2. Methodology for FAO Studies

2.1 Role of FAO in global agriculture and food production

2.1.1 What is FAO?

The Food and Agriculture Organisation (FAO) of the United Nations is one of the largest specialized agencies in the UN system. Specialized for agriculture, forestry, fishery and rural development, FAO is responsible for global governance of agriculture and food. FAO of the United Nations was constituted in 1945 even before the UN General Assembly, emphasizing the need for a global system for food and agriculture.

It has a mandate to raise the level of nutrition, improve agriculture productivity and improving standards of living and providing better conditions for rural populations. Since its inception, FAO has been actively involved in developing and implementing programs and policies to alleviate hunger, poverty, malnutrition in its pursuit to achieve food security in the world. A specific priority of the organisation is encouraging sustainable agriculture and rural development, a long-term strategy for increasing food production and food security while conserving and managing natural resources. The aim is to meet the needs of both present and future generations by promoting development that does not degrade the environment and is technically appropriate, economically viable and socially acceptable (FAO 1999).

2.1.2 Structural organisation of FAO

FAO has six major departments that work in cooperation with each other in various sectors. These include, the Agriculture Department, Fisheries, Forestry, Technical Cooperation, Economic and Social Development Department, Technical Cooperation Department and a recently constituted Sustainable Development Department. Each department has divisions and sections that focus on specific issues in the entire field (Figure 3). Each department is headed by an Assistant Director General (ADG), under whom are division directors and section chiefs. FAO is a secretariat for all its 184 member nations and carries out the tasks laid out by member nations, primarily helping poor nations for capacity building.

The headquarters of FAO is in Rome and there are six regional offices, five sub regional offices, five liaison offices throughout the world, on every inhabited continent. There are also country offices in all member nations through out the world (FAO 2000).

Figure 3: Organisational Chart of FAO

2.1.3 Tasks performed by FAO

FAO helps the member nations in many ways. It extends its advice to governments on agricultural policy and planning, rural development, alleviation of poverty and food security, and all other administrative and legal structures needed for development. It helps member countries practically through providing developmental assistance in projects and training at government level as well as field level as extension managers. It also gathers, stores, analyses and interprets all information in agriculture and all related fields in its mandate worldwide. It organises workshops and conferences for knowledge dissemination; especially in the poor and less developed countries it disseminates all information free. Most importantly it has the role of a neutral forum and an honest broker among member countries. It provides a platform for all the nations to discuss and formulate policies on all food and agriculture related issues. It also carries out many special programmes like the annual World Food Day and hosting World Food Summits (1996), Telefood, and special programs for food security.

2.2 Interviews with FAO staff members

2.2.1 Background to the FAO ethics in food and agriculture initiative

FAO has been more applied than normative in the work, although the work is based on fundamental principles of ethics. Some of the 17 UN organisations, for example, WHO and UNESCO, have established ethics committees looking into various ethical issues related to medicine, health care and human rights. FAO was called to become involved more in global governance of ethical issues by the use of modern biotechnology in food and agriculture and doubts about the appropriateness of genetic engineering.

In July, 1998, an Ethics Initiative was started at the FAO with the establishment of a Committee on the Ethics of Food and Agriculture (CE), which in turn established a Sub-Committee on the Ethics of Food and Agriculture (SCE). The focus of this initiative was to operationalize the approach of FAO to ethical issues in food and agriculture. After internal discussion and identification of some ethical issues from major departments, external advice was sort from a visiting scientist (Macer 1999).

The concepts of ethics may be described by different terms when applied to different fields. Before conducting interviews, common phrases used in FAO documents, and by members of the subcommittee on Ethics in Food in Agriculture during a briefing seminar held with the subcommittee and the visiting scientist were compared with common terms in the bioethics literature. The visiting scientist was accompanied by three volunteers, including myself, who spent 2-3 months investigating ethics in FAO under the invitation of the ethics committee and Director-General.

2.2.2 Conducting the interviews

In order to seek the full diversity of ideas a letter was sent from the visiting scientist to all the Directors of the Divisions in FAO seeking a formal interview with both senior members of their Division, and persons who they suggested. This letter introduced the visiting scientist and the volunteers, with mention of the Director-General's mandate to investigate the appropriate development of an ethics in food and agriculture program at FAO. However, the methodology to interview people from every division, was from a desire to be as comprehensive as possible in order to understand the work of FAO and its mandate, rather than from the Ethics Committees original plans to work through department representatives on the committees. The target number of people was chosen to be one hundred, representing every department and also many divisions inside each department, in order to get wide range of ideas and concerns to be able to qualitatively analyse the range of issues that emerge from the biotechnology.

Interviews were conducted with people identified through this process, with representatives in all divisions, and subsequent interviews were also conducted with persons referred to in this initial round of interviews, and through analysis of the documents FAO had produced. The interviews were deliberately conducted by exploring general issues first, for example, by asking questions, "What is the mandate of the division, and your duties?", "What is ethics in your mind?", "What ethical issues do you face in your daily work at FAO?", "How did you cope with these issues?", "Who did you talk to about these issues?", "How have you and FAO responded to these issues, or how do you deal with them when they arise?", "Can you give some examples of projects, papers and policy that deals with these issues?" Then the interviewees were asked "What are the major ethical issues facing FAO?", and "What do you think is the ethical

responsibility of FAO?". The key point was not to introduce any ethical issues until the respondents had raised the issues in the interviews themselves.

As specific issues were raised, further questions were asked in order to elaborate so as to obtain as much information as possible. The detailed interview questions were flexible, with the primary focus being on obtaining information to allow a description of the views of people, that was helpful in providing recommendations to FAO.

2.3 Categorization of Ideas from Interviews

2.3.1 Idea categorization

The issues raised, and keywords and concepts used, in the interviews were categorized into 95 keywords (issues), over 8 very broad concept categories. These headings are named based on the ethical issues that people raised related to a wide range of topics in food and agriculture. In order to clarify the methodology of characterization a description of each word is given below.

In interviews, that averaged close to one hour in length people expressed a wide range of concerns and thus the same person may mention many different issues. The general process of categorization of open comments follows the methodology developed by Macer (1992, 1994) for comments written in survey questionnaires.

A brief description of each keyword used is described below, please compare with the results of the categorization process in Table3.

2.3.2 Food

Food is one of the basic necessities of life for all organisms. The provision and access to it are fundamental ethical questions. In the present time, food is not longer hunted or gathered from the wild, rather it is grown, therefore its availability is a duty of humankind to fellow beings. What is food is difficult to define because food is a unique character of a culture. Each culture has its own cuisines and ways of cooking which makes it unique. People have preferences and choice depending on the taste, culture and availability. Although arguably the world depends on less than 20 staple crops for basic food requirements. What constitutes food in one region of the world may not necessarily be

considered as food in another part. However, globalization going around the world and merging of cultures has resulted in abundant choice and variety of food in the world. It is considered that there is enough food in the world today for every human being to live a healthy and productive life and yet hunger afflicts one out of every seven people in the world. Despite the fact that a right to food is recognised as a human right, hunger still very much prevails and it is causing a lot of suffering and death.

The availability of food is dependent on many factors. Climatic conditions, choice, manpower, land availability, population, social structures, governance etc. There are regions in the world where food is in abundance, and it is a leading cause of many diseases as in USA and Europe; also there are regions of the world where there is no food available, resulting in millions of death every year, as in Sub Saharan Africa and Parts of Asia, Central America and Latin America. This is more ironic and unacceptable situation as these regions of the world are most populated and people die because of food unavailability.

