in many developing countries. In many coutnries, plant varieties explicitly cannot be patented, although they can in the USA and more recently in Europe, despite the Europeans having originally developed plant breeders rights (PBRs) as an alternative to patents for plant varieties, There is pressure now for patents to be extended to plant varieties as well as PVP from firms producing generically-engineered crops as this gives great control over the products.

TRIPS requires WTO Members to introduce either patents or a *sui generis* system of PVP or both. With the introduction of PVP, in particular PBRs, industry argues it will enable it to undertake breeding work and also bring in foreign material to developing countries. The key questions, argues Rangnekar in a background study for the UK's Commission on Intellectual Property Rights, are "has the access to foreign bred genetic material enhanced national capacity in plant breeding and what is the impact on food security. Existing literature on Kenya does not provide encouraging evidence on either of these two issues"[42] (Box 10). However, this is a complex issue that goes beyond IPRs. In some countries where governments have an effective monopoly on seed provision, decreasing funding and a lack of incentives results in poor service and little innovation. Competition from private domestic and foreign seed suppliers could benefit farmers, particularly commercial farmers, in countries that are not served well by their public seed system. However, replacement of a public monopoly by a private monopoly should be avoided[43].

After examining the economic impact of PVP, Rangnekar concludes "research conducted in the private and the public sector are non-substitutable as they are targeted at different farming groups". He also suggests that closer ties between the public and private sector raise public welfare issues regarding accountability and transparency, and that "the spread of proprietary control in research tools and uncertainty in the limits of ownership make the conduct of agricultural research all the more difficult by requiring complicated negotiations.[44]"

The impact of PVP will depend upon whether the system adopted takes account of local conditions and provides a regulatory framework that will support the various farming systems in the country, rather than advantage some and disadvantage others. In a review of possible options, Dhar concludes that "the *sui generis* legislation that developing countries must introduce has to take into consideration the interests of both the farming communities and the plant breeders in the formal sector"[45]. He argues that adopting the systems developed by the industrialised countries and embodied in UPOV is not adequate. He suggests approaches that take into account Farmers Rights, as outlined in the ITPGR, and which allow seeds bred by farmers to be covered.

Under patent law, unlike PVP, there is generally no farmers' exemption to allow the use of farm-saved seed as allowed for in UPOV. IPGRI notes that "Breeders and modern biotechnology companies often perceive the farmers' exemption as potentially reducing the profit, or the expectation of profit. Consequently, there may be strong opposition on the part of breeders and modern biotechnology companies to this exemption in countries where patent-like protection for plant varieties is being considered.[46]" However, another study concludes that the "very limited empirical analysis undertaken in the US would suggest that maintaining the farmers' privilege [under UPOV 91] does not impinge on the incentives for R&D and does not even form a serious form of competition[47]"

3.4 PVP and patenting

Independent of any concern about how PVP works, there is major concern about the extension of patenting at the expense of PVP, even from those on both sides of the argument about the use of PVP. They expect such an outcome to lead to a few major companies controlling seed production for all major commercially important crops within a few years, as is already the case in the USA. With patents, firms may try to obtain broadly defined patents on key processes or enough patents to achieve what those in the patent business call 'clustering' – building enough patents, preferable interlocking, around a product to prevent others getting into the field. Another tactic

[42]Rangnekar, 2002, p 7

[43]Eaton, 2002, p18

[44]Rangnekar, 2002, p 6

[45]Dhar, 2002, p 27

[46]IPGRI, 1999, p 10-11, see also Dhar 2002, and Correa, 2001

[47]Eaton, 2002, p 29

10. New rules' effects on plant breeding

"There will continue to be many crops and production environments that will be the responsibility of the public sector, which needs to position itself to make the best use of the international agricultural research centres (IARCs) and, increasingly, proprietary technology. The latter will require that public research systems have access to sufficient intellectual property management skills to be able to interact productively with the private sector" *

The expansion of IPRs in plant breeding has fuelled a strong sense in developing countries and in some in the CGIAR system that an implicit bargain has been broken – with germplasm used in breeding programmes largely provided by the south for free being still in the public domain but science becoming increasingly proprietary[a].

The extension of IPRs in agriculture – both PVP and patents – is already having some effects on the exchange and use of plant genetic resources. In the USA, public sector breeding programmes have found it harder to get materials from companies which has interfered with their ability to release new lines and train students[c]. Tim Reeves, director of the International Wheat and Maize research Institute (CIMMYT) in Mexico, also says that the expansion of PBRs is leading to some collaborators no longer sending their best lines for use in the breeding programmes, but the second best[d]. Since the breeding programmes work by many partners exchanging material, everyone normally gets much more out of them than they put in, but if the quality of what is put in goes down, everyone will suffer.

