

5. Discussion

5.1 Modern biotechnology has increased the discussion of the ethical issues raised by science in society.

5.1.1 Modern biotechnology and traditional biotechnology

Various definitions and debates over the use of the terms like modern biotechnology and genetic engineering with traditional biotechnology in internationally accepted documents were discussed in the introduction chapter. Internationally accepted the Convention on Biological Diversity (CBD) described biotechnology as "any technological application that uses biological systems, living organisms and their derivatives there of to make or modify products or processes for specific use". The convention has been ratified 168 countries (as by October 2002), which implicitly suggests for the purposes of that Declaration they accept also that definition. The definition can be interpreted as being applied to all the experimental applications involving living beings, therefore biotechnology can be considered as an old technology and is not a new subject. This is consistent with other definitions of biotechnology in common use (Macer, 1990).

The current debate on biotechnology focuses on limit sets for new biotechnologies that primarily use novel biological methods such as genetic modification, rDNA techniques, cell fusion techniques and new bioprocesses for commercial production. We can consider modern biotechnology to be based on these technologies. Genetic modification enables single, well-defined genes to be isolated and transferred, whereas with traditional methods. The method leads to more rapid introduction of desired characteristics. The techniques of modern biotechnology are becoming an extremely important part of overall efforts of increasing food supply through adopting new ways of improving food production. These also can increase the variety and the quality of food while assuring safety of food at the same time. However, the immediate products of these technologies go through a series of extensive breeding trials before testing in a variety of crops and different climates, in the same way as conventional breeding methods. GM crops do not have any short cuts to the markets, (Mephram et.al 1995).

Traditional biotechnology and conventional ways of farming had involved processes like inbreeding and hybridization techniques where thousands of genes were crossed at

one time. Traditional biotechnology like brewing, baking, and fermentation was applied as an attempt to increase food production. In most crops, traits that were compatible with agriculture, like free threshing in cereals were incorporated centuries ago. Scientific breeding in traditional biotechnology has been underway only after rediscovery Mendel's laws. As in the case of perceived problems of genetic modification in plants, problems were also found in conventional breeding and lessons were learnt. For example in the 1950s a type of maize was used in F1 hybrid production in the US which was later discovered to be associated with susceptibility to Southern corn leaf blight. Also in the UK in 1970s, wheat varieties with single major gene resistance to fungal diseases were released; but later found to be usable on an average for 14 months since fungal populations repeatedly overcame the disease resistance genes (Nuffield Council of Bioethics 1999). Nevertheless, such conventional techniques have been widely accepted and did not cause public concern. It is very difficult to point out exactly when the debate on biotechnology started. But the debate has not yet been concluded. The debate has not been conclusive because the issues have not been properly separated and discussed.

5.1.2 Why modern biotechnology is feared

Applications of modern biotechnology have raised optimism as well as controversies. There is a need to consider why new biotechnologies have been under the storm of controversies. The applications of modern biotechnologies are essentially target specific and very selective. They provide unlimited possibilities of changing characters that may or may not be physically conspicuous. For instance, insertion of herbicide tolerant gene in crops does not change their overall physical characteristics. Neither do bananas containing vaccines look different. Genetic engineering can easily be applied in all species and across all kingdoms. For example, use of Bt gene in plants to produce toxin to kill insects has been applied to many species (James 2002). Similarly there are other examples like modifications in corn, rice aimed at increasing nutritional contents. This positive aspect has been a major threat for scientific endeavours that can misuse the technology. It would be extremely difficult for consumers to identify the changes unless they are informed. This is the main concern for people who follow restricted ways of consumptions, strict diet patterns. For example, strict vegetarians fear mixing up of animal genes to make proteins. In certain cultures and religions, there are restrictions on consumption of certain animals. For instance, some Muslims fear the mixing of pig genes and Hindus fearing genes from cows. These concerns may be considered theoretical, but

are certainly possible using genetic engineering. Another important factor that adds to the fear is the general image among people that genes are special and carry not only physical traits but also behavioural patterns. Some concerns are misconceptions and misleading but they have added to the havoc of technology.

The above mentioned fears are related to the process and the immediate products of the applications of biotechnology. The wider fears are related to the health concerns, environmental and economic impacts of the technology because its application forces us to rethink our values and moral beliefs with regards not only to food, agriculture, environment but also in the area of health care and medicine. Products of "green biotechnology" like genetically modified crops and genetically modified food also influenced the lives of poor people. They have evoked many controversies even in the countries who do not have capacity to apply and use the technology. Different sectors of society, religion and morality, governance and legal systems, economic and trade policies at national and international level have been enveloped in the controversies surrounding genetic modification of crops and food, and ethical and moral issues in using merely technology based health care. A clear distinction can actually be drawn for the use novel technologies in food and agriculture; and medicine. As mentioned earlier, some of the fears of green technology are based on unexamined, and often unproved assumptions, related to the wider impacts on nature, environment and biodiversity. Others are more intrinsically based on moral and religious reasons. Medical biotechnology is feared on moral grounds for where lines can be drawn for human enhancement and God's creation. These fears were found among some policy makers in FAO and India.

5.1.3 Catalytic role of modern biotechnology in thinking about the ethics of science

Hypothesis 1, that "Modern biotechnology has increased the discussion of the ethical issues raised by science in society", has been confirmed by this study. Different sectors of society including religion, governance and legal systems, economics and trade have been enveloped in GM controversies both at national and international level. The applications of modern biotechnology have increased our understanding of the intrinsic value of nature and the integrity of life, given that it can easily be applied between two different species and across kingdoms. In most of the contemporary environmental ethics debates,

environmental debates are distinguished based on Kantian thought of means and ends. Understanding of intrinsic value of nature is debatable, given that what can be qualified as possessing intrinsic value. Preserving nature "for its own sake" can also be debated based on arguments that nature has appeals that ultimately satisfy human beings, such as its aesthetic value, which is necessary and useful. This is also considered as serving human ends. Nature possessing intrinsic value can be based on "sentientism" or more broadly "biocentrism", that all beings have intrinsic values and should not be merely treated as means (Weston 2003). In opinion surveys, many people relate it to God's creation (Macer, 1992 a).

The fear of unknown, which is commonly used in ethical debates includes the fear of interspecies mix up especially in more complex animals such as mammals. This is based on the common thinking found among people that all life forms are integrated and dependent upon each other. Any change in one form would affect the entire system, and ultimately human beings who harness the maximum from nature. Another aspect of the integrity of life is based on the philosophical thinking that life in itself is valuable, because it is a gift from God. This fear has also generated the anti-genetic engineering debates that have been very critical, and even stopped some scientific endeavours. This might come from realisation of our moral responsibilities to future human beings, which is a motivation found in many for sustainable development. However, there are differences in the views that can be found for animals and plants. Compared to animals, genetic modification in plants has been more controversial simply based on the fact that plants propagate vegetatively and it is easier to affect the other species. So any invasion to natural areas of vegetation could be disastrous, leading to general ethical concerns of loss of biodiversity and imbalance in nature.

Modern biotechnology has increased the discussion of the ethical issues raised by science in society. Ordinary people do not understand science that well, have both used philosophical, moral and religious grounds for accepting and rejecting the technology. As discussed above, there are fears of hurting religious and cultural sentiments of people, International agencies like Codex Alimentarius Commission have established guidelines for food, such as Halal food and Organic food, giving due respect to the cultural sentiments of the people. Also the Government of India has made compulsory labelling for packaged food as vegetarian and non-vegetarian given that the large population in the

country is vegetarian. These steps have been taken as precautions in wake of the growing controversies around food derived from modern biotechnology, which is shadowing other foods also.