Food has become a central issue for international political debates. The debates are related to conventional agriculture on governance in logistical issues and agricultural policies, as well as on the introduction of genetically modified food and use of genetic engineering. Especially the environmentalists and NGOs have taken apprehensive stands for the use of genetic engineering to solve the food problems. However, much ethical debate is needed and the issues of food need to be diversified, clarified in a relevant context, whether environment and biodiversity, socio-economic concerns, international policies or national preferences.

2.3.2.1 Food security

According to the World Food Summit (WFS) 1996 Rome Declaration on food security, "*food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life*". (WFS 1996). This is an objective definition and it encompasses three major goals of food sufficiency, diversity, and safety of food. It is an interlinked and complex concern, considering agriculture is a social activity. FAO estimates show that there are over 800 million people estimated to be hungry and malnourished globally

mostly in the poor and developing countries of the world. Everyday about 24,000 people die from hunger and other related causes and mostly women and children. The food is considered to be concentrated in rich countries of the world and most of the developing world and the poor countries suffer from hunger and malnutrition. It is an ethically unacceptable situation, which has led countries, international agencies, UN agencies to make many commitments and develop many programs to achieve that goal.

At the World Food Summit 1996, the FAO and its member nations pledged to reduce the number of hungry and chronically malnourished people to half by no later than 2015. Since its inception FAO and World Food Program have been leading agencies in trying to make a hunger free world which is the primary goal in the constitution of FAO. It involves food aid, economic and technical aid, training programs for better agriculture practices while preserving cultural and biological diversity for a holistic sustainable development. FAO has launched a special program for Food Security in 1994, especially focusing on Low Income Food Deficit Countries (LIFDC). These are the countries least able to meet their food needs. This program called for concerted efforts at all levels to increase food production, availability, access and proper utilization of food.

2.3.2.2 Right to food

Availability of food is not only a right but also a basic need to life. The right to food is a concept extending from Article 25 of the Universal Declaration of Human Rights which proclaims "everyone has the right to a standard of living adequate for the health and well being of himself and of his family, including food (UN 1948)...". 20 years later, the Convention on Economic, Social and Cultural Rights in 1966 also reaffirmed the right to food, specifying in the article 11 that " fundamental right of everyone to be freedom from hunger shall...." This emphasizes the need to make the right to food more explicitly a fundamental human right. Right to food is not only an individual right but also a collective responsibility as member of community, or as citizens of respective nations, above all as human beings of this world. Hunger exists in the world not only because of environmental and socio-economic concerns but also due to neglect of the universal right to food and non-recognition of the value of food. There has been global voice to make right to food as a legal right, to ensure that food is not used as a weapon to solve disputes among the countries.

However, there are concerns that recognition of right to food alone cannot not solve the problems of food insecurity. Ethically right to safe, sufficient and nutritious food is the most important concern as millions of people also die because of malnutrition and unsafe food. With genetic engineering and globalization crossing national boundaries, there are concerns on losing the unique values of food in cultures due to harmonization and homogenization of cultures. Cuisines and cooking of food are often a unique and special character that is an inseparable part of each culture. The right to the food that is not only safe and nutritious but also culturally and socially blended is a step further to achieve in promoting right to food and food security.

2.3.2.3 Justice

There are different types of justice, and it is one of the basic principles at the foundation of bioethics. Macer (1998a) describes justice as 'love of others' in *Bioethics is Love of Life*. Justice also suggests a reasonable resolution of disputes and problems. Sometimes we need critical evaluation of the alternative conceptions of justice that include libertarian justice, socialist justice, welfare liberal justice, communitarian justice and feminist justice (Sterba 1996a). Very often at national level and international debates the issues of justice are marked by acknowledging the rights of poor people, giving sanctions, and withdrawing support and aid. Equity by acknowledging human rights, proportionality in the form of benefit sharing, excuses in the form of benefit to humankind and freedom of research.

In food and agriculture, all the conceptions of the justice can be applied depending on the political ideals of the countries and the social structures. Considering food as the basic necessity of life, equal distribution of food is based on the concept of communitarian justice and the virtue of distributive justice. Making countries self-reliant in agricultural production and providing equal opportunities is an argument of socialist justice and also a principle of special conception of Rawlsian justice (Rawls 1971). There are many other components that can be argued based on justice. Justice also involves due returns to the investments done by agro-biotech companies to improve quality and quantity of crops; safeguarding nature and its diversity with doing no harm to other members of the environment is environmental justice. And this is a common argument put by NGOs and environmentalists groups in the debates. How to balance the ideals of ethics to provide a

due justice to each component involved in agriculture is very difficult and sometimes unattainable. How to balance the needs of the developing countries and the demands of developed countries is core issue in the agriculture sector globally.

2.3.2.4 Poverty

The root cause of food insecurity in the world today is poverty. Hunger is the ultimate and most unacceptable symptom of extreme poverty. According to FAO, every two seconds a person dies of hunger and malnutrition. Poverty is also the cause of death and sickness. Around 11 million children die every year before reaching the age of five and 70% of them (approximately 8 million) die due to disease and malnutrition (WHO press release/64, 1997) The World Bank defines poverty or poor as those having consumption of less than US$1 per day. It has been estimated that nearly 1.2 billion people in the world come below the poverty line and 24% of the population in the developing world lives on less than US$2 per day.

Poverty has many dimensions and many faces that change in time and place, like hunger, disease, malnutrition, lack of shelter, lack of education, joblessness and consequently death. It is a situation that people want to avoid but still it persists in at least a quarter of the world's population. Poor people lack food that results in improper mental and physical development leading to incompetence in all areas of life and work. Although income is not only the measure of poverty, increasing economic opportunities is a fundamental tool to overcome poverty. The greatest number of poor people live in South Asia but the proportion of the poor is highest in Sub Saharan Africa where millions of people are at the margins of survival. Poverty results in striping people of basic human rights and therefore it is one central issue that is explored. International actions and dedication is required to combat poverty. It involves, providing opportunities to poor to learn and earn, empowering them through some training and knowledge, providing security and recognition in society. The World Summit for Social Development in Copenhagen in 1995 set forth the goal of eradicating poverty in the world through decisive national actions and international cooperation. Also OECD's Development Assistance Committee (DAC), released guidelines for poverty reduction to help donor agencies make their programs more effective in the year 2001.

2.3.2.5 Overpopulation

Overpopulation is one cause of poverty and underdevelopment. There are 6 billion people in the world today and this population doubled since 1960. It is still increasing rapidly by 77 million per year. The developed regions of the world are collectively home to about 2 billion people the population of the less developed regions is expected to be 4.6 billion people and it is growing at the rate of 1.6% annually.

There are many issues related with overpopulation. It is one of the most key issues that is recognized as causing food insecurity, disease, war, lack of opportunities and powerlessness in the world. Cultural practices, myths and fatal beliefs are not only the reasons for overpopulation, advances in the health care systems have decreased mortality rate, which resulted in overpopulation. There are many programs started at the international level to combat the massive increase in population but the poor regions of the world where the population growth is still on the rise lacks the basic requirements like education and health care. In some poor countries, attempts to increase food production and consumption are undermined by rapid population growth; migration from rural to urban areas; unequal land distribution; shrinking landholdings; deepening rural poverty; and widespread land degradation. Lower birth rates, along with better management of land and water resources, are necessary to avert chronic food shortages.