The effects of the CBD, with its implicit bilateralism, on the availability and use of genetic resources held by public research institutions are not yet clear. There is preliminary, largely anecdotal, evidence that the CBD has failed so far to encourage greater access to genetic resources, but has resulted in a decline in the use of such genetic resources. Some in the seed industry and the CGIAR suggest that the flow of germplasm has declined and that the complexity of access arrangements is putting off direct collecting. Since there is so much material in genebanks and the industry has many lines to work from, there is no urgency for them in accessing new material from the field at present. Plant breeders generally prefer to get germplasm from genebanks as this comes with associated information and is cheaper, easier and quicker than through collecting expeditions.

The CBD's bilateralist approach and the sense of unfulfilled promises the developing countries have about commitments made both in the CBD and TRIPS to transfer technology to them are fuelling development of national access laws that could seriously hinder the collection and dissemination of materials from both the germplasm collections and the materials being developed by the IARCs. The new ITPGR and rules on the use of PGRFA to be agreed by the governing body may help.

For the considerable number of food crops not included in the international treaty there may be much greater transaction costs in using germplasm, which could adversely affect their development[e]. A study commissioned for GFAR concluded that a "scenario in which all germplasm exchange falls under bilateral agreements entails excessively high transaction costs" and felt that only for very few crops, such as industrial crops, might a bilateral approach to germplasm exchange have acceptable transaction costs[f].

There is also a potential problem with seeking benefit sharing for PGRFA through a bilateral approach to agricultural germplasm owing to the definitions used in the CBD. These could be interpreted as meaning any benefit sharing has to go to the country of origin, which for agricultural crops may be very different from the place where materials are collected from for use in breeding programmes and put into genebanks[g].

*Tripp, 2001, p487; [a]Serageldin, 2000; [b]op cit; [c]Riley, 2000; [d]Pers comm, GFAR 2000; [e]Stannard, 2000; [f]Visser, 2000; [g]Fowler, 2000;

"basic research and many other forms of knowledge are not, and almost certainly should not be, protected by an intellectual property regime. In these areas efficiency requires public support. And public support must be at the global level."

Stiglitz, 1999, p 320

is 'bracketing' – surrounding a competitor's patent with so many of one's own that it cannot be commercialised[48]. In many sectors, such as information technology, IPRs have evolved from a production tool towards ways of restricting innovation by others, and are most often used in "cross-licensing" between the major players, creating, in effect, oligopolies around IPRs.

While PVP legislation covers only varieties, and not the genetic material they contain, and therefore allows further research on PVP varieties and commercialisation of that research, patenting does not. Though there is normally a research exemption, commercialisation of anything developed requires permission of the patent holder – which can be a considerable disincentive to further work and block its use. It is a major problem with public goods research since the objective is to develop new products and methods and give them away.

The variety of concerns has led to different views about the extension of patents into the biological sphere:

- Remove biological materials from patentability and seek other reward systems to encourage innovations.
- Amend the terms and conditions for patentability to facilitate agricultural research for development. A number of options were suggested at the Global Forum on Agricultural Research (GFAR) in May 2000 :

  - patent length on research processes should be restricted to 5-6 years, by which time often new processes had been developed anyway, and which gave companies a head start[49];

  - set a flat fee for use of the patented process after a fixed time so users cannot be held hostage by monopoly rights holders;

  - develop a clip-art like toolkit of patented technologies (ie free for public use and easily obtainable) that would be freely available to public good R&D research in IARCs and NARS to use in specific countries or for specific poor people's crops; or,

  - declare certain regions as a kind of 'conservation area' where the rights of

[48]Granstrand, 1999

[49]Serageldin 2000

patent holders are restricted or overridden for the greater public good.

- Develop a pooled resource base of patents in which rights holders agree to non-exclusive royalty-free licensing of the patented process and products for specific purposes. It would also need to include the tacit knowledge required to utilise them for agricultural research. This might be done on a multi-member approach or encourage individual companies to publish details of all the patents they hold on the web, and offer downloadable royalty-free licences, with minimum bureaucratic effort.

Another suggestion for plant breeding, which involves relatively small-scale innovation and has to draw on the public domain for much of what lies behind each innovation, is to create compensatory liability regime. This involves an automatic license for use by someone developing an innovation further which denies the first inventor the right to exclude people from using his invention. If used immediately, there would be a set compensation fee payable but not if the follow-on developer waited a set time. Then the knowledge would be considered freely available in the public domain as by then the inventor should have recouped any R&D cost through his exclusive use of the innovation or compensation for others using it[50].

Some proposals would require changes in TRIPS, such as not allowing patents on basic processes and allowing countries to exclude micro-organisms from patentability. Considerable coalition and capacity building would be needed to negotiate such alterations in TRIPS.