Modern biotechnology has been catalytic in considering the goals of social and environmental justice. Use of biotechnology for improving production and nutritional quality of food is based on the ethical principle of equity and justice and denying food is an attack on fundamental human rights. International agencies like FAO are playing a vital role for achieving food security and sustainable development in poor countries where availability of basic food needs is also a luxury. FAO and other international agencies like WHO have stated that biotechnology should be appropriately applied to achieve food security and eradicate malnutrition in the world. Despite international statements on the safety of GM food, it has been difficult to distribute not only the technology but also the products per se to many developing countries. The reasons are more political and market oriented rather than actual safety issues, given the lobbying and socio-economic linkages or partnerships of many poor countries with their former colonies, or places of markets of their domestic goods. These may contribute to unequal distribution. Novel technologies are both beneficial and harmful with respect to environmental safety. They can be considered beneficial in preventing further loss of biodiversity, given the worldwide efforts to collect germplasm of all plants. The negative impacts could result from the large-scale monoculture of GM crops, given the unintended and intended effects on the other species in the agriculture ecosystems. There have been many debates on the negative impacts of the use of novel technologies and much research has also been done by academia for counter challenges to the results, which has only resulted in added confusions and doubts about the technologies.

The current debate on biotechnology has had a positive impact in the sense that it has made consumers well aware of their rights at least in the rich countries. Consumer unions are even represented in the international meetings as NGOs. They are given space to express their opinion during dialogues in framing regulatory processes. Consumer unions have been pushing for GM food labeling in many countries, which is based on their right to access to information. Consumers in the developed countries have realised their rights to have access to not only safe products but also on the information regarding the contents and process of production. One side it could be helpful in making choice by the people in

the market is whether we should buy GM food. On the other side too much information is also sometimes confusing for ordinary people to make a reasonable choice. More broadly, it emphasizes the universal demands of autonomy of people to be able to choose and also *gives rights to farmers to adopt novel technologies or not. However, the limiting factor is the negative campaign by anti-GM groups that have influenced the farmers and also the consumers to buy GM seeds and GM products. Usually this is based on immediate issues of fears of safety, adverse environmental affects and health concerns; issues of farmer's rights to protect local varieties, and protection of intellectual property rights in the broader context of market availability and trade. At global level, it could be considered as an attempt to establish environmental safety and provide markets for the products from poor countries that are facing stern challenges to sell products in the process of globalisation.*

5.1.4 Public understanding of biotechnology

Modern biotechnology has also brought increased public participation in democratic decision-making. Public interest in nutrition and food safety has increased dramatically. Also food stories -- because they are inherently so related to daily life -- make for compelling news. Another reality about emerging science, the media, and the public is the confusion that is caused by mass communication media. Surveys tell us that the high volume of media coverage has not brought clarity to or improved understanding of a topic of such obvious impact. It means that more has not always meant better. Although people are motivated to understand and exercise their rights, the general unfamiliarity of people with the scientific process can make the evolutionary nature of research appear contradictory and confusing. Moreover, there are also disagreements among the scientific community itself on what constitutes scientific evidence sufficient to warrant changing recommendations to the public. And, perhaps most important of all, how emerging science is communicated - by scientists, the journals, the media, and the many interest groups that influence the process -- also can have powerful effects on the public's understanding, on its behaviour and, ultimately, on its well-being.

Governments of the world, essentially in developed countries have been cautious to include public perception in science and technology policy making. In the United Kingdom, for example, the need to explicitly involve the public in the policy-making

process has been identified as a government priority (Salter et. al 2001). Public support and rejection for genetic engineering has also been a topic for governmental elections in many countries. For instance in the New Zealand general elections in 2002 the position of the Green Party against GM was the reason for a call for early elections, and they lost the balance of power in the resultant coalition government because of an intransigent rejection of GM technology in agriculture. Public perception studies have become a common trend in rich countries, not only for policy makers but also for the academic and scientific community for the reasons discussed above. International organisations, research institutes, and media all have known to conduct public opinion surveys and interviews and tried to analyze the general trend among different sectors of society. These have also contributed to the increased understanding and awareness of the new technologies in society. Opinion surveys and interviews also guide in appropriate policy formulations in the countries and comparative studies in different cultures and different societies help in better international understanding of the problems and ethical concerns related to the applications of the new genetic technologies. Broad public concerns, however irrational they may appear to some, must be taken into account in food safety regulations, if they are to maintain their credibility.

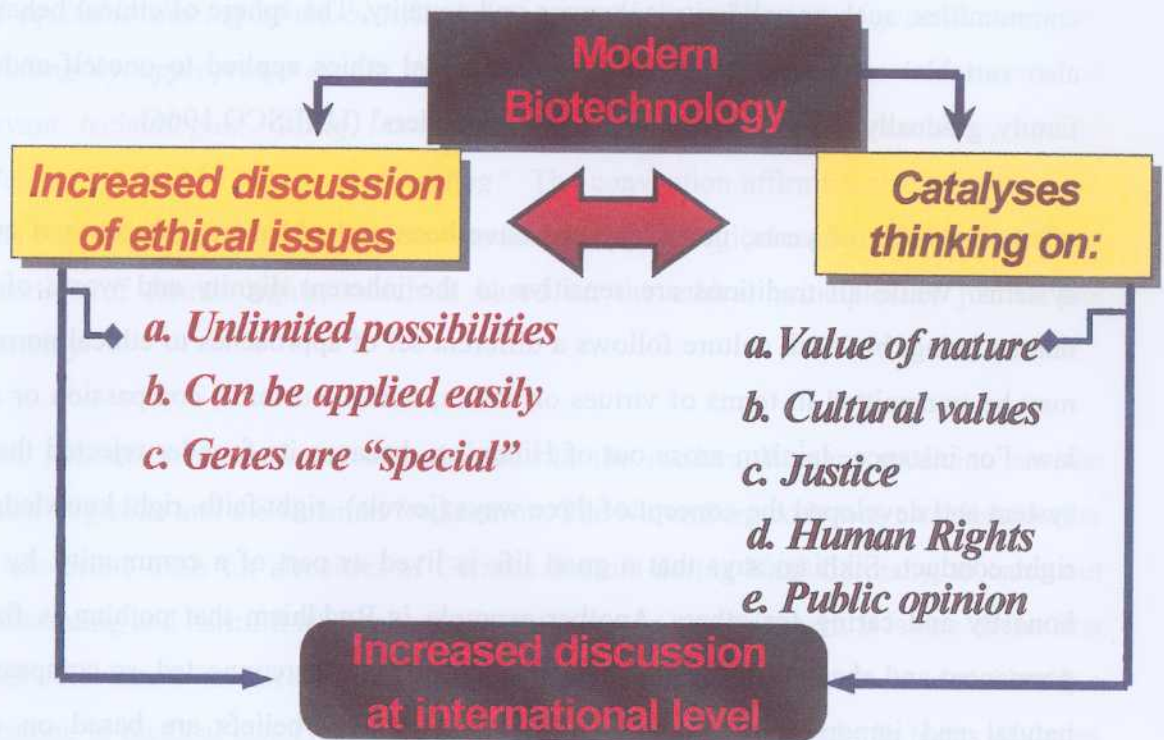


Figure 25: Modern biotechnology has increased the discussion of the ethical issues raised by science in society.

5.2 People use ethical principles even when they do not explicitly use the term "ethics".

5.2.1 Universality of ethics

Universality is not necessarily imposing one thing or one way on all people. It is rather an inclusive, global and shared way of mutual acceptance and understanding to build consensus, values and norms on what may be divergent, but having a common end. Bioethics, ethics, morality and philosophy are all integrated subjects, that are applied in different contexts based on similar principles and values, that may be expressed in different ways. Each culture has set of principles that are guided by some beliefs and cultural practices; which in the long term of governance can become ethical principles.

The present era of cross cultural ethics includes a "minimalist" approach that works from commonly observed values such as mutual care, elementary justice and injunctions against violence and deceit. Likewise, a more "maximalist" approach aims for a more complete set of values and principles adequate for the good life of individuals and communities, such as solidarity, tolerance and equality. The sphere of ethical behavior is also variable: one might begin with the traditional ethics applied to oneself and one's family, gradually extending these to include "outsiders" (UNESCO 1966).