Recognising that demographic growth in the population was alarmingly high, the Economic and Social Council of the United Nations established a trust fund named United Nations Population fund (UNFPA) in 1967, which had been very active in promoting programs addressing the basic demographic problems. UNFPA under UNDP held an International Conference on Population and Development (ICPD) on 3-4 September 1994 in Cairo to draft a program of action for adoption of appropriate procedures for evaluating and monitoring issues of population and development. The Cairo Declaration recognized the delicate balance between population and sustainable development; also the need of reproductive health, family planning and women empowerment. The member countries emphasized that better resource mobilization was necessary for balancing population growth and development (UNCPD, Cairo Declaration 1994)

2.3.2.6 Emergency food aid

Human-made emergencies like war or ethnic conflicts and natural disasters like famine, drought earthquakes or floods can cause lack of food and decline in agriculture production. Poverty and vulnerability also increase in the face of human-induced disasters that erupt as civil wars rage and governments collapse. People face immediate hunger, and mass starvation threatens. Poor people in the underdeveloped countries are worst hit by such calamities. The economic cost is also very high. The annual loss was estimated to be about US$3 billion in the 1970s growing to US$9 billion in the 1980s. Food exporting countries sometimes take advantage of this and put sanctions on the poor countries that indulge in war against them. Cut in food and medicine aid can cause severe damage to the lives of common people. Considering right to food as a human right and basic necessity to survive, it is an ethical need that all people have access to minimum food at all time.

FAO's Special Relief Operations Service (TCOR) together with the World Bank respond to needs for emergency assistance in developing countries affected by exceptional natural or human-induced calamities. They provide emergency assistance covering a wide number of activities related to the urgent rehabilitation in disaster-stricken areas. TCOR also assists developing countries in the establishment of agricultural preparedness and post-emergency measures, formulating and implementing relief and short rehabilitation programs. Many times UN bodies have sent in special forces in the conflict hit regions to provide relief and food aid to people. For instance, following the 1948 Arab-Israeli conflict, UNRWA, the United Nations Relief and Works Agency for Palestine Refugees in the Near East, was established by United Nations General Assembly resolution 302 (IV) of 8 December 1949 to carry out direct relief and works programmes for Palestine refugees, which is active till today since its inception. It involves food aid, education, and many other social relief and developmental programs.

2.3.2.7 Food quality

With the expansion of agricultural technology, and food derived from modern biotechnology, people's expectations over the quality and safety of food have increased. Consumers are entitled to know what they eat is safe, wholesome and nutritious. Food borne diseases kill many people, and even in developed countries it is estimated that 90% are not detected (Macer, 1996). The quality of the food is not only determined by its

nutrients but it starts from its production and processing before it reaches market and ready to eat. Such concerns have also become an important issue in the food trade. Often there are disputes related to the food quality and food safety standards because the standards in one country may not be equivalent to the standards in other country. The WTO Agreement on Sanitary and Phytosanitary Measures (SPS agreement) is one mechanism for the governance of food quality at the economic and trade levels. This is a big ethical issue for the developing countries who sometimes fail to meet the required criteria for their foods for export to the developed countries and thus they lose markets and foreign exchange. Also with the revolution in the agriculture technology the developed countries primarily focusing on the production, their standards become more competitive in the international food trade.

The Codex Alimentarius Commission (CAC) is a subsidiary body of the Food and Agriculture Organisation (FAO) and the World Health Organisation (WHO). It was established to formulate internationally accepted food safety standards with the aim of protecting the consumer's health and ensuring fair trade practices. The Commission is composed of 164 member countries. The work of FAO/WHO expert committee scientific evaluations and CAC in establishing their science based standards, recommendations and guidelines for food quality and safety is essential to all country programmes to improve domestic and exported food products. In its strategic framework for 5 years from 2003-2007 CAC, has established 6 specific objectives to improve quality of food at the global level. These include promoting sound regulatory framework, widest and consistent application of scientific principles and risk analysis, linkages between CAC and other multilateral regulatory instruments and conventions, enhance capacity to respond effectively and expeditiously to new issues, concerns and developments in the food sector, maximum membership and participation, maximum application of CAC standards (CAC Strategic Framework 2003-2007).

2.3.2.8 Antibiotics

Antibiotics were first considered a universal answer to the infectious diseases following their discovery in the twentieth century. But the global increase in the resistance to anti-microbial drugs has created a public health problem of potentially crisis proportions. In cases of resistance the antibiotics don't work for infections, and these are more hazardous

for people suffering from immune-impaired diseases like AIDS and cancers. This phenomenon is potentially containable and the reasons for acquiring resistance are many fold. It is a deepening and complex problem accelerated by the overuse of antibiotics in developed nations and the paradoxical under use of quality anti-microbials in developing nations owing to poverty and a resultant dearth of effective health care. Also with increased travel worldwide, the spread of such phenomenon has become easy and widespread.

It is also becoming an increasingly important problem in animal agriculture. Anti-microbial use in animal agriculture is not new. Anti-microbials are used in animals to improve health, carcass quality for economic efficiency of growth and production but it is also an indirect public health concern. But with pathogens developing resistance there is a concern that anti-microbial use in food animals can lead to anti-microbial resistant pathogens, which can be transferred to people by consumption of contaminated food or with direct contact with animals. Controversy over anti-microbial resistant pathogens and use of anti-microbials in food animals is likely to impact the future trade decisions.

Use of antibiotic resistance genes as markers in biotechnology and genetic engineering experiments have also caused much havoc. A critical and very controversial aspect of the antibiotic resistance issue is the utilization of antibiotic resistance genes as selection marker in genetically modified organisms (GMOs). The main safety concern relates to the escape or transfer of the antibiotic resistance genes to sensitive bacterial strains when these GMOs are introduced into the environment.

2.3.2.9 Consumer's health

The health concerns have always been the prime concern for any product that is being launched in the market. Especially with regard to food, any new and uncommon kinds of food have attracted a lot of attention, positively or negatively. Coincident with the development of foods derived from modern biotechnology, was the BSE crisis and lack of trust in food safety mechanisms, and consumer concerns over food have increased dramatically. People have different perceptions about the way food is being produced, the modifications whether intended or unintended, the possible health effects; positive or negative. Some of the concerns are due to improper knowledge and unprecedented uproar

by media, which is making consumers confused about what should they eat. The food that is being produced with certain modifications is not necessarily bad for the health of the consumers but it is the question of trust the consumers have in the agro-industry, which has become notorious for pursuing their hidden objectives. It is important to note that not all the food is meant to become 'magic bullets' for health to improve vitamin intakes or proteins; food is also being modified for storage and preserving it for long time or making it easy for cooking. Such kinds of modifications are also making consumers fearful about the unintended side effects on their health. GM food has come under sharp criticism for not only health concerns for human consumption but also its implications for the environment and other species.

Health and safety of the consumers are the foremost criteria for any product to reach markets both at local and global markets. Every country has its own consumer protection laws and international agencies like Codex Alimentarius Commission (CAC) set international standards for food. The FAO and WHO have launched a joint evaluation of FAO and WHO food standards programme, including the CAC, so that the programme best serves the concerns of all (the rich and poor) regarding health, safety and trade in food. This is the first evaluation process of the international food code, and the CAC itself, and its standard-setting mechanisms after 40 years of operations (CAC 2002).