3.5 Rural opportunities and market structures

A key fact bears repeating: three-quarters of the world's poor are rural, and that number will fall only slowly in the years to come"

Ashley and Maxwell, 2001, p 421

Other concerns focus more on the implications for market structure and opportunities in rural and urban areas. There is growing economic concentration of firms in agricultural development, especially in biotechnology (section 1.4). Prof John Barton identifies a number of concerns for developing countries:

- Effects on seed prices, which he expects to be increased in the tens of percent not hundreds. However, this is a reason why public seed provision will be needed in countries with oligopolistic seed markets.
- Use of trade marks, patents and PVPs to protect major developed-world markets from competition, which are likely to increase the use of lawyers and law suits.
- Use of patent portfolios to restrict follow-on research by potential competitor and public sector bodies. This requires countries to ensure developing world researchers have a legal right to use such research.
- The need to counter oligopolistic tendencies through competition and anti-trust measures.
- The need to restrict broad patent claims and patents on fundamental innovations

Another concern is with the nature of publicly-funded R&D, especially in developing countries and its linkages to local private or community-based innovation. Alternative products and practices geared to the real needs of small farmers especially in marginal areas could provide competitive and socially desirable products and practices that would enable them to increase their agricultural production in a sustainable manner and produce a surplus that could be used to generate income.

This, however, assumes that providing support to small farmers is a policy goal and not getting rid of them as fast as possible to move to models of agricultural production similar to those in the USA and Europe, with few farmers linked into supply chains. Here, as OECD regularly points out, governments spend billions of dollars in various forms of subsidies to agriculture – but which generally fail to benefit small family farmers as they are continually squeezed out, and may do more to help maintain land values, high levels of input prices and larger enterprises, In 2000, total support to agriculture was $327 billion or 1.3% of GDP in the OECD area, of which support to producers accounted for 34 % of total farm receipts[51].

For food security at different levels, especially in improving rural livelihoods, policy makers must be clear about the role and desirability of maintaining the current farming population. In many states there are de facto policies which aim or tend to reduce the number of small farmers, a process which some feel the more private-sector, IPR-based approach in the future will exacerbate. If small farmers are squeezed out, as has happened in the industrialised countries, the key issue is whether alternative livelihoods exist through which they can maintain their food security.

[50]Reichman, 2000

[51]OECD, 2001

Given the vast differences that exist between countries, with farming populations varying from a considerable majority of the population to a small minority, a range of policy options will be needed to ensure food security at the household and individual level. These include enabling some households to leave farming, or to receive technologies to improve their efficiency and protect natural resources they manage, or to become fully commercial farmers – depending upon the livelihood strategy[52]. Complementary policies may also be required, for example where IPRs also affect people's ability to maintain their food security through effects on health (Box 11).

3.5.1 Differing visions

"The success of the Act (PVPA of 1970) in creating such incentives is reflected… by the more than 50 seed company acquisitions by pharmaceutical, petrochemical and food firms..."

Leibenluft quoted in Lesser, 1998

Some emphasise the need for participatory technology development with small farmers and an agro-ecological approach to agricultural development in keeping with rural development needs. In this approach, biodiversity is viewed broadly, the importance of *in situ* conservation and use stressed, and natural resource management strategies used to develop technologies with resource poor farmers that support the agro-ecological conditions[53]. Genetically re-engineering plants is seen as a biologically dangerous and socially simplistic way of dealing with the "complex realities facing small farmers" who have few resources other than knowledge of how to farm in difficult conditions. That knowledge needs to be nurtured and supported, rather than replaced[54].

This view also questions the ability of the existing international and national research systems to deliver this. It sees seeds as an integral part of farmers' strategies for managing the land and risk, with farmers in the Andes, for example, using hedge rows as decentralised and farmer-managed *in situ* gene banks. Agricultural biodiversity is not just the genetic resources but the economic and social systems that go around them.

One response to this vision in Peru seeks a non-IPR based way of safeguarding food security by creating a space for local communities to manage and develop their genetic resources – potatoes – within the framework of the traditional and indigenous knowledge and practices. Another response in India embraces IPRs and seeks to have the innovation of farmers and small scale entrepreneurs covered by IPRs and the inventors receive rewards (Box 12).

Others see such concerns as misplaced. For them the current developments followed to their logical conclusion will bring about food security and benefit everyone. Biotech, private sector, IP-protected, intensive-farming-led change is to be welcomed. Its biggest impact will be through lowered prices for agricultural commodities and that this is the way to benefit the poor[55]. Industry argues strongly that their biotech R&D and the necessary IPRs will lead to major improvement in crop production and help safeguard future food security.

In the future, some in the modern biotech industry expect genes to be invented in the lab, characteristics developed there for use in seeds or animals for farmers to buy to produce commodities to feed into various markets. The implications of this are that genetic resources are overvalued, and as the structure and functions of genes become known, activities more akin to chemical synthesis than identification of naturally found traits will be the main activity. However, this is still a long way from being practical.

[52]Tripp, 2001, p 485

[53]See, for example, Altieri & von der Weid, 2000

[54]Most would agree that the problems facing small farmers, especially in marginal areas, are not going to be solved first and foremost with technology. And where technology can contribute, alongside investments in infrastructure, health care, education, policies, etc it is unlikely that the technology of most immediate importance is improved varieties.