For thousands of years, moral systems have been embedded in religious and cultural systems. While all traditions are sensitive to the inherent dignity and worth of every human being, but each culture follows a different set of approaches to ethical norms that may be transmitted in terms of virtues or values, duties, customs, compassion or sacred law. For instance, Jainism arose out of Hinduism, because its founder rejected the caste system and developed the concept of three ways (jewels)- right faith, right knowledge and right conduct. Sikhism says that a good life is lived as part of a community, by living honestly and caring for others. Another example is Buddhism that nothing is fixed or permanent and change is always possible; that all life is interconnected, so compassion is natural and important. All these religions and cultural beliefs are based on ethical principles and have guided societies since the beginning of humanity. These have global influences on social governance systems.

5.2.2 Some examples of use of ethical principles at international level.

5.2.2.1 *International Conventions and ethics*

Many of the international declarations, conventions, guidelines are known for their ethical norms, although in many of the old conventions and declarations the word "ethics" has not been explicitly mentioned. The Universal Declaration of Human Rights (1948) is one of the oldest and widely known international declarations is based on ethical principles. For example, the very first article states, "*All human beings are born free and equal in dignity and rights.*" This is based on the ethical principle of beneficence and justice, or in simple terms we can also call it as loving good and love of others (Macer 1998).

The CBD calls for recognition of the intrinsic value of nature. It can be interpreted that this intrinsic value of nature is based on respect for nature, because it provides goods and human life depends on nature for everything. The objective of the convention is *"the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding"*. The convention affirms that biodiversity has value for both theological i.e. ethical reasons and for biological reasons. It also mentions protection of farmer rights, which is based on the ethical principles of justice and autonomy.

The two main international ethical codes in the modern Western medicine are the Nuremberg code and the Helsinki Declaration. The Nuremberg code was established after the war crime trials for atrocities of German doctors during Nazi Germany, to carry out unconsenting and harmful medical experimentations on war prisoners. It is one of the first codes relevant to medical ethics emerging in international law. It is considered a milestone in medical history because it introduced an ethic that speaks in terms of duties and responsibilities, including informed consent from the subjects, which has become the first condition to be met at the present time in any medical trials. It replaced the old medical ethics notions that exclusively focused on consequences and producing benefits and avoiding harm. However, there are criticisms to it because it did not directly and clearly address the problem of the abuse of human subjects in medical research, which it should have (Veatch, 1996). Also, it can be considered too utilitarian. The Helsinki Declaration was adopted by World Medical Association in 1964 as a statement of ethical principles to provide guidance to physicians and other participants in medical research. It is one of the modern declarations that exclusively used the term "ethics".

5.2.2.2 Ethical missions of international organisations

United Nations organisations are known for their ethical missions and they have general image of being clean and trustworthy even among ordinary people. For example, in a survey done by Macer et al. (2000) in Japan, 69% of the respondents were in favor of United Nations and other international organisations, for their confidence and approval of

regulatory structures (Macer, Chen Ng 2000). Various international organisations use ethical principles in their justification for work. FAO's mission "ensuring humanity's freedom from hunger" and World Bank's mission of " World free of poverty" are examples of international institutions founding their work on ethical principles. They are also based on based on ethical principle of beneficence (loving good) and global distributive justice that resources need to be equally allocated. They are based on the ethical principle of benevolence; that guides those in authority to do good for all people and recognize equal human rights and responsibilities.

Most of the programs and normative work of FAO and other UN agencies are based on the new global ethics. According to UNESCO, a system of global ethics rests on five "pillars" that include human rights and responsibilities, the protection of the minorities, intergenerational equity, commitment to conflict resolution by non-military means, democracy and the elements of "civil" society (individual citizens as opposed to governments) (UNESCO 1995). For instance, FAO People's Participation Program (PPP) in many poor nations in Asia is a multi-dimensional project with many elements. PPP's main emphasis is on formation of small, informal, self-reliant groups of the rural poor as part of a longer-term strategy to build institutions serving their interests. It is an example of involvement of governments and international organisations in applying practical ethics in the projects to improve the quality of life in poor countries, through knowledge dissemination, policy advice; technical and financial help which is based on the principles of global ethics.

5.2.2.3 *FAO literature and ethics*

Although ethics as a word was not found in explicitly, FAO literature often includes terms related to the foundation based on ethical principles as shown below:

<i>Principles of Bioethics</i>	<i>FAO Terminology</i>
Balancing of Principles	Appropriate advice
Beneficence	Hunger alleviation
Justice and Solidarity	Equity, Food security, Right to food
Respect for Autonomy	Participatory approach
Communitarianism	Partnership of knowledge
Do no harm	Safety, Quality, Precautionary principle
Future generation interests	Sustainability
Conflict of interest	Conflict of interest, Impartiality

5.3 The ethical issues raised in the national governance of biotechnology mirror those raised in the international governance.

5.3.1 National governance versus International governance

The International Covenant on Civil and Political Rights requires its 148 States parties "to respect and to ensure ... the rights recognized" in the Covenant and "to take the necessary steps ... to give effect to the rights". It is for nations to ensure the rights of the people to be recognized and put at international forums to resolve the issues. Coordination between national priorities and the operational activities at the international level is necessary to resolve national issues and implementing effective frameworks at international level. At national level, governance includes the government but transcends it by taking in the private sector and civil society. All three are critical for human development. However, such development cannot occur in a political and social vacuum. At a global level, governance has been viewed primarily as intergovernmental relationships, however in the present time it is also involving NGOs, citizen's movement, multi national co-operations (MNCs), and the global capital markets. Interacting with these is the global mass media that has a dramatically enlarged influence, especially since the beginning of global new biotechnology debate.

In a globalized world, national and international governance are inextricably linked. The interface between the national priorities and the global implications of biotechnology is delicate, which international organisations attempt to bridge, trying to meet the demands of the governments while balancing the interests of the international community. Today every part of the natural and human world is linked to every other. Local decisions have a global impact. Global policy, or the lack of it, affects local communities and the conditions in which they live. Humans have always changed, and been changed by the natural world; the prospects for human development now depend on our wisdom in managing the relationship.

International institutions of governance will be in a better position to respond to the needs of the developing world once national institutions meet the test of good governance. The demands of governments in the international arena are only legitimate to the extent that they reflect the will of the people. However, the domestic politicization of the issues make it difficult to resolve the issues at international level, which has a combined influence both at home as well as global level. Some examples are discussed in the following subset that were raised in the interviews having national as well as international importance, good governance at both national and international with concrete measures is necessary for international development.

5.3.2 Some examples of universal ethical issues that are also national issues.

5.3.2.1 Food

The causes for persistent food insecurity in the world are deep rooted. These causes are many, like unavailability of sufficient food either through production or through import, inefficient and unjust distribution, poverty, illiteracy, discrimination and neglect. It is also related to unhygienic living, lack of basic amenities and health care. Ultimately it is a story of failed governance at global, national and local level. In the poor countries of Asia, Africa and Latin America, the issues are no different, with some specific causes being more influential in one part than the other. India is country of one billion people, and traditional village farming and modern agriculture are the main economic resource for the nation.