2.3.3 Rural development

It is estimated that 75% of the world's poor people live in rural areas. Typical images of rural areas in developing countries include remote villages surrounded by large fields and farms, small huts, animals, no proper telecommunications and transportation, illiteracy, dirty localities, no basic infrastructure facilities etc; distance from modern urbanization that has refined telecommunication, concrete structures without much greenery around, big roads and markets. Rural development is a complex multifold dynamic process, which has overlapping aspects and there is no universal threshold for it. It involves change and development in the basic thinking of rural people with infrastructure development. Rural development is an essential part of sustainable development, it is important especially in the third world countries where economy and social structure is largely dependent on agriculture production and where the majority of the populations live in rural villages and remote areas. To begin with there is need for better connectivity, both in transportation

and telecommunications. Rural communities represent the "last mile of connectivity" challenge in both developing countries and developed countries. Secondly the development in thinking about the social causes like gender discrimination is extremely important in developing countries as women perform the majority of household work and also in agriculture. Underlying issues could be specifically dealt.

Development in the socio-economic conditions, or betterment in the quality of life at the grass roots level is the goal of FAO in rural development. But the conventional strategies for rural development have not been able to achieve its goals and the disparity of the rural-urban divide still persists as it was in the past. There is a need first to map out the assets of the rural areas, it including the simple traditional methods and the indigenous knowledge rather than simple applying modern technology; it has several negative affects mainly waste of precious resources and efforts of both local and international organisations. FAO set up Sustainable Development Department in 1995, which looks into such overlapping areas of concern. It looks into 4 major areas of development; people, institutions, sharing of knowledge and environment by designing integrated policies, strategies and appropriate methodologies.

2.3.3.1 Sustainable Rural Development (SRD)

The concept of sustainable development is a balancing act that focuses on socio-economic development with the demand for sustainability and safeguarding the environment with economic development for present and future generations. The difficulty is to lessen the threat of economic growth or economic development to the environment; hence proper strategies and projects are prerequisite to implement sustainable development. Out of 1100 million people of the developing countries, 800 million people live in the rural areas, and since such large populations are concentrated in the rural areas, they often get marginalized in the development process resulting in an alarming growth in the number of hungry and unemployed people in rural areas. Sustainable rural development is a new concept that has emerged because rural development efforts over the years failed to come up with the promises even with intensive inputs that concentrated on introducing new technologies, which can boost productions and generate income for rural people. Sustainable rural development aim towards self-reliance and empowerment among the rural people and broadening local

resources and strengthening economy based on domestic structures broadening its scope to cover its impacts on environment. Use of both modern technologies and traditional knowledge should be integrated in a way where implementation of better infrastructures are not received as "magic" by the rural communities but as a better developed traditional method for agriculture that saves time, energy and losses.

FAO has been very active in promoting training programs, extension services, providing technical expertise at the grass-root. It involves providing customized information products to specific inquiries including assistance in economic revitalization issues; local government planning projects; rural health issues; funding sources; and other related issues for the purpose of monitoring the quality of rural life. But these programs have sometimes been alienated from the ways or opportunities of their returns for implying enhanced technologies for improving productions (SRD, FAO). The World Summit on Sustainable Development (WSSD) in Johannesburg in 2002 also reaffirmed sustainable development as a central element of the international agenda and gave new impetus to global action to fight poverty and protect the environment. Governments agreed to and reaffirmed a wide range of concrete commitments and targets for action to achieve more effective implementation of sustainable development objectives (WSSD 2002).

2.3.3.2 Dependency on experts

Hiring consultants and advisors are seen both in public and private sectors. Governments hire consultants and advisors sometimes on a permanent basis or sometimes for short periods until the project is finished. Such consultancy systems are also issues in the international global governance by the UN. One of the roles of the UN system is advice and consultancy. Almost every UN organisation hires consultants who are experts in particular fields related to the respective projects of UN organisations.

Recognising that developing countries lack expertise in many fields, this aspect of dependency on experts has become an ethical issue. Mostly expertise is often sought from academics who have done intensive research with many internationally recognized publications, have extensive global experience. These criteria are often not met by experts of poor countries who know the situation within the countries better but do not have a

global experience. So experiences of experts from developing countries within their own countries are not accountable at UN level. With the larger number of academics in rich countries compared to poor ones, especially among those who have time for extensive research investigations, it is difficult to have global equality in consultancy.

Attempts to hire the services of the world's best experts in fields, there must be good incentive, which includes financial compensation. Therefore, consultancy costs a lot of money and sometimes consultants fail to deliver their promises because many experts from rich countries are not much familiar with the poor countries situations that exist in reality and not projected by the documents and books; although there could be various other factors as well, although ethically we can say incentives should not be the criteria for best experts to choose to give advice, and there also lies a personal ethical duty on experts to sometimes give free and fair advice. Another issue related to consultancy is possible favoritism based on acquaintances and nationalities. It is expected that people might raise this as an ethical issue, on the hiring of incompetent consultants. Nevertheless, it is undeniable that good consultancy with the experts undoubtedly improve the structure of the projects and can give unimaginable good results with less inputs.

2.3.3.3 Participatory approach

Participation is an essential component of successful and lasting development. It contributes to equity by involving people living in poverty and other groups in planning and implementation. Participatory decision-making, together with the rule of law, democracy, and transparent and accountable governance and administration in all sectors of society is an important requirement for the effectiveness of development policies. For the past four decades the conventional strategies for rural development have been concentrated on intensive inputs and stereotype methodologies of introducing high technologies to generate income in the short time. The small stakeholders were left behind most of time during the development process and the development efforts were not having sufficient impact on poverty and income generation in rural areas. The need for better involvement of the small rural stakeholders was emphasized in the WCARRD (World Conference on Agrarian Reform and Rural Development), held in Rome1979.

The People Participation Programme (PPP) of FAO arose from WCARRD and its call for "the active involvement and organisation of the grassroots level of the rural people". The PPP involved formation of small groups consisting 10-15 members from similar socio-economic backgrounds participating in decision-making and collective learning. Such activities are facilitated with the help of project coordination committees, NGOs, individual governments and locally recruited people who are given training in a special stepwise process called Training of Trainers, who then can communicate with the particular communities in local language and exploit local resources better. It has many advantages. The participatory approach has a grassroots receiving system so there is an economic benefit when channeling the projects directly through the needy, resulting in reduced costs and greater efficiency of development services; also providing democratic opportunities for poor to become self-reliant with establishing sustainable development networks for rural development. It encourages in creating participating group's own self-evaluation capability through periodic discussions and consultations with expertise.

2.3.3.4 Gender issues

Gender is a provocative term and is often debated very hotly. Gender issues should not be muddled with women's issues, and should be considered as two different issues, although they women's issues and gender issues are parallel to each other. In spite of increased awareness in the past two decades, efforts are still needed to overcome problems to address gender issues. According to the Population Reference Bureau figures there are 3083 million women in the world today, comprising 106 women per 100 men in developed countries and 97 women per 100 men in less developed countries. Less than 50% of the women in developing countries have an economic status with 40% of them having been educated. All the issues related to gender cannot be solved by rural development but it may be a cornerstone in the better balancing of the gender and its various arena. Women's roles and gender relations have been largely interpreted in the political priorities and shifting positions in different social structures. Rural populations, especially the women, suffer from traditionally contextualised gender division in social, economic, labour, cultural and demographic disabilities and social constraints more than urban women. They have lower literacy rates, lack of access to resources, lack of health and legal services and no decision making power, even though they provide 70% of the agriculture workers, 60-80% of labour for household food production and 100% of the

processing of the basic food stuffs. Despite these contributions, 550 million rural women live below the poverty line.

The programmes and activities for reducing gender imbalances and have so far achieved very limited success. One reason could be that the mode of such developments concentrated more on helping women as vulnerable rather than women empowerment that can give women equal opportunities for self-education, self-dependency, and self-promotion. The sustainable Development Department of FAO has launched many programs relating to gender issues realizing that sustainable development cannot be achieved without addressing inequalities of women as they are the central part of rural development.