[55]According to one US official at GFAR

11. Health, medicines and food security

AIDS is incurable, fatal and kills the most productive members of society. AIDS and poverty interact in a vicious circle. In rural areas with high infection rates it can decimate the active farming population, an especial problem in much of Sub-Saharan Africa. The epidemic has taken a heavy toll on the agricultural labour force, with 7 million agricultural workers already dead in Sub-Saharan Africa and at least 20 million more could die before 2020. In some countries as many as 1 in 3 or 4 people is infected. Families hit by AIDS lose their capacity to produce as much as they did, their livelihoods are undermined and new strategies are needed to maintain knowledge about farming and agricultural production.

In addition to decimating the agricultural labour force, AIDS also undermines agricultural productivity, as families are often forced to sell productive assets to pay for the care of the sick or for funerals, thereby compromising the possibility of long-term development. As a result, AIDS poses a threat both to food security and rural development.

Thus, if patents affect drug pricing and access to medicines to fight AIDS and other health problems then they indirectly affect food security in many countries. Unless compulsory licensing arrangements enable poor countries to access drugs and technology transfer agreements are made effective and measures taken to support the remaining labour force then food availability not just at the household but national level will be threatened.

Source: FAO 2002 & Gillespie *et al*, 2001

12. Potato parks and honey bees

For farming communities in the High Andes near Cusco in Peru, food security is not improved by them being squeezed from their land and traditional farming systems but by ensuring they have the legal space to continue farming and develop it further – in keeping with the CBD obligations both for *in situ* conservation and to indigenous peoples. They do not want their knowledge, such as of the nuna (popping bean), expropriated and subject to IPRs in the USA, as was done by one researcher, but to live better in their home environment and share the knowledge they have.

For this they are seeking to create a legally defined potato park area, in which they can continue with the customary laws and practices and continue the *in situ* management and development of their natural resources, in particular the potato which originates in this region.

In India, the Society for research and initiatives for sustainable technologies and institutions has started The Honey Bee Network which has documented innovations, traditional practices and collected examples of contemporary knowledge to form a 10,000 strong database. It aims to create a network of local innovators and is trying to ensure that those who innovate in the rural community can benefit from their inventions and also have them known about and used by others.

Sources: QUNO Regional meeting, Cusco, Peru, 2001; http://www.sristi.org

3.6 Environmental aspects

"All known biological weapons programmes about which there is publicly available information have included a concern with the military utility of offensive anti-crop biological warfare agents and munitions"

Whitby *et al*, 2002, p 150

Two areas of environmental concern link food security, biotechnology and IPRs. One is whether the balance of rights and obligations achieved in the current IPRs regime that helps underpin the application of biotechnology is such as to minimise any accidental damage (eg unforeseen consequences of biological innovations on ecosystem viability). This is related to risk management, adequate trials, monitoring and evaluation, constraints on over-rapid deployment of technology without an adequate biosaftey regime and liability regime to compensate for (or provide mechanisms to ensure food available to do so) any such effects. In a world threatened with increasing variable and extreme weather events such as storm, floods and droughts, linked to climatic change, could widespread application of IPRs-protected, less diverse crops affect the sustainability of farming systems as well as farmers and researchers efforts to adapt to climatic changes? Will there be sufficient flexibility for both farmers and researchers when IPRs and contract law could reduce it?

Another concern is over the deliberate use of biotech weapons aimed at disrupting agricultural production of specific groups or regions. To avoid this requires conflict prevention, non-use of such weapons, systems to prevent their development and use and means of verification. It is in the verification area that questions have arisen over how far industry concerns over protection of their IP could impede controls to prevent the intentional use of biotechnology to inflict damage through the development and use of biological weapons (Box 13) by either states or terrorists.

3.7 Trademarks, trade secrets and geographical indications

"We are focused increasingly on driving the growth of our leading brands and dealing with other brands in ways which create value for shareholders"

A Burgmans & N Fitzgerald, chairmen of Unilever, 2002

Although patents and PVP are likely to have the most direct effects on food security through their impact on farming, other IPRs may also affect it. This will depend upon how far their use advantages or disadvantages different groups, local or national industries versus transnational industries, and affects prices, market structures and access to food, especially by poor people, and the ability of traditional communities to market local products.

Many companies make strong use of trademarks, and a focus on brands and substantial marketing investment such as brand advertising to secure their markets. Greater effort to protect brands and increase market share is increasingly likely. In 1993, the chairman of Unilever, the Anglo-Dutch multinational, called brand equities 'the most valuable items in our stewardship' and saw ' the power of our brands as the engine of long-term growth'. That year it spent almost 12% of turnover (£3284m) on advertising and promotional investment. There has been a spate of mergers and acquisitions in the food industry over the past decade, which is still continuing, as firms gear up to serve global markets and also to counter the growing power of multiple retailers. For Unilever, brands still remain a crucial part of their strategy although it announced in 2000 plans to cut out three quarters of its 1600 brands to focus on 400 around the world. For small producers selling into markets dominated by brand advertising, achieving some kind of brand identity is a major challenge.

For some products, a combination of widely advertised branded [trademark] products and trade secrets – Coca-Cola being the most famous – can be used. Others may develop certification schemes to show that those people supplying the good

have followed a particular practice, eg organic production or artisanal methods. Here one issue may be the ability of small producers to find markets for their often unadvertised products. In urban areas too there may be a threat to some people's food security from the replacement of the indigenous street food activities in many developing countries – often linked to local supplies – with trade-marked franchises of global fast food chains[56].