Even fifty years after independence, it has not been possible for the country to ensure access to productive livelihood and food for all. The causes mentioned above can also be applied to the present food insecurity situation in the country. More than one third of the population is too poor to be able to afford an adequate diet (WB 2001a). Issues of overpopulation and poverty and other issues based and linked to them are the main issues for governance in India, given that 44% of the population lives below US\$ 1 per day. The indicators show that the world population is growing annually by 1.3 % and it is estimated that it will grow 50% from 6.1 billion to 9.3 billion by 2050, with India accounting for 21% of the total increase (WB 2002). The indicators are threatening not only for the nation but also for the world. It shows that the population is growing fastest in places where the needs are the greatest. The issue of availability of food to the ever-increasing population was raised both in India and FAO. In India the main issue related with food for the nation is food availability, food access and food absorption. At global level, there is a debate with some claiming that food is abundant, and improper distribution of food is the main cause of food insecurity in the world. It can also be argued that this improper distribution exists because of the stringent trade rules and regulations at global level that are one of the obstacles for the poor nations to import food. Adoption of novel biotechnologies for enhancing food production and improving the quality of food is more favoured by the poor countries to feed the populations because of the limited access to the available food, in rich countries in the world.

5.3.2.2 Rural Development

Rural women in particular are responsible for half of the world's food production and produce between 60 and 80 percent of the food in most developing countries (FAO 2002 a). Yet, despite their contribution to global food security, women farmers are frequently underestimated and overlooked in development strategies. Rural women are the main producers of the world's staple crops - rice, wheat, maize - which provide up to 90 percent of the rural poor's food intake. Feminization of agriculture is increasing, because of wars, HIV AIDS, and rural-to-urban migration of men in search of paid employment and rising mortalities. Despite the fact that women are the world's principle food producers and providers, they remain 'invisible' partners in development, and women's contribution to agriculture is poorly understood.

In India, there are cultural restrictions on women, for instance, women are expected to give all their earnings to men, and in many remote parts of the country women are not expected even leave the houses and work, and the decision maker is always men even if women contribute financially and socially more in the household. Also, because of the social customs, women are given very low status, especially in the rural parts of the country where approximately 70% of the population lives. The gender statistics of the nation show that there are only 927 females per 1000 males, which has dropped from 945 in 1991 raising deep concerns about the prevalence of foeticide, female infanticide, and child mortality among girl children. At global level also, the situation is no different. Women are more than half (51%) of the world's agricultural work force, yet they are powerless (FAO 2002 b). For example, In coastal Mozambique, women are not allowed to come close to the boats men use for ocean fishing, or to do such fishing themselves, although they process and market the men's catch. Their aquatic space is close to the shore, where they harvest and sell shellfish, crabs and other small sea creatures—women's work that provides about 20% of average monthly household income according to a recent study (FAO 2002 b). Such examples of restrictive cultural impositions are seen in many other developing countries. This is a common ethical issue for nations and international organisations. That Sustainable rural development is not possible without resolving gender issues was stated both in India and FAO, for the reasons mentioned above.

Sustainable development both at rural and urban level is necessary, as both are interdependent. Rural sustainable development would ease the pressures from urban areas especially the issues like urban poverty and urban migration and giving a demographic balance at national level. Sustainable rural development is essential especially for the less and least developed countries where majority of the population lives in rural areas. At present more than 75% of the world population lives in rural areas of poor countries and they are mainly based on small-scale agriculture and rural cottage industry dependent. Although there are various sustainable developmental assistance programs have been started at national and international level, some of them especially focusing on women, they sometimes are not effective or have to be terminated in the middle, sometimes not due to routine problems of financial and logistical support but due to cultural restrictions, and from this perspective international action plans will not necessarily be considered a fiasco. This richness in cultural diversity is a unique heritage for the nation on one side

and other side it is also a big obstacle to implement evenly satisfying policies, given that there are more than 300 ethnic groups in the country and all the 25 states have their own language and cultural diversity. FAO and other international agencies try to address such conflicts by taking a participatory approach, which is considered as a major criteria for international policy formulations. A participatory approach has become essential and also unavoidable in governance systems because of the increasing multi-dimensional cooperation between the countries and the involvement of the private sector and pressures from civil society in global decision-making process.

5.3.2.3 Information Management

The impact of new information technologies on society is ubiquitous and in many instances profound, but our understanding of this impact remains remarkably uneven. Information technology is changing models of economic growth, forms of employment and patterns of inequality; it is creating new challenges for governance and regulation; it is enabling new forms of community and association; and it is transforming the ways in which cultural goods are created, distributed and consumed. This list is far from exhaustive.

Public ownership of the information is an essential right. It not only helps the individuals to fulfil their civic responsibilities, but also to contribute to an overall improvement in their quality of life. Current information technology not only brings with the expanded opportunities for using information but also raises a number of difficulties in developing countries, adequacy of finding tools, technological incompatibilities and sometimes just the overwhelming amount of information. They are obstacles for both an access to information and also in disseminating information. Lack of professional skills to properly use what is available in any format is also a hindrance. Very important information can become meaningless and not usable if not properly understood and then applied.

Governments of the developing countries have been actively promoting and establishing information management systems for collecting, piling, analysing and applying information in a better way. Established in 1988, during a period of transition when India was moving from a state-regulated economy to a market driven system, The Technology Information, Forecasting and Assessment Council (TIFAC) is an autonomous organisation

under the Department of Science and Technology (DST), Government of India. Its mission is to undertake technology assessment and forecast studies in key areas of the national economy, keep track of global trends in technology and formulate preferred options for India, and establish a nationally accessible technology information system. Despite such efforts, the information does not reach out to the public, because government structures do not function properly to collate and circulate information to the people. It is not only the problem of structural adjustments in wake of rapid developments in the world but also bureaucratic hassles and corruption that stop information to go out of government offices and reach the public. Even to gather and develop information within the country is a problem because of lack of basic professional skills to gather and analyse and interpret the information. In all, we can say that most of the developing countries lack information management capacity.

At international level, access to information from developing countries is a major hurdle for designing developmental aid projects. International agencies cannot obtain information from poor nations because many times the information does not exist even on some very sensitive issues, especially in the area of medicine. Developing countries governments sometimes do not deliver correct and complete information that could tarnish the image of the country at international level. Insufficient, untrue and biased information management is an obstacle. It is one of the fundamental problems that international agencies try to look into while designing and implementing projects. Information dissemination is a key for knowledge dissemination and the most important need for the developing countries for capacity building. Fundamentals of development are no longer found only in local resources, experiences, and context. Infusion of technology cannot alone transform societies, there is a need for information and knowledge exchange to utilize what is available in a sustainable way.

With development in new biotechnologies, a major issue for developing countries like India is the safety of technology. Given the positive stance of the government to use biotechnology for solving various problems, the issue of information management of various biotechnologies becomes crucial for applying technology. Information management of new biotechnologies is crucial because their impact on societies, environment and culture is deep and diverse. It is multi-faceted. Technological innovation is inseparable from cultural and social innovation, the generation and dissemination of

information on any novel biotechnologies would have an embedded and enormous affect on the ways in which people give meaning to their lives together, develop specific identities, help them pass on local traditions to future generations and express themselves. In this process, national and international institutions and governments also play prominence as sources of innovation, as adapters of technology to existing structures and as regulators of how new technologies are used.

5.3.2.4. Biotechnology

The most overriding issue for developing countries in the area of biotechnology is to use the technology to increase the well-being of the people and increase in the quality of life through general welfare. Biotechnologies are viewed in a utilitarian way of analysing benefits and risks of the applications on people, and other entities in the ecosystem. It also depends on the level from which we start to analyse and compare the benefits and risks, and it is usually seen by quantification of the results. For developing countries, the start is from the basic problems of hunger, poverty, and overpopulation. Modern biotechnologies in themselves are not the ultimate solution for the issues, but provide enormous possibilities of finding opportunities to resolve these issues. According to FAO statistics, 680 million people, 12% of the developing world's population could still be "food insecure" in 2010, and food insecurity would accelerate in whole of Africa and South Asia, a home to a projected 70% of the world's food insecure people in 2010 and they are expected to remain locus of hunger in the developing world. So it is no surprising that the developing countries would look forward to harnessing products of biotechnologies if they help in overcoming some of the very fundamental issues that have multi -dimensional influence on overall productivity of the nations.