2.3.3.5 Youth labour

Child labor issues have been a global concern for many years. Almost all countries and the United Nations have set laws and regulations limiting the extent and the type of work that children can perform either as informal jobs, part time jobs or "employees" jobs. But still child labor is commonly seen in the world. UNICEF's 1997 report on the *State of the World's Children* says "Hazardous child labour is a betrayal of every child's right as a human being and is an offence against our civilisation". The Convention on the Rights of a Child was adopted on 2 September1990, which was ratified by all countries except Cook Islands, Oman, Somalia, Switzerland, UAE, and USA. This convention expresses the idea that children have full spectrum of rights as adults; civil, political, social, cultural, and economic. According to the report, child labor is not a unique problem of the developing world. Even in the developed countries like US, a high proportion of ethnic minority children or immigrants are employed in agriculture. Child labor is most prevalent in Asia, Africa and Latin America, the three most poverty-stricken continents. Half of them can be found in Asia alone. Poverty alleviation is not the only solution for child labor and both should be dealt with independently, although they are inter-linked. The more visible side of the child labor is the sweat-shops for export industry whereas majority of child laborers are found in invisible and informal working places; in domestic services, in homes, and fields. Overpopulation, poverty, illiteracy, cultural and social sanctions are the root causes of child labor.

The report established the fact that there is a substantial increase in child labor in the Eastern and Central European countries as a result of switch from centrally planned to market economies. In the industrialized countries, growth of the service sector and need for a flexible work force has resulted in the increase in child labor. This emphasizes the fact there is not much difference in the child labor between Asia and some parts of Europe.

2.3.3.6 Intensive agriculture

Intensive agriculture is a pattern of large scale farming where generally much more food is produced per hectare compared to other subsistence patterns. Agriculture began more than 6 thousand years ago and the intensification of farming methods had been growing as a necessity to feed the ever-growing human populations. The first intensive agricultural societies were located in India, North China, Middle East, North Africa and Central America. Modern crop intensification began in the mid 1940s. Green Revolution resulted in dramatic increases in cereal-grain yields in many developing countries beginning in the late 1960s, due largely to use of genetically improved varieties. Agriculture intensification during the green revolution relied heavily on the use of synthetic fertilizers and pesticides, improved irrigation, large-scale farming, use of heavy farm machinery. It resulted in reducing the number of people needed to produce food for the population. In developing countries pesticides were considered a necessary part of crop intensification, as the other scientific advanced techniques and mechanical farming required heavy economic investments. The initial results were very encouraging, as it helped food problems during famine and drought in some countries. The environment became a secondary consideration in the process. The after effects of the Green Revolution have shown that poor farmers cannot afford heavy farm tools, and that intensive use of pesticides had harmful health effects not only on the health of the farmers but also on the ecology of the farms, as it resulted in higher salt concentration in the soil and large scale farming promoted monocultures which resulted in nutrient-deficient soil and reduced genetic diversity.

After the Green revolution many agriculturists realised that intensive use of pesticides and intensive farming had deteriorating affects on the environment, while doing an overall benefit and risk analysis of applying large inputs to increase productivity. Since

the mid 1960s FAO advocated Integrated Pest Management (IPM) as a preferred pest control strategy. IPM is an integration of a number of pest control techniques that discourage the excessive use of pesticides and keep them to levels that are economically justified and safe for human health and the environment. It emphasizes the growth of healthy crops with least possible disruption to agro-ecosystems, thereby encouraging natural pest control mechanisms.

2.3.3.7 Small versus large farms

Most of developing world agriculture is based on small-scale farming, which generates about 80% of global agricultural output. Due to globalization, for many decades the focus has had been on the large scale, mechanized, chemical intensive, corporate and private sector dominated farming. One reason for the large farming systems could be the private ownership of the land in most of the developed economies, namely many privately owned large-scale farms. This has undoubtedly increased the yield on one hand but at the same time it has also increased the pressure on the small farmers that are still using the conventional agriculture and grow for small markets in their own countries with some cash crops for export, but at small scale.

Most small farmers in rural areas or remote villages are doing subsistence farming. They depend on these farms for their food, and each small family is a production unit. In fact almost all of the farmers in the remote villages of poor developing countries are subsistence farmers who grow only enough food and fiber for their own needs. They collect fuel and building materials from natural resources. Subsistence cropping involves much human labour and farmers could hardly enter the cash economy. Globalisation has indirectly put an extra pressure of survival for the small-scale farmers with issues of IPRs and access to genetic resources being debated at international level.

For several decades large farms were regarded as the easiest, quickest, most reliable, highest yielding and most efficient way to feed the growing population of the world. Privatization has resulted in the large farms into big agro-business. In developing countries, small farmers with fewer resources to raise productivity and little bargaining power had been expected to follow this conventional idea, if they wished to compete commercially in international agriculture trade. Lately, the advantages of small scale

farming have been realized; they embody diversity of ownership and cropping systems, multiple cropping gives sustainability to the agro-ecosystems, more production and higher total output, helps in more labor mobilization and consumption patterns and a personal connection to the food thereby produced. They are many other advantages that have been acknowledged (Rosset 1999).

A new concept of "contract cropping" has emerged to bridge the gap between small-scale farmers and large-scale farmers. This method involves a participatory approach linking powerful agri-business supplying inputs and technical advice to small farm sectors and exploiting small-scale beneficial resources for higher productivity and profitability for both. The large agro-industries getting access to land and crop production in other countries giving them political acceptability and stability in the business, which otherwise they have to buy or lease. Nevertheless both have to share the respective risks involved (FAO, AG21 Magazine 2000a).

Another tool for better returns for the small-scale growers is the CSA (Community Supported Agriculture) system. In a CSA system, the farmer grows food for a group of shareholders (or subscribers) who pledge to buy a portion of the farm's crop that season. This arrangement gives growers up-front cash to finance their operation and higher prices for produce, since the middleman has been eliminated. It started in Europe and Japan around 30 years ago, but in US it started only in 1986. It has not been well developed as a system in developing countries (Attra 2001).

2.3.3.8 Farmer's life quality

The transition to intensive agriculture brought major social changes in the lives of farmers. During the last thousand years, farmers were reduced to a small piece of land where they needed to grow and cultivate crops throughout the year, as the society was rapidly being transformed into classes and elite people and monopolized social structures. This resulted in farmers becoming poorer over the years and forced to do labor on their own lands. Even today in most small-scale societies with less intensive subsistence patterns, the economically important properties on the land, such as land and water wells are usually not owned by farmers in the sense that we think of ownership in the present time, especially in poor regions of the world. This has had negative impacts on the

physical and mental effect on the farmers; and deteriorating climatic conditions and with globalization, has reduced the small-scale farmers to a state where their survival is difficult.

At the present time, with the growing competition at global trade, farmers have more pressure to generate high yields of better quality and they keep experimenting on new ways and new techniques to improve their production systems. The divide between the big farmers and small farmers has widened due to market liberalization and globalization. The fundamental issues of access to seed, intellectual property rights, access to modern farm management techniques and relevant technologies, sharing of benefits, and access to proper markets, are some of the issues physically related to the quality of life of the farmers as their resolution will in someway effect their quality of life. The question becomes stronger in the context of the trendy agricultural reforms that are occurring.