For other groups of producers, producing a product in a particular way or region as a designated name, linked to the region and method of production, provides a marketing tool that allows them to capitalise on their uniqueness. These geographical indications are of considerable importance in food, eg Roquefort cheese, Parma ham. Such designations normally come out of a well-established activity that has national recognition and produces products sought after by consumers. A study of these issues and five case studies of essentially niche products (kava, Rooibos tea, quinoa, Basmati Rice, and neem) concluded that "Both geographical indications and trademarks show the greatest potential [to benefit local producers] where traditional small-scale production is still present, on the supply side, and where end-use products are marketed directly to consumers. In other words, they are less likely to be appropriate when the product is a commodity traded primarily in bulk"[57].

How far the use of geographical indications (GIs) will affect food security in the areas concerned is unclear. There is considerable disagreement among developing countries about the economic benefits of extending stronger protection to geographical indications to foodstuffs. Some, such as India, favour this, believing they will gain from having protection for a range of products such as basmati rice. Others, such as Argentina, with a large segment of the population tracing their roots back to Europe and with tastes for European type foodstuffs, fear that production of local versions of many products will become much more difficult if they are prevented from using terms associated with the foodstuff which are likely to be reserved to products, such as cheeses, from Europe.

There is also the problem of the misappropriation of traditional knowledge of food crops, and lack of systems for ensuring benefit sharing with traditional and indigenous communities[58]. While trade secrets may have a role, instruments of other kinds than IPRs may be needed to protect their knowledge as well as excluding plants and animals from patentability as allowed in TRIPS. Moreover, if indigenous crops such as quinoa or nuna or yellow beans are patented in developed countries, in what is now called biopiracy, this may foreclose export markets there or if other crops have look-alikes produced which are trademarked and widely marketed this may also undermine the potential markets for developing country crops. The "biggest single threat to indigenous and local knolwedge is the disappearance of indigenous peoples, local communities and their cultures…Minimum standards of land-tenure security, self governance and social support are co-requisites for their cultural survival"[59].

[56]FAO, 1992, pp 16-17

[57]David R Downes *et al*, 1999

[58]Carlos Correa, T K, 2001

[59]Crucible II, vol 2, 2001 p47-8

13. Biological weapons

"In 2000, researchers in Australia accidentally created a lethal mouse virus and published their findings. The case demonstrated that modern biotechnology could easily be misused to create potent bioweapons"[a].

Many major developments in biology have led to attempts to see if they can be used to develop weapons[b]. Developments in functional genomics coupled with genetic engineering could potentially be harnessed to develop biological weapons that target specific crops, animals or ecosystems[c]. The failure to agree a binding and effective verification protocol to the Biological and Toxin Weapons Convention at the end of 2001, which was precipitated by the USA, was a major blow to reducing the risk from biological weapons. Among the many reasons for the final collapse, were government concerns over the loss of national security information and US industry concerns, largely from the pharmaceutical industry, over snap inspections which might compromise commercial confidentiality. This was a very different industry attitude from the approach of the chemical industry to the Chemical Weapons Treaty[d].

Oliver Meier in discussing the possibility of concluding a protocol without the USA, notes that some European industries are concerned that they would have to be open to inspection and US industry not, and are unwilling to be so. He dismissed such concerns:

"because the burden on industry under a verification Protocol would be minimal. For example, the draft Protocol limited that number of non-challenge 'visits' world-wide to 120 per year. No state party would have received more than seven visits annually, no facility more than three during a five year period." (p184)

[a]Meier, 2002, p 175; [b]Rogers, 2002, pers comm; [c]Rogers *et al*, 1999; [d]See Meier and also Feakes and Littlewood, 2002; Malcolm Dando, pers comm, 2002

4. Some TRIPS dimensions

"Indeed a "one size fits all" approach might be interpreted as demonstrating a lack of respect for local customs and traditions."

US delegate, IGC, 2001

The complex nature of food security and its interactions with biotechnology and IPRs raise questions about whether the minimum, one size fits all, set of TRIPS rules, despite the flexibilities, are adequate to deal with the diverse needs of communities world wide. The US delegate to the first meeting of the IGC questioned whether 'a comprehensive, uniform set of rules at the international level to govern the use of genetic resources, traditional knowledge and folklore' was either possible or desirable. Since many TK farming communities are responsible for the development of agrobiodiversity, it is perhaps worth asking the same question about TRIPS when it comes to its impact on food security.

Article 8.1 allows members to "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". Lessons should be drawn from the Doha Declaration on the TRIPS Agreement and Public Health that "the TRIPS Agreement does not and should not prevent Members from taking measures to protect public health". Adequate nutrition is an essential element of food security – indeed it embraces both the problems of undernutrition and overnutrition – and should be treated similarly. This may be particularly relevant if R&D in the food system moves into a similar pattern to that in the pharmaceutical sector, which also has a problem in generating products that deal with the diseases of poor people[60].