Developing countries like India have shown positive attitudes to the use of biotechnology for not only overcoming food insecurity problems but also increasing employment opportunities and meeting the necessities of rural women and people from the economically weaker sections of the society. Biotechnology is sought for transferring simple and low-tech biotechnologies for improving the life of poor communities. GM food is considered as an optional product for resolving the problem of food insecurity in the country; which has three main dimensions - food access, food availability and food absorption (FAO, India 2001). However, due to the image of biotechnology, as for

monoculture, large-scale farming of the GM crops, there also exists big pressure from NGOs to resist introduction of GM food, not only for home production but also for imports. Domestic pressures within the countries make it difficult to implement the commonly friendly policies in the country. There is a clear division between the views of different NGOs, and the private sector, government and ordinary people over the use of GM food. Many NGOs put pressure on the governments to recognise rights-based ethical concerns related to rights of farmers for their land races and people to have safe food. The private sector wants to exploit the positive attitude of the government for industrial prosperity and global markets. Governments in developing countries look forward to using biotechnologies for solving basic problems that seem persistent despite various claims of strengthening the capacity of local people through various projects and ordinary people, with loss of trust in their own governments, either do not know much about biotechnologies due to various social and infrastructural reasons, or are they ready to accept whatever it may take to bring better quality of life.

In developed countries the difference lies in the dimension that is stressed more in opposing or favoring GM food. Rich countries do not face a shortage of food, but a global economic competition in the biotechnology industry. Developing countries can serve as markets for the biotechnology products from the rich countries. This can be understood as an unwritten and non-committed bilateral relationship with wide international understanding. This view has dominated debates being opposed in many African nations, to serve as testing grounds for the products of rich countries. However, there is much less opposition seen in the Asian region. Some opposition within the developed countries also comes when considering the implications on the environment of the use of novel biotechnologies.

Developing countries see the use of biotechnology in medicine as a tool for improving health care, especially the reproductive technologies. However, expensive infrastructure and environmental set up is a major hindrance for developing countries to fully install and use the technologies. Also, there are debates on the primary health care availability and shifting resources to medical technologies that do not seem to be affordable by poor people, at least in the near future. In developed countries, arguments are more philosophical and spiritual based, rather than economic and health based.

5.3.2.5 Sponsorship and funding

In the industrialized countries, a new pattern of biotechnological research funding has emerged. With the availability of property rights protection of biotechnologies and prospects of vast markets for biotechnology products and the techniques, the bulk of the research is funded, carried out, and controlled by the private sector. Research institutions in the public sector are now generally required to raise a substantial part of their budget from non-government sources, via contractual research, licensing agreements and royalties. This is tending to increase secrecy over research findings and to hinder free and open scientific communication. Heavy involvement of the private sector and market considerations greatly influence the topics and commodities chosen for research. Major crops, commodities and farming systems of great socio-economic importance to the developing world, but of little international market importance, do not figure in the biotechnology research agenda of industrialized countries. Furthermore, these countries are keen to reduce their production costs, increase the productivity, quality and value of their products and, thus, improve their overall competitiveness in the world market (FAO 2002 c).

Biotechnology facilities are being established in most developing countries. However, the level of research, development and use of biotechnology for agriculture, forestry and fisheries in the developing countries is generally far below the level in the industrialized countries. Among developing countries, the status varies considerably. A few, such as Brazil, Mexico, India, China and The Republic of Korea, have sought to gain full scientific and technological capacity, especially in agricultural biotechnology. Others, such as Indonesia, Malaysia, the Philippines and Thailand and a few countries of Latin America, have built the capacity to apply biotechnologies and develop biotechnologies useful for their agriculture and food industries. The participation of the private sector in gaining biotechnological capacity is not very significant in most of these countries, although since 1990s the trends have been changing and the private sector is also venturing into biotechnology and genomics besides their regular businesses.

Many developing countries have inadequate funding, poor human resources and limited access to information, resulting in a relatively low-level capacity for research and technology development and exploitation, especially in the field of modern biotechnology

research, which is costly and requires highly trained personnel. Most developing countries are vague as to their immediate aims in agricultural biotechnology. Few have appropriate proprietary-rights protection systems or mechanisms to increase their access to protected techniques and products. Furthermore, there is negligible involvement of the private sector, which accentuates the problem of insufficient attention to biotechnology.

5.3.2.6 *Environment*

Use of modern biotechnologies has given a new direction to environmental ethics. Its reflection is also seen in the approaches taken at the national and international level by rich and the poor countries. Environmental issues of biotechnology can be actually described as direct implications of agricultural biotechnology, environmental usage, rights based and market based. Environmental debate at international political level often uses rights based arguments, which are argued in the form of patents and protection of the intellectual property rights. Some arguments are based on ecocentric views of loss of biodiversity. The benefits and risks of using genetic engineering and its effects on the environment have been debated much at international level. In summary, those risks are based on philosophical views of tampering with nature; naturalness and unnaturalness and religious dimension.

Developing countries also look at the biotechnology not only as a tool for increasing agriculture productivity but also for improving environmental conditions in the country. Since its inception, the Department of Biotechnology under the Ministry of Science and Technology in India has been launching projects of bioremediation and waste recycling in microbial consortia (DBT 1999). However, the environmental use of biotechnology is not in much conflict, the environmental impacts of agricultural biotechnology are the ones that have taken the forefront as the key issues needed to be resolved at the international level.

Developed countries are usually extremely poor in native genetic resources of crops, and therefore highly dependent on access to genetic resources from Third World countries. The global concept of 'Farmers Rights' can be interpreted as a tool to justify a 'supra-national' approach to maintain access to genetic resources. Farmers have been contributing to the genetic resources for centuries, and benefit sharing and royalty systems are pictured as a reward for that contribution, however there are still practical

difficulties of tracing already-collected samples back to the farm of origin that are many times taken as a scapegoat to avoid benefit sharing and claims of the poor farmers, which makes farmer's right issue an impractical one. There is also a need to distinguish between plant breeder's rights from farmer's rights. It is important to note that it is the individual farmer, and not the 'community', who selects and decides to propagate these novelties, and it is the individual farmer that could be rewarded. A mechanism to reward individual farmers could be the greatest possible stimulus to on-farm conservation and varietal improvement by farmers. However, plant breeder's rights (PBR) are politically more respected in the developing countries because they can be more readily introduced into national legislation in developing countries and they are the single most practicable measure that could best boost crop production in many developing countries. This would reduce their need for imports and also make them new players in the global crop export market, where competition is already intense (Wood 1996). Based on these arguments, genetic resource ownership is also a big issue for resource rich country like India that has various types of agro-ecosystems.

At international level, these concerns are significant in getting access to genetic resources and trade related concerns. FAO's Commission on Genetic Resources in Food and Agriculture (CGRFA) has been active in formulating agendas and policies for carrying out procedural methodologies for ensuring the rights of farmers in the poor countries. The International Undertaking on Plant Genetic Resources (1983) had been regarded as a key instrument to look into matters related to the plant breeder's rights and farmer's rights. Many of the existing problems in the undertaking are tried to amend into the International Treaty on Plant Genetic Resources for Food and Agriculture, adopted in 2001. Also the CBD provides a legal framework for the conservation of global biodiversity, the sustainable use of biological resources, and the fair and equitable sharing of genetic resources. Despite the provisions of the Convention, nothing yet protects the rights of indigenous farmers who harbour traditional domestic seed strains or tribal healers who understand the medicinal properties of wild plants to benefit from the commercialization of these resources. Part of the difficulty is that while the CBD sets general principles, it leaves the operational details to bilateral agreements between countries. Among other things, the Convention states that access to genetic resources shall be subject to the prior informed consent of the providers, who may grant or deny permission to use them for research or commercial purposes. This may pose a lot of

problems in relation to indigenous knowledge and indigenous innovations. For example, when indigenous knowledge appears to be common knowledge that is in the public domain, finding out from whom to obtain informed consent is very difficult. But to ignore this step is to invite charges of "bio-piracy". So developing countries like India have introduced legislation to protect plant varieties and farmers' rights, which dictates that some of the benefits of biodiversity return to steward communities to strengthen or revitalize their traditions, according to their own priorities. There must be ethical principles in the utilization of the knowledge of indigenous peoples just as there should be ethical principles in the utilization of biological material.