The issue is more challenging for the farmers of the developing countries who don't have access to even proper farming tools and depend on the traditional way of agriculture. They lose their enthusiasm for recreation and leisure. Lack of time and resources also discourage them from learning new things and adopting new technologies because they very carefully want to avoid the risks involved. Sustainable livelihood and sustainable agriculture are interlinked but during discussions on food security or program implementations, or sustainable agriculture often farmer's life is forgotten and the focus is more on the ways of improving agriculture systems for better yield and sustainability of the agriculture systems.

2.3.3.9 Farmer's health

With the expansion in the rural enterprises and urbanisation, intensive agriculture is increased and many farmers are turning away from farming to other jobs. The primary reason is less economic returns for more labor and adverse health affects caused during farming. The usual image of the farmer is that they are tough, hard and self-reliant and sustain themselves in any kind of environment; which is a myth. Farmer's health is equally important for sustainable agriculture because the hardness they endure, stress and strains of weather conditions for the crops, economic burdens and social imbalance have

ultimate affect on the mental and physical health of farmers and the productivity of the crops.

Evidently, the Green Revolution focused on the excessive use of pesticides and intensive agriculture in which misuse or overuse of synthetic insecticides had many deleterious affects on the health of the farmers, as well as the consumers. Farmers are more likely to be affected by mishandling of pesticides than any other group in society as they come in direct contact with the pesticides. Farmers suffer the dangers of inhaling large amount of combustible gases fuming out from large farm machines, often with high hydrocarbon emissions. Those farmers relying on traditional farming practices, face risks because of proximity to animals and may suffer the risks of animal transmitted diseases. This is a major issue for animal farm owners. Ailing farmers are not able to take care of their fields and that affects their production both qualitatively and quantitatively. This is a major problem for small scale farmers who are involved in subsistence agriculture when compared to large scale intensive farming seen in developed countries. Poor farmers do not take enough precautionary methods for avoiding severe health hazards because they either are not aware of such hazards and do not know how to handle equipments properly; sometimes precautions also require extra investments that they try to avoid to save money. According to the Pesticide Action Network (PAN) in the UK poor farmers in developing countries are paying an estimated US$300 million for pesticides that do not meet internationally-accepted quality standards and have been banned elsewhere (PAN 2001).

2.3.3.10 Toxic dumping

With the recent movement towards IPM, conservation agriculture and organic agriculture, as well as genetic modification, the enthusiasm for pesticide use is declining. However, an estimated one to two million different chemical preparations are on sale around the world today. After the automotive sector, the chemicals industry is the world's biggest manufacturer, with annual sales of US$1.6 trillion. Some early pesticides were particularly dangerous, and even many today that are hazardous remain to be discarded safely. The environmentally sound management of the toxic chemicals within the context of sustainability and human health has become a major challenge. The unused and expired pesticides and other outdated farm chemicals are sometimes illegally dumped in the large rivers, seas or oceans. Gross chemical contamination has many adverse effects not only

on the soil chemistry but also a grave damage to the health of living organisms, their genetics and reproductive behaviour. Hazardous and persistent toxins enter into the food chain and get biologically magnified in each trophic level and get accumulated in the bodies.

There are various mechanisms outlined in the Agenda 21 for reducing risks and abatement of the agriculture chemicals and toxins. It is a big issue for the developing countries because of lack of sufficient scientific information for the assessment of risks entailed by the use of a great number of chemicals, and lack of resources for assessment of chemicals for which data are at hand. (FAO 1997, Agenda 21 chapter 19). In USA, the Environmental Protection Agency has launched PBT (Persistent Bio-accumulative and Toxic) Chemical Program to consider such issues (EPA 1997)

FAO developed *International Code of Conduct on the Distribution and Use of Pesticides* in 1990, which in its article 5 outlined the measures to be taken into account for proper use of pesticides to avoid any health hazards. Different organisations of the United Nations developed an Inter-organisation Program for the Sound Management of Chemicals (IOMC) in 1995 that develops capacity building programs for environmentally sound management of chemicals. Although the Prior Informed Consent (PIC) Convention was adopted in 1998 in Rotterdam for ensuring the protection of citizens and the environment in all countries from the possible dangers resulting from trade in highly dangerous pesticides and chemicals, WHO's press release on 1 February 2001 reported the fact that 30% of the pesticides marketed in developing countries were of poor quality and do not meet the international standards (WHO/04 press release).

2.3.3.11 Rapid change

With intensified industrialization with globalisation and technological advancement, things are changing ever more fast. There is a rapid conversion to computer based technical networks all over the world in all the fields which no doubt has many advantages like rapid exchange of information, easy to store, less manpower required etc. It is also reflected in the food and agriculture sector as we begin to apply new genetic technologies that can adapt to any environmental conditions and ways of improving farming systems by introducing fast and easier planting and harvesting techniques. The

Green Revolution saw the intensive agriculture with improved farm machineries and introduction of high yield varieties crops. Until the late 1980s the trend has been for intensive agriculture where the tendencies were to favor large-scale farms, heavy mechanisation, intensive use of pesticides and synthetic insecticides, with involvement of corporate sector. Soon there after effects were realized and IPM was introduced. Now in the present time, there is concept of genetic modification and transgenic crops to improve crop production both in quality and quantity. It is considered as an alternative to deteriorating environmental conditions and changes in the climate due to environmental pollution.

The transitions' are more visible in the developing countries that adopt the new technologies at hand because they lack resources and expertise to explore new areas, new methods of production, new varieties and self-develop their farming systems. They try to implement the tested and exploited technologies in their conventional systems. So the sudden shift from the conventional ways to new technologies some times may or may not produce the expected result. The trend in the developed countries has been towards the experimenting new ways of enhancing their agriculture systems. As discussed earlier the agricultural systems in the rich countries have been largely been privately owned, that are generally profit motivated enterprises; where agriculture has become an industrial business as any other enterprise. When this is similar tried in developing countries, many times the projects fail not only because of the difference in the environmental conditions, but also because technologies do not suit the agricultural systems and there is lack of knowledge to properly implement technology. Such failures result in heavy losses on the countries that already suffer economic losses in conventional ways.

2.3.3.12 Urbanization

In simple words urbanization refers to the transition of people from rural areas to cities. People from rural areas migrate to big with hopes of opportunities for better livelihoods, work opportunities; especially for economic efficiency and comfortable lives. During the twentieth century there was a fifteen-fold increase in people living in the urban areas. In the year 1900, there were only150 million people living the urban areas compared to 2.9 billion people in year 2000. The world is expected to reach 50% urban by the year 2007 according to United Nations (UN Press Release POP/757).

The forces that contribute to urban development are strong. Urbanization results from the interplay between three factors: the rise in agricultural productivity; the transfer of demand to industrial products, and the attraction of economies exercised by industrial activities. Growth in income alters the structure of the household consumption and Engel's law stipulates that the share of a household's budget devoted to food declines as income rises (Polese1994). According to UN and World Bank sources, a Canadian family spends on average 11% of its income on food compared to 52% for an Indian family and 64% for a Tanzanian family. Higher wages in urban areas reflect higher productivity and better living standards. Although beneficial, growth in productivity has not resolved other problems related to urbanization. The rapid and massive immigration from rural areas has added to the problem of urban poverty, many people fail to find jobs due to lack of experience or incompetence or it takes very long time to settle down and by that time they already exploit all their saved resources. They are forced to live in harsh situations and hard urban life. Fast urban life has also added to the deterioration of the urban environment. Poor sanitation, water and air pollution, scarcity of water and electricity due to over growing demand, waste disposal problems are just a few to mention and very visible. Income generation sometimes becomes the sole motive of the families to meet the everyday upgraded standards and they lack time for other social activities.