4.1 Balancing private rights, public interests

"Intellectual property rights over life convey an asymmetric system of conserving, using, transforming, managing, and controlling biodiversity. This asymmetry is detrimental to many indigenous and peasant people, who are precisely amongst those most in need of biological innovation and who can best carry it out"

Gari, 2001, p 23

The balance of rights and obligations mentioned in Article 7 of TRIPS should not be viewed simply within the context of the Agreement itself but in the way the Agreement affects the overall balance of social and economic welfare in relation to food security. TRIPS clearly focuses on the private interests of innovators or those investing in innovation protectable by IPRs while it is the whole of society and the environment that may be affected, for good or ill, by these innovations. If the innovations are damaging (environmentally, socially or ethically), or if innovation is affected or skewed by the implementation of minimum standards of IPRs required byTRIPS, and if any costs will not be borne by the private interests behind the innovation but by the public at large or certain sections, eg such as small farmers, then has the balance of rights and obligations been achieved? The way to ensure a balance comes from a broader context of rules and regulation – from competition and anti-trust rules to those still to be agreed in the biosafety protocol of the CBD on liability for any unforeseen damage caused by biological innovations. However there are major institutional capacity problems in developing countries to achieving this.

Private industry has clearly seen the potential profitability of IPRs-protected biotech research and invested heavily in it. Does the current IPRs-based incentive structure, without a balancing competition, strict liability framework and use of full cost accounting to estimate the true costs of changes, favour private pressures to innovate, and so allow those promoting innovation to capture benefits, while possibly not having to bear any adverse consequences from such innovation?

There is often a built-in assumption that innovation is in and of itself a good thing, irrespective of what it is. But is that the case, especially for indigenous knowledge and practices, unless the communities themselves lead the change? The current international regime seems to provide an unbalanced set of incentives, with those for the formal and commercial sector well grounded in the WTO, WIPO, UPOV while those aimed at supporting traditional and indigenous communities where *in situ* agrobiodiversity needs to be maintained and developed, and Farmers'Rights, in the ITPGR and CBD Article 8(j) are still under-developed. The reviews of TRIPS need to take this into account.

4.2 Using flexibilities without pressure

The TRIPS Agreement allows countries considerable flexibility to interpret the meaning of the words used in it, in keeping with the understanding that IPRs such as

[60]Correa, 2001

Doha Ministerial Declaration, Nov 2001

19. We instruct the Council for TRIPS, in pursuing its work programme including under the review of Article 27.3(b), the review of the implementation of the TRIPS Agreement under Article 71.1 and the work foreseen pursuant to paragraph 12 of this Declaration, to examine, inter alia, the relationship between the TRIPS Agreement and the Convention on Biological Diversity, the protection of traditional knowledge and folklore, and other relevant new developments raised by Members pursuant to Article 71.1. In undertaking this work, the TRIPS Council shall be guided by the objectives and principles set out in Articles 7 and 8 of the TRIPS Agreement and shall take fully into account the development dimension.

patents are territorial and it is up to each country to determine the details of its own law. Legally, if countries have been or are obliged to adopt stricter provisions than those outlined in TRIPS, this would be contrary to the spirit of the Agreement (Article 1). Politically, however, they may have no choice in order to gain trade preferences or otherwise make agreements with the USA or EU on other bilateral issues. Such pressures do not build confidence that an IPRs regime can be developed in a way that suits the needs of developing countries or meet food security concerns. Indeed, following complaints from NGOs about EU practices in its bilateral negotiations with developing countries to adopt TRIPS plus legislation, the Trade Commissioner went on the record as stating that the EU would not require, as part of the terms for other agreements, that countries adopted TRIPS plus requirements[61].

There is a fundamental difficulty in dealing with these issues in broad-ranging trade negotiations, where trade-offs may be made in one agreement for concessions in others. These may not turn out as expected or trade-off things that should not be traded. The problems are exacerbated when the time comes to review the provisions of specific agreements or parts of them, such as Articles 27.3(b). Here some of the suggested solutions to problems identified in Section 3 call for some rethinking of its provisions, for example, in relation to R&D that affects food security. Ideally, these issues should be resolved on their own merits and without having to make further trade-offs in other areas, especially given the Doha Ministerial Declaration's statements on development, special and differential treatment and technology transfer.

4.3 Some specific elements

4.3.1 Patents - Article 27

The extension of the coverage of patents for inventions in all fields of technology whether products or processes may have adverse impacts on R&D in agriculture. While some concerns, for example over issuing over-broad patents, can be addressed within the terms of TRIPS through strict definitional and examination criteria, others, such as over the length of protection, cannot. While Article 27.2 could be interpreted to exclude certain inventions from patentability, as it allows this to protect ordre public or morality, they must also be forbidden from commercial exploitation. This might address concerns of those who do not approve of patenting lifeforms on moral, ethical, religious or customary law bases. However, it would not address the concerns of those who would prohibit basic processes to be patented but allow them to be used for commercial purposes – although the meaning of commercial exploitation is not given in TRIPS.