Apart from the rights based arguments, the issue of biodiversity loss and ecosystem damage has also been most rigorously fought at the international level. The proposed introduction of GM crops has led to a range of concerns about the potential impact on wildlife and the biodiversity. The intensification of agriculture has already led to a serious decline in the populations of various species in the world. The use of herbicide resistant crops and the insect resistant crops, especially the use of Bt gene technology have been a global controversy because of their severe impacts on the other wild relatives and other animal species that are dependent on them. The migratory nature of animals and pollination in plants makes genetic diversity a trans-boundary issue, and threats of genetic pollutions have led many countries to oppose the use of genetic engineering at international fora. Many developing countries use their plant genetic diversity also for tourism purposes as natural parks and gardens, which is a good source of foreign income, which is threatened. Hence the concerns for overall ecosystem damage have been a key concern at national and international level for different reasons.

5.3.2.7 Animal Use

Use of animals for experimental purposes and genetic engineering to derive products that are human friendly has been issue for many animal welfare organisations. The potential to cause harm and suffering is one of the main issues in genetic engineering of animals. The major opposition of animal welfare groups is based on the issues of animal rights and anthropocentric use of animals. There have not been many modifications that have been directly useful to animals, but some of them are more detrimental. Concerns over direct benefit to animals through genetic engineering have been overridden by the potential benefits of transgenic animals to human beings. Genetic modification of animals

for experimental purposes, like oncomouse have raised considerable anxieties (Macer 1992b). However, compared to plant genetic engineering, genetic engineering has brought less controversies given the fundamental difference of propagation and reproduction, animal genetic engineering is less likely to cause "genetic pollution" compared to plant genetic engineering. The ethical concerns of genetic engineering of animals are based more in the religious, social context and intrinsic value of animal, which are politically more significant. There is still a need to look into possible direct risks to humans and the environment that could result from genetic engineering of animals, which further could be developed as more explicit ethical questions (Rollin 1996).

Followers of all the world's major religions are found in developing countries, and India is a secular country where many religions co-exist. The value of animals is not only based on their use but also the views are guided by culture and religion. The view that "there are certain things that humans are not to know or meddle with" would imply that genetic engineering of animals is intrinsically wrong regardless of what affects it might have. This comes from a theological perspective. For instance, in the case of when human growth hormone gene was inserted into pigs, a statement signed by 24 religious leaders stated that "combining human genetic traits with animals raises unique moral, ethical and theological questions, sanctity of human worth". Another alleged ethical problem is the concerns for violation of "species integrity" which simply assumes that transmutation of species at the hands of humans is inherently wrong and that fixed mutable species are the building blocks of nature. However, modern biology rejects the fixed notion of species (Rollin 1996).

In many cultures animals are considered very sacred and some species are given status of divine beings equivalent to God, as seen in some Hindu scriptures. Also some religions forbid use of some animals, such as pigs in Islam. These are sentimental questions for many people, and many prove to be critical for acceptance of ordinary people. However, in liberal developing countries like India, the religious concerns are not a serious concern in front of the potential benefits that are projected by the use of genetic engineering. Religious concerns are considered smaller and sidelined when compared to the social benefits of using genetic engineering.

There are potential risks raised when it comes to the use of transgenic animals concerned with animal welfare. Potential dangers include the rapidity with which such activity can introduce wholesale changes in organisms and their unsuspected implications to humans that interact with animals. There are fears that the wholesale reproduction of transgenic animals using cloning for commercial purposes will result in the loss of farm diversity, a narrowing gene pool and a tendency towards genetic uniformity. Also the concerns are raised about the interaction of genetically altered animals with other animals in the farms. However, proponents have dismissed the arguments stating that strange interactions can also arise in conventional breeding or by changing the environment in which animal typically grows (Royal Society of London 2001).

At the international level also, the ethical problems related to animals have not been considered substantial, usually referred to as "other legitimate factors" given the utilitarian thinking for the benefit of humankind. The legislative frameworks related to animal welfare also focus on the use of animals in the early stages of development for therapeutic experimentation and not only the welfare of animals when they are on farms. Many countries lack legislative strategies on the use of animals for genetic modification and proper animal welfare; also there is a lack of regulatory framework addressing the welfare of animals and use of genetic engineering in animals at international level. This is a critical issue for international agencies involved in framing regulations in balancing animal ethics with human needs; and also cultural and religious considerations.

5.3.3 International regulations guide national regulations

International regulations and guidelines provide a basic foundation and a direction for developing nations to set up their domestic legislative strategies for the regulations; especially in the new biotechnology sector given that the international standards are changing with the same rapidity as new technology is thriving. Many times international guidelines also help to recognize personal and explicit needs of the countries based on their socio- economic and legislative structures, extending their dimensions beyond national boundaries. It leads to another dimension where the internationally recognized concerns also become national concerns for many countries if the priorities are guided by international institutions and also if the local issues get identified as global issues at the international podium. International declarations by the United Nations and its cooperating

bodies have laid the foundations for development of many national codes and amendments to the existing systems. For instance, the Charter of the Universal Declaration on Human Rights in 1948 laid the foundations for constitutions of many countries, by recognizing various rights of people.

The environment is one of the most important areas where the international standards and procedural guidelines have been developed. The CBD has been instrumental in setting up a national code of conduct of Biotechnology for many countries, helping them to identifying areas in the environmental regime that can play a critical role, not only in conservation of nature, but also in enhancing value at international level for commercial purposes. Countries have become more cautious in trade of environmental goods since its inception in 1992, although the CBD itself did not laid procedural methodologies for impact assessment and impact management of biodiversity, it helped to identify the areas that countries can focus on.

In medicine, the Nuremberg Code and Helsinki Declaration still lack mention of the use of animals for experiments, which is gradually becoming a common area in medical ethics debates in the present time. For instance, the ICMR in India adopted the Ethical guidelines on Biomedical Research on Human Subjects in the year 2000 had some inspiration from the Helsinki Declaration adopted in 1964.

5.4 The governance of biotechnology requires multilateral and multi-sectorial cooperation.

5.4.1 Addressing the needs of developing countries:

Globalisation has proven both beneficial as well as harmful; especially it has a deep impact on the economies of the developing countries. Nevertheless, economic globalisation has become unavoidable for global governance of biotechnology, which has resulted in the many conflicting issues as listed below.

a) Market liberalization for economic growth vs. protection of the communities, based on a utilitarian theory of ethics and autonomy.

The Human Development Report 2002 from the United Nations Development Program (UNDP 2002) shows that significant improvements in the health, nutrition and living standards of the world's poorest people have actually been achieved in the last 30 years. This is largely as a result of technology, globalization and market forces. However, still the average per capita income has increased very slightly in developing countries. The reasons are given both in favor and against market liberalization and globalization. It is believed that developing countries need market liberalization for economic growth and the use of novel biotechnologies provides new niches for economic growth of developing countries. However, given the patent cultural patronisation inherent in this depiction, it might seem surprising that governments and the business sector in 'less developed' regions take it up with such alacrity. On one side, market liberalization and globalization have influenced growth in incomes, longer life expectancy and better schooling and prosperity in many developing countries in Asia, like India and China; but not all countries have integrated successfully into the global economy particularly in sub-Saharan Africa, the Middle East, and the former Soviet Union. On average, these economies have contracted, poverty has risen, and education levels have risen less rapidly than in the more globalized countries, according to the World Bank report (WB 2002 a).