2.3.3.13 Agriculture is a part of nature

For 100,000 years, humans depended on hunting and gathering food from the wild until they stopped a nomadic life and began to domesticate. Humans had been cultivating crops and domesticating animals for their own consumption, trade and commerce. Since the history of cultivation beginning around 6000 years ago, the essential nature of agriculture has been changing as new agricultural methods are being adopted through intensification and conversion from small scale farming to large industrial agriculture. Agriculture has a deep relationship with nature as all the resources for agriculture come from nature. The fundamental nature of agriculture has been farming utilizing natural resources like soil, rainfall, climate and genetic resources. Humans chose some vegetation as food from the wild, domesticated and grew them as food; later on developed them into cultivars through various hit and trial techniques.

There are different ideologies and views on the issue whether agriculture should be regarded as a different entity from nature or should be regarded as one. Some people believe in agriculture and a dichotomy with nature, but others not. As shown in surveys across different countries, for many people the image of nature is large forests and wildlife in the natural habitat without any human intervention. Forests have a longer history and image of a long life. They have a unique character, and it is impossible to farm forests, which is the house of millions of species of different kingdoms. Agriculture is an ecosystem created and developed by human beings for satisfying their needs using natural resources collected and discovered from nature. However, it should be recognized that many of the genetic diversity found in forests have been able to be saved through modern agriculture technology like genetic engineering. Henceforth, agriculture and nature are becoming interdependent as the trends in conservation of nature being changing constantly. There is an emergent need to preserve the nature and its diversity without expanding agriculture land to preserve the remaining species all over the world, to have a balance between man made interventions and the earth and its environment developed in the due course of development.

2.3.3.14 Long life is a value

Any living thing that lives a long life creates a special place in society, nature and among people be it human beings, animals, plants and tress, or other materialistic objects. It adds respect and compassion with a desire to learn from the past experiences. Genetic engineering and biomedical advancements have made it possible to change physical characteristics, and extend life to a certain length in human beings, plants and animals. In nature, trees in the forests and some animals like turtles live life for hundreds of years without any transformations. This is a critical question in establishing the relationships between agriculture and the nature and also for people who are involved in the business of forestry. Around 11 million hectares of forests are disappearing annually and forests have virtually disappeared in 25 countries of the world (WCFSD1997). There are several reasons attributed to it. Urbanisation and overpopulation can be considered as core reasons for such an alarming situation. There are attempts at reforestation in the lost places but lost diversity of trees being planted is still the question. Also considering forests take a longer time to re establish, and the pace of deforestation and environmental pollution being fast, there are fears of losing forests at a higher rate. Long life of forests

have tremendous importance as they are the only source of many businesses, tribes that habitat them, rural people that harvest their necessities and nonetheless forests are homes of all the wildlife.

Forests are the source of many businesses in the world. Timber and pharmaceuticals being prominent. The value of the tree for timber is acknowledged by its life. A longer life means most trees become stronger. However, it is also a big issue for foresters as many businesses see the value of the tree and they do not care about the forest as a whole. A lot of money is invested for growing trees for timber, but the returns are expected in a short term, which is a dichotomy considering unique characteristics of forests and trees. It takes decades to grow one tree and during that period the priorities of the investors and the customers change which sometimes result in heavy losses. The length of the time to grow forests and their long life span is extremely important for sustainable development and maintaining natural environment but it is also an affliction for timber merchants.

2.3.3.15 Cultural differences

The article 1 of the *Declaration of the Principles of International Cultural Co-operation*, that was adopted by UNESCO's General Conference on 4 November 1966, states "each culture has a dignity and a value, which must be respected and preserved". With human development in general, there is a wide diffusion and homogenization of cultures on the periphery but some central values and principles in each culture may remain unchanged and still be an integral part of the social life. Cultural differences increase the diversity of social life and social systems. They also encourage affirmation of the personality, dignity, rights and freedom of human beings attested by Universal Declaration of Human Rights.

Culture is not merely heritage of knowledge and works of art and humanities but is also a way of life. Food easily distinguishes one culture from another. We can also regard food as a logo to determine a culture. These differences in particular food-culture and beliefs in the world have become ethical concerns especially in the recent debates on genetic modification to increase the crop production. In the past, agricultural production was a difficult issue because of technical barriers. But with modern farm machines and better forecasting, the production systems have become better, with more production in less

time. At the present time, it has become more of a moral question when we are trying to increase production using genetic enhancement techniques; especially when we are trying cross-kingdom transfer. Personal beliefs and religious beliefs are hurt by such modifications; for example imagining pig gene transfer in rice and unknowingly eaten by Muslims. Also choice of people to be vegetarian. People in different parts of the world have been producing different varieties of food according to their needs and tastes and beliefs, depending on the resources available. Homogeneity does not ensure social solidarity any more than heterogeneity guarantees conflict. The challenge is to ensure respect for differences without fragmentation and isolation, to promote consensus on values and practices without imposing a stifling uniformity on everyone (FAO 2001a).

2.3.4 Information

Sharing knowledge is information, and information plays an important role in development. There is broad consensus in the international community that the sharing and exchange of information at local as well as global level is critical for achieving sustainable development. With increasing knowledge resources and information technology, the flow of information has become very fast. Digital revolution and Internet technology have made better connectivity between the institutions and different sectors of society. The options of CD-ROMs and diskettes have solved the problem of Internet and limitations of paperwork. It also increases opportunities for remote and distant learning by providing extension support and networks.

Information management is ability to access information and at the same time being able to disseminate information. Information management is an important issue in the light of rapid emergence of information tools. It is part of capacity building and empowerment of the nations. Still there is a very visible divide on the issue of information management between the rich countries and the poor countries. The central issue in information management is the knowledge gap and information problem. The relationship between knowledge gap and information problem is a twin issue and cannot be addressed separately. It is a three-step process; acquiring knowledge, absorbing knowledge and then communicating knowledge, which is information (WB report). It is unlikely to entirely eliminate unequal distribution of knowledge and close the digital divide in the larger context of the rural environment, but it can be elevated from its

present situation if parallel efforts are taken to improve the local environment; being able to accept the rich flow of information in a new and different form.

The complexity of the ethical, legal and social issues (ELSI) and their impact on the users of information and communication technologies (ICTs), and the right of access to information for all, as a fundamental right that should be upheld with greater efficiency and imagination in a spirit of equity, justice and mutual respect, were considered at UNESCO's Conference on 'Info-ethics', Paris from 13-15 November 2000 (UNESCO 2000).

2.3.4.1 Information access

Access to information is a question that arises very often in the United Nations conferences and meetings. Although there are constant efforts been taken to provide information as efficiently as possible, it is still unable to reach the grass roots. Knowledge is expensive and difficult to create that is why much of it is created in the developed countries. Developing countries are poor not only in terms of capital but also in terms of information and knowledge communication. Knowledge about technology and knowledge about attributes are the two critical problems for the developing countries (WB report 1998).

Even with the costs of communications plunging, the 'digital divide' is conspicuous between North and South. Poor countries first need technology get to access to the information. They don't need to recreate technology, they can just adopt the technology; but the paramount issue is lack of basic resources to get access to technology for information. Computers and Internet are not available in the remote villages. Even if it is available, illiteracy is an obstacle to people to fully exploit the advantages of digital technology. Many of the local people in the rural villages lack the capacity to understand and capture the knowledge in the digital form. Internet connectivity alone will not solve the issue of information problem where in the most development programs the main source of information is through training and direct consultation with expertise.