Article 27.3(b) provides the most scope for revisiting the provisions, as such a review is mandated and has been highlighted in the Doha Ministerial Declaration. However, this has been deadlocked and would require significant movement among the members to achieve a consensus. If, however, any clarifications are made, or interpretations, that acknowledge the special importance of food security and need for differentiation in that area, linked as it is to nutrition which is specifically mentioned in Article 8, this might be the place to do it. The Ministerial Declaration clearly required members to 'take fully into account the development dimension' in their deliberations. Since food security is a crucial issue for development, and the thrust of many of the concerns about the impact of IPRs on food security, and the application of biotechnology, is that they will impede the development needs of the poorest people in many countries, this needs to be given urgent attention. This should avoid a situation developing as has occurred in the health area.

4.3.2 Article 30

Article 30 exceptions might apply to food security if, after examination of the effects of patents on accessibility of researchers to research tools, processes and products necessary in the pursuit of food security, it was found that the way they were being used affected members' ability to meet food security needs. If so, then members could perhaps provide exceptions related to farmers and the seed industry to the exclusive rights conferred by a patent on account of the legitimate interests of third parties.

[61] Oxfam International Seminar, "What Future for the WTO TRIPS Agreement, Brussels, 20 March 2001

4.3.3 Articles 31 and 40

These articles on compulsory licensing and anti-competitive practices in contractual licences may provide a basis for ensuring access to patented technologies if they cannot be accessed within the normal framework of operations of the public research system. If there are anti-competitive practices then Article 31(k) may be of use. If there is a market failure, as many fear, these provisions can be used to ensure that public institutions and investment in the less favoured areas and most food insecure exist by allowing processes and products to be used to benefit these specific cases.

4.3.4 Copyright

There is some concern among researchers over the effects of the extension of copyright on access to educational materials and databases. More generally, since education is one of the prime areas for public investment that bring major returns in increasing productivity if the extension of copyright affects access to education, especially by the poor, it may have deleterious effects. Already there are reports from some developing countries about this. Again, there may need to be special consideration for knowledge affecting food security and ensuring the flow of information is not inhibited to the detriment of farmers, researchers and others involved in food production.

4.3.5 Geographical indications and trademarks

The economic costs and benefits of extension of additional GIs protection into food are not clear. How far this is a food security matter is also unclear but GIs could be of use to traditional communities producing products with a niche market domestically and abroad[62]. They first of all need to be protected locally and Article 22 provides the means for this. They also require investment for enforcement and marketing, which is difficult for such communities. Trademarks are used as part of marketing and promise to be an important factor in future developments in developing country markets. How their use will affect different actors in the local food systems, and advantage or disadvantage local producers and so affect their livelihoods, is unclear but should be examined. This should cover the way that brand-based advertising and marketing affect food security for all, especially the poorest people. It should also examine the effects on local people in micro enterprises and their livelihoods.

4.4 Linkages

TRIPS is one of a range of international legal instruments and regulatory regimes that connect IPRs and food security. There is a continuing challenge to ensure that TRIPS, the CBD, ITPGR, Biosafety protocol and others operate in a way that is mutually supportive to ensuring food security at all levels.

Within the WTO, there may be cross linkages with other WTO agreements, such as the Agreement on Agriculture, that affect food security – in terms of encouraging a mixture of on-and off-farm employment and processing of farm products into those with greater value added, ensuring access to markets for primary and processed products, and avoiding dumping of subsidised production in developing countries undermining their food system's production capacity. Technologies may be needed to do this and markets to export to, not just the domestic market.

The private sector should, in a competitive environment, be left to get on with things it does well – like serving commercial farmers in the case of the seed industry. It can serve those with effective demand. But poor, small and marginal farmers are also part of the private sector. Their needs may mean other private sector interests should not be allowed to prevent work aimed at providing public goods R&D targeted at poor farmers needs[63]. This latter approach, which might be state run or contracted out or incentives created for farmers groups, academic/industry partnerships, would offer competitive alternatives to the commercial sector route. To do so, means encouraging a mixture of cooperation with the private sector to encourage it to share research tools that are relevant and revisiting regulation so that anti-competitive practices do not inhibit pro-poor agricultural development.

[62]Tansey, 2000

[63]Much could be done right now to benefit these farmers with existing public sector technology if the financing (ie, will) was there

5. Conclusion

"Progress in agriculture aids the goal of food security. Intellectual property rights, however, provide the basis upon which their owners may exclude others from access to, amongst other things, plant genetic resources. Clearly, if intellectual property regulation is to co-exist with and complement the regulation of food and agriculture, a great deal of dialogue and complicated international and national standard-setting will be required"

Drahos, 2001, p v

Society grants IPRs to increase social and economic welfare. Current work suggests the changing IPRs regime may adversely affect food security for some – through its impact on agricultural R&D, on researchers' in developing countries and IARCs' ability to do work with small, poor farmers, or through promoting market structures and price movements that undermine the food security of the poorest.