For developing countries, the main issue lies in the protection of domestic industries given the import of technologies and use of them it is difficult to establish an internal R&D capacity, since such a capacity is essential to understand, modify to local objectives and conditions, and improve, imported technology. There is also a criticism by developing countries that although it is true that international private cooperation in biotechnology R&D is growing, this cooperation is mainly restricted to the economic Triad of USA, Europe and Japan. It therefore has the characteristics more of a 'triadization' than a 'globalization' of technology. Private companies tend to transfer or contract out their R&D activities to those countries that have a lead in R&D in the sector concerned, in order to improve the companies' access to advanced R&D and qualified scientists. Consequently, it is no surprise that companies' foreign R&D laboratories are almost exclusively located in Triad countries, with a few exceptions such as some East Asian countries, India and Brazil (Editorial 1995).

b) Open access to genetic resources vs. farmer rights/IPRs.

Truly, globalization in the biotechnology sector necessarily should involve participation from communities to get access to genetic resources. Access to genetic resources by local farmers is linked to broader developmental concerns particularly the struggle for daily survival of local and indigenous communities. However, regulations of access to genetic resources although conceived at global level, practically pose many problems when implemented. One of the main problems lies in the tension between the property and the use rights of land, which may be private or community based versus the sovereign rights of the nations over the genetic resources that the land contains. To make matters more complex, intellectual property rights (IPRs) over genetic information, which remain intangible until applied, are part of difficult debate over patent regimes. When regulating access to genetic resources, it is important to recognize and account for these linkages. It has to be noted that there is an array of differences between pharmaceutical industry and agriculture industry on the issue of intellectual property rights and access to genetic resources. One of the differences lies in the high value and low volume character of pharmaceutical bioprospecting. On the other hand the use of genetic resources is complicated by vast array of collections and banking of seeds, which at international level fall out of CBD's purview and sovereign rights of countries of origin (Columbia University 1999). Opening up genetic resources is also a trade off for developing countries to get access to the technologies and protection of intellectual property rights that sometimes are considered economically beneficial, in the form of royalties if properly carried out.

The International Undertaking on Plant Genetic Resources defines Farmers' Rights as *"rights arising from the past, present and future contribution of farmers in conserving, improving and making available plant genetic resources, particularly those in the centres of origin/diversity."* The purpose of these rights is stated to be *"ensuring full benefits to farmers and supporting the continuation of their contributions."* However, there are concerns from the developing countries that at international level, the relationships of intellectual property rights (IPRs) with access and benefit sharing arrangements of genetic resources have not been appropriately dealt with, especially with regard to TRIPS agreement. There are also views that individual 'farmer-ownership' of the good varieties of crops conflicts with the interests of developed countries because it could restrict the

pool of varieties freely available internationally the 'global commons/common heritage' is of vital importance for the agriculture of developed countries. In future what is left unclaimed by individual farmers may not be very useful: farmers know good varieties when they see them. And for farmer-owned varieties, in place of the present system of access without cost, payments would be in order for varietal use, as governance system.

c) International pressure to enforce stringent guidelines vs. streamlining domestic regulatory processes for biotechnology.

One of the other critical issues for developing countries is the international pressure to enforce globally acclaimed stringent guidelines especially for trade in products derived from modern biotechnology. As discussed in the previous section, the WTO provisions of free trade conflict with the issue of farmer's right and the protection of intellectual property rights, especially with regard to the living modified organisms. However, at international level, developing countries are forced to implement rules. Applications of international agreements like TRIPS or SPS agreement, have set high standards for traded. This means that the public sector of developing countries that still controls majority of biotechnology in poor countries, often cannot meet these for various reasons. The private sector still controls the majority of the biotechnology in rich countries, and that has developed strongly and has a strong influence on the national and international procedures.

The dual issues for developing countries are international competition and streamlining of domestic regulatory processes for biotechnology. For instance, the CBD provides: "Access to genetic resources shall be subject to prior informed consent of the Contracting Party [i.e., the country] providing such resources, unless otherwise determined by that Party." Brazil, the Andean countries, the Philippines and other countries have already introduced national legislation or policies to govern access to their genetic resources. Mexico, Australia and others plan to introduce national access regimes soon. In the absence of national access to genetic resources regime, there exists the obligation under the CBD to obtain the prior informed consent of the national government to gain access to genetic resources gathered after 1992. It is critical to ensure that the appropriate officials in the national government have consented to the application and do not accept just the consent of officials in a partner foreign institution. It is also a question of foreign laws and

patents in the developing countries. Many developing countries like India who have not yet made a policy on access to genetic resources and traditional knowledge is not very well protected by any legally defined rights; are amending their patent and trade laws to provide regimes for governing the access to their genetic resources.

5.4.2 Multi dimensional nature of biotechnology

a) Multi-stakeholder involvement

Biotechnology is multidimensional and it has direct implications for environment, animals and human health, social and religious values has expanded the involvement of various sector of society commonly called "stakeholders". Given the emerging differences in the international governance of biotechnology, and to cover the gaps between the international regulations, cooperation between all the stakeholders becomes essential and unavoidable to get a balanced perspective for integrated and effective approach. In current discussions of development strategies in developing countries, there is much interest in ways of ensuring adequate participation of "stakeholders" in arriving at social decisions about both technology choices and more broadly about alternative development paths. The term "stakeholders" covers suppliers and users of technology, including external donors or multinational companies as well as many different internal groups potentially affected by possible unforeseen side-effects of the policies chosen. For stakeholder participation to be more than symbolic, the decision makers should genuinely willing to allow others to say or encourage both public understanding of the issues and public understanding of the issues.

There is always the fear that, the greater the level of participation the greater the risk that any single group that perceives its particular interests or values to be adversely affected by the application of technology will be able to exercise a de facto veto over a technical enterprise almost regardless of the consequence for other affected interests or values. An intensely felt opposition from a small minority might outweigh the diffuse, immobilized interests of a large majority. The opposite could also occur if the majority has an effective and well-connected political advocate; i.e. the legitimate rights of a minority could be overridden by a well-represented majority (Saloman 1994).

Both at national and international level, the stakeholders would evolve from the central question of who is interested in the issues of biotechnology and biosafety and what kind of information is useful to which stakeholder. In biotechnology and biosafety, the directly involved stakeholders include farmers, consumers, scientists, policy makers and environmental groups. This list can be extended further to NGOs, whole private sector, religious groups and philosophers and ethicists who may be indirectly linked to the issues. At international level it could also involve international organisations and other countries that have bilateral relationships.

b) Examples of multi sectorial approach

The Codex Alimentarius Commission (CAC), a joint intergovernmental body under the jurisdiction of FAO and WHO is an example of a forum providing for multilateral and multi-sectarian international cooperation, by inviting people from all sectors in dialogue for regulatory framework development. CAC like all UN agencies is open to NGOs including the private sector and NGOs that are recognised by Codex can participate in Codex meetings as observers. Most of the United Nations organisations are taking multi lateral and multi-sectorial approach in framing guidelines and conventions, involving participation from donors and recipients of the aids. Many national governments have also been cautious in ensuring farmer's representatives, and also NGOs and religious representatives are on national commissions. In many countries the Institutional Review Boards (IRB) have representatives from ordinary public (lay persons), for example, theologians, lawyers, economists etc. For instance in India, Institutional Ethics Committees have representatives from many walks of life. Committees include basic medical scientists, legal experts, clinicians, social scientists, philosophers, lay persons and member secretaries.

c) Importance of multi stakeholder involvement

The reasons mentioned above gives some perspective of the need of the multi stakeholder involvement to address the issues that can have serious impact on the life of people. There are also many advantages of multilateral and multi-sectorial participation in the decision making process. The foremost and the biggest advantage is that it helps in setting up a better ethical and moral framework for good governance. It lays the foundations for not only addressing the issues and technicalities involved, but also brings

innovative ideas for accomplishing projects and strategies with universal consensus. Sometimes it is considered that more participation means more conflicts and delays in the societal decision-making process, although it might be partially true, nevertheless it makes the decision making process more transparent. "Common but differentiated responsibilities" can bring new approaches that are more systematic, effective and cohesive in decision-making. These differentiated responsibilities on the other hand may help in preventing delays in practical applications of the work and strategies, by enforcing more moral responsibilities on those involved. This results in "integrated thinking and practice" that reduces contradictions, and conflicting information, and outcomes and helps in better management of information. Ethically it provides opportunities and space to those who are impoverished and incapable to put forward their needs and priorities by building a humanitarian bridge between the people and the governance system of nations.

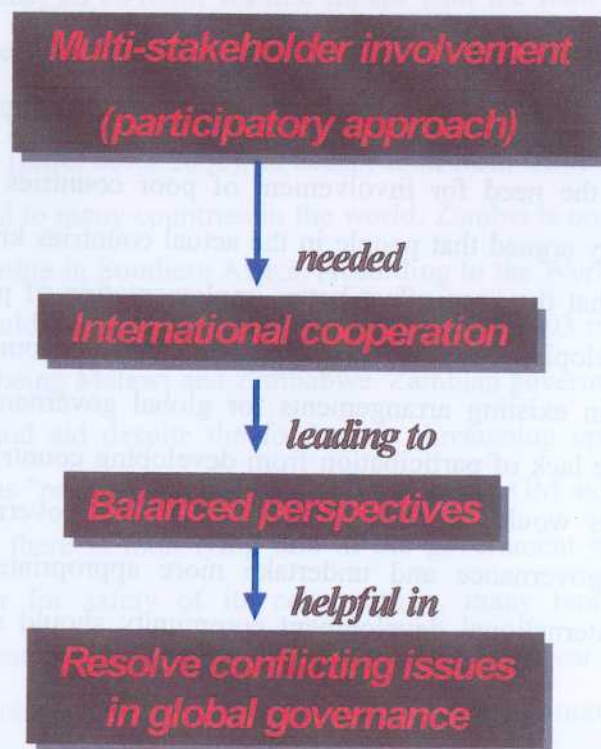


Figure 26: Importance of multi-stakeholder involvement in biotechnology

5.5 Participation from poor countries is also needed in the global governance of biotechnology.

As discussed in the previous section, participation from all stakeholders is essential. Developing countries are known to have what can be termed as the raw materials for genetic engineering, but they often lack skills. Biotechnology has considerable potential to address the issues and problems facing food and agriculture in developing countries but it is currently only catering for farmers in developed countries and should be re-directed to also consider the specific requirements and problems of small holders in developing countries. In developed countries, agricultural biotechnology is dominated by the private sector because the development of biotechnology products is generally expensive and may require an extensive IPR system, and highly-qualified human resources and that, consequently, this situation results in developing countries depending on developed countries or the big multinational private sector. Sometimes it also means that the needs of small, food-insecure farmers in developing countries were being overlooked as these farmers do not represent an important market for the private sector in developed countries.

The participatory approach was a major concern for a third of the staff members in FAO, who stressed the need for involvement of poor countries in not only capacity building but also they argued that people in the actual countries know the needs of their countries better so that they can effect better implementation of policies and programs. Participation of developing countries in global governance becomes mandatory because of the weaknesses in existing arrangements for global governance that have partially developed due to the lack of participation from developing countries. Participation from developing countries would be effective only when the governments of developing countries improve governance and undertake more appropriate long-term structural planning and the international development community should support diversification efforts.

In much of the biotechnology literature, biotechnology is projected as a pro-poor technology so participation from poor countries is crucial for capacity building to interpret the interest and value judgment of variety of stakeholders involved at national and international level. In global governance structures, there are many discrepancies

existing between the commitments that are pledged in the conventions and the actions that are taken up as a follow up for those commitments. These discrepancies arise because there is a lack of institutional transition from international agencies to the governmental regulatory bodies who are responsible for dispersing the knowledge, skills and regulatory reforms to social institutions (both at primary level and secondary level), professional associations or industry self-regulations. These institutional discrepancies lie more in the developing countries. Direct participation of developing countries would help to build up fast and better transition of skills from international agencies to local level in poor countries.

5.3 Donors vs. recipients demands and the divide between developing and developed countries were raised as major issues in research both in FAO and India. The point is for developing countries to be given autonomy in decision making for the types of projects and programs that need to be founded. However, there is still a big issue of recipients trust over the donors. For instance, many poor countries in Africa are facing severe food shortages and famine, HIV/AIDS, chronic illness with the food insecurity that hampers the total development of the nations. However, due to ambiguity over the safety issues of genetically engineered food and crops, there is still resistance in some countries, like seen in Zambia in 2002 (BBC news 2002), to accept food from United States, which the main supplier of food aid to many countries in the world. Zambia is one of the countries facing life-threatening famine in Southern Africa. According to the World Food Program (WFP) 300,000 people could die of hunger before the end of the 2003 in six African countries - the worst affected being Malawi and Zimbabwe. Zambian government refused to overturn its ban on GM food aid despite the food crisis threatening up to 2.4 million people, naming GM food as "poison". Zimbabwe has also banned GM aid in case it contaminates local crops, while there is food lying idle in the government storehouses. Despite the WHO certification for safety of its consumption, many famine and hunger struck countries government are still resistant to release it. Another fear is that Southern African nations will lose lucrative export markets in Europe they cannot certify their crops are GM free (BBC News 2002b). The trail of hunger, famine and death in Africa is an example of failed social and environmental governance, and also international governance.

Developing countries lack capacity in many aspect of governance but it is also an issue for the governance at global level which has not been able to determine and prove the trust and worthiness of the international institutions that have so far not been very successful in implementing effective international governance of biotechnology. The participatory approach with the rule of the law would help poor countries to have a precise, clear and better perception of new biotechnology that would help them to lay out concrete steps and measures for developmental programs in their countries and at international level concrete and incontrovertible policies could be made for global governance of biotechnology.

The United Nations system is based on "one country one vote" for voting on any international treaty, giving equal status to every country, both small and big and autonomy to exercise their rights and needs at the international podium. However, international trade, geographical distribution, government structures at national levels result in what can be termed as "bracketing" of nations and classifying them into categories because of the unfair distribution of bargaining power. For instance, the most important and influential bloc of the countries is G8, group of the world's eight richest economies. Developing countries participation in the global governance could bring this fair distribution of power and also help in inherent empowerment of the poor nations for by learning from the experiences of biotechnology governance in the economically richer countries. The gaps between ever expanding scopes and decision-making of the international institution structures cannot be overlooked, which sometimes forget the needs of the participation from developing countries and represent a narrow range of powerful interests. International governance has so far focused on the provision of public goods to poor countries as development aid, an additional complementary effort is required to strengthen the necessary supporting institutions in the developing countries that would help in enhancing the inherent capacity and improving their participation.

International conventions like CBD, TRIPS, SPS Agreement, and International UN organisations including Codex have stressed the need for participation from developing countries for regulatory frameworks. In many conventions and codes there are explicit provisions and attention to the needs of developing countries, realising the need for better participation from poor countries. For instance, Article 19 of CBD relates to the handling of biotechnology and distribution of benefits." *Each contracting party shall take*

legislative, administrative or policy measures, as appropriate, to provide for the effective participation in the biotechnological research activities by those contracting parties, especially developing countries, which provide the genetic resources for such research, and where feasible in such contracting parties." The FAO Code of Conduct on Plant Germplasm Collecting and Transfer (1994) "*aims to promote the rational collection and sustainable use of genetic resources, to prevent genetic erosion, and to protect the interest of both donors and collectors of germplasm."* Similar examples could be found in many other conventions and codes focusing specifically on poor countries. These are encouraging trends in the global governance of biotechnology.