2.3.4.2. Information dissemination

Information dissemination is as equally important as the access to information. Information is still a property of the rich world, and in the world where half of the world still do not use telephone, it is difficult to distribute equal and proper information. Over 40% of the US now uses the Internet – but just 1.6% of Asians and 0.3% of Africans do so. When it comes to content over 80% of web pages and 90% of documents on the web are in English despite the fact that the vast majority of the world do not speak it (Brown MM 2000). The question is prudent but should not be ligated to the need for education or health improvements; but how best we can improve the technology so that it can reach the grass roots in an effective way. We need to find new ways to leverage information technology for distance learning, basic health information to patients and practitioners and also weather forecast, crop techniques to farmers in the area of food and agriculture.

The United Nations and its various bodies have initiated many effective programs for better dissemination of information. Rural extension services are implied in the human development projects, so that information can be translated in the local language and according to local environment. Use of information and communication technology (ICT) has become part of modern extension services. FAO with help of Massachusetts Institute of Technology Media Laboratory (MIT Media Lab) has launched a wireless technology that can be used by the illiterate farmers in remote and isolated areas to collect and share information relevant to their day-to-day work: information (FAO press release 20 June 2001). Information and training can be conveyed through voice and images. These can be used either to access information or to transmit and share data on a wide variety of issues including status of crops, market information, or other. So efforts are being initiated globally to level differences between rich and poor.

2.3.4.3 Technology transfer

Technological innovation is an essential tool for growth and development. Improvement in technology is parallel to improvement in the lifestyles, income generation resulting in better standards of living, health, and better social participation in terms of creativity and communication. Especially with advancements in information and communication technologies, there is better participation by people in exchange of information and knowledge sharing and greater transparency in the work. Globalization

has led to partnerships between developing and developed countries. Developing countries harbour the bulk of unharnessed resources that can be efficiently exploited if proper mechanisms, and techniques are applied.

Initially technology transfer was regarded as a private sector business, although governments did have a major role in its implementation. So for a long time it was not considered globally and as a public sector issue. With liberalization of market-based economies and globalisation, constant efforts are being taken worldwide at the United Nations level for transfer of technology to the needy nations but still sometimes they fail to make a visible impact. When a technology is introduced in a place, sometimes the environmental conditions are not suitable, or locals are not capable to use it. Sometimes social problems like corruption and gender issues make it difficult to imply it effectively. On the top if there are intellectual property or patents issues linked, they make it extremely costly for common people to utilize the techniques for reasonably sufficient output. It is also a demand and supply issue depending on the type of the technology being transferred. The need for favourable access to, and transfer of, environmentally sound technologies to developing countries as a part of long-term capacity building at all levels to promote sustainable development was recognized in Agenda 21. Agenda 21 for global development highlighted appropriate mechanisms and effective strategies to apply at national and international level (FAO 1997 Agenda 21 chapter 34).

2.3.4.4 Project design

The United Nations has been very active in human development work, which is basically through introducing various projects covering various spheres of life. But not all the projects that are started are successfully implemented or result in the expected outcomes. Most projects pass through a similar sequence of events from conception of project idea till its implementation. A typical investment project cycle usually follows the stages of identification, design, preparation, appraisal, implementation, supervision and evaluation. Clarity and specificity in project design with traditional instructional objectives have a significant impact on the outcome of the projects.

Much of the success of a project depends on the way it is designed. Project design is a fundamental and crucial step in the success of a project. Project design considerations

include: selection of the location; taking into account institutional, social, market, economic, financing or environmental constraints; the range of different components; choice of the technology in the sense that it should be technically sound; considering organisational arrangements during design of the project so that it is operationally and managerially implementable; and last but not the least, the appropriate time frame (FAO/IC paper 1985). The designed project should be coherent and relevant to the needs and capabilities of the nations. It should be attractive to donors and the intended beneficiaries. Participation of the locals who know the best about their environment can make a big difference in the proper implementation of the project. Developmental facilitation can be aided with decentralized decision-making. Another most important is the legal feasibility of the project, which could be critical at the international level. In agriculture the feasible project designing is important because inappropriate designs is not only a loss of time, money and efforts but their implementation would have a devastating affect on the lives of organisms which could be chronic and epidemic.

2.3.4.5 Project evaluation

Evaluation is the periodic assessment of a project's relevance, performance, efficiency, and impact (both expected and unexpected) in relation to stated objectives (WB 1996). Monitoring and evaluation of the projects is the basis for accountability in the use of developmental resources. Generally any evaluation of the project involves self-evaluation and evaluation by specialized units or expertise. Several criteria and indicators are taken into account during project evaluation. Project managers do interim evaluations of the on-going projects to review its progress, its good or bad effects, to review its performance indicators and as a way to identify necessary adjustments in project design. Recently, mid-term monitoring and evaluations of the projects has been increasing so that alternative mechanisms and strategies could be applied and necessary changes could be made to overcome limitations in project design if required; to avoid future discrepancies and overall impact on the project. Terminal evaluations are required for the project completion reports.

There are many tools for project analysis and evaluation. They also depend on the type of project. Selection of indicators for monitoring and evaluation reflect soundness of the objectives of a project. If the indicators are structuralized, measurable, and could be

comparable with the existing data, it resolves a major difficulty in evaluation Monitoring process includes goal setting, performance measurement and performance diagnosis, corrective or emulation action (WB1996a). FAO and many other international agencies involved in the international projects in many poor countries and since many times the experts and consultants are not native people, midterm evaluation becomes more necessary to evaluate the effectiveness and feasibility of the projects as project designs constantly change due to several reasons. The evaluation process should involve references from the national advisors of the projects for the respective governments. Good project evaluation can even help many countries for policy synthesis for agriculture and in other sectors.

2.3.4.6 Safety of technology

Technology is inherently neither bad nor good. It depends on the way it is utilized. Technological advancement is at the forefront and it is an indispensable tool for development. Rapid technological progression has made a deep impact on the restructuring resources, it has a significant impact on the environment, human beings and markets. It has revolutionized the lifestyles as well as our thinking. Humans have enjoyed the fruits of technology for many decades without giving enough thoughts to long-term effects. One reason could be that it was more of mechanical advancements, which did not directly involve human life, although general environmental concerns have always been there. Technology like all other human activities involves trade offs. Many times the use of certain very critical technologies involves balancing overall benefits and risks. Overall projected benefits may outweigh the inherent risks involved in using technology during any decision-making, which needs to be considered while balancing ethical principles in the use of technologies.

Since the 19th century the science of biotechnology has dramatically developed more than before. Its tremendous power to resolve food related and health related problems is already acknowledged, tested and applied. Given that applications of biotechnology are powerful and there potential is not completely exploited; there have been growing concerns on the positive and negative potentials of biotechnology, especially those involving genetic modification. There are different kinds of fears raised for biotechnology, like changes in the environmental structure due to mixing up of genes and

their escape to other species, loss of genetic diversity, adverse health affects by eating GM food and many other long term effects that are not very conspicuous at present. A very typical example for a long term devastating affect is taken up for nuclear energy. For instance, when nuclear energy was considered safe until explosions like Chernobyl happened, or the way it was exploited in war although nuclear energy has tremendous power if used positively. Also with information technology there are fears about losing privacy. So safety of technology before it is being applied becomes an immediate concern. It is more concern as it directly involves lives of human beings or other non-human organisms.

2.3.4.7 Scientific ethics

Ethically science is neutral. Scientific ethics is a moral responsibility of scientists