To prevent such outcomes action is needed in a number of areas, including further study of their effects, with priority attention given to:

- Examining the options available in TRIPS, including extension of the timetable for compliance, greater differentiation in relation to food according to the particular circumstances of different developing countries. The review of Article 27.3(b) should ensure its provisions are framed in a way that facilitates the achievement of food security for all. This includes utilising the flexibilities necessary in designing a *sui generis* system of PVP required under TRIPS and taking account of the ITPGR and CBD. The Article 71.1 review process should draw lessons from the experience with public health and be open to rule changes to meet development needs and suitable indicators developed to allow differentiation to be used effectively.
- Full implementation of agreements affecting agriculture and food security arrived at in FAO, the CBD and other fora is necessary as well as avoidance of agreements, whether international, regional or bilateral, that might limit the necessary flexibilities, for example through negotiation on patent law in WIPO, to provide a more balanced set of international agreements.
- Possible safeguards or amendments to IPRs rules nationally and internationally need to be worked out to ensure poverty focused agricultural research is not adversely affected. This might be linked to a rethink about the nature of technology transfer which focuses on sharing knowledge internationally in ways that nourish and support the innovative capacity of communities and countries in meeting their needs.

The consumer side of the use of IPRs and their effect on food systems in developing countries and access to food by the poor also needs greater attention.

14. A role for Official Development Assistance?

In general, agriculture needs a higher priority in ODA for food security and national and international IPRs regimes should be tailored to be supportive of this fundamental need. There is policy conflict and inconsistency within some donor countries, especially those countries relying on strong IPRs to promote their own economic interests. Development agencies face a challenge to ensure that policy promoting the required flexibility in IPRs, eg over use of *sui generis* PVP, is not overridden by other government departments. Donors should engage with a broad range of policy makers, opinion formers and the public in developing and developed countries, so that a suitable balance can be struck in the IPRs regime. Funding may be required to ensure the needs of the poor are heard in the policy making processes on IPRs. Other aims might be to:

- ensure bilateral and regional agreements are not used to pressurise countries to take stronger or more restrictive interpreations of IPRs than required in TRIPS;
- support policy and advisory work on IPRs and agriculture, including by IARCs, to assist developing countries understand where the flexibilities in TRIPS lie and what changes may be necessary to meet food security needs;
- support development of *sui generis* systems of PVP, for example, through IPGRI's work in cooperation with other international bodies such as FAO and NGOs, and monitoring of compliance with rules on the use IARCs' materials;
- build capacity to understand and negotiate on IPRs as they affect food security via a range of inter- and non- governmental organisations focusing on the needs of the client, and not on implementing the existing rules in the way donor countries think fit;
- press for speedy resolution of the liability regime under the Biosafety protocol of the CBD and support development of counterbalancing national legal arrangements, such as anti-trust and competition laws;
- support civil society organisations in developing countries working on these issues and trying to bring a broader range of stakeholders into the rule making processes;
- fund research to monitor and clarify the impact of the changing IPRs regulatory framework on developments in biotechnology and food security, including collection by relevant bodies of new types of trade statistics on inter- and intra-firm trade, not just trade between states, to understand better the effects of IPRs; and
- seek new participatory mechanisms to encourage development and use of innovations beneficial for small farmers.

In all cases, donors should also rethink their current IP policy in their contracts and ensure that they are flexible in the approach they take.

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Acronyms

ABS	Access and Benefit Sharing
CBD	Convention on Biological Diversity
CGIAR	Consultative Group on International Agricultural Research
COP	Conference of the Parties (CBD)
CTE	Committee on Trade and Environment (WTO)
FAO	Food and Agriculture Organisation of the United Nations
GATT	General Agreement on Tariffs and Trade
GFAR	Global Forum on Agricultural Research
GIs	Geographical indications
GURTS	Genetic Use Restriction Technologies
IARC	International Agricultural Research Centre
IFPRI	International Food Policy Research Institute
IGC	Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore
IPGRI	International Plant Genetic Resources Institute
IPP	Intellectual Property Protection
IPRs	Intellectual Property Rights
ITPGR	International Treaty on Plant Genetic Resources for Food and Agriculture
LMO	Living Modified Organism
MAT	Mutually Agreed Terms
MTA	Material Transfer Agreement
NARS	National Agricultural Research System
NGO	Non-Governmental Organisation
OAU	Organisation of African Unity
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
PBRs	Plant Breeders' Rights (UPOV)
PGRFA	Plant Genetic Resources for Food and Agriculture
PVP	Plant Variety Protection
R&D	Research and Development
TK	Traditional and indigenous knowledge
TRIPS	Trade-Related Aspects of Intellectual Property Rights (WTO)
UNCTAD	United Nations Conference on Trade and Development
UPOV	*Union Internationale pour la Protection des Obtentions Végétale* [International Union for the Protection of New Varieties of Plants]
WIPO	World Intellectual Property Organisation
WTO	World Trade Organisation

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Published by: Quaker United Nations Office, Quaker House, Avenue du Mervelet 13, 1209 Geneva, Switzerland

ISBN 2-9700323-2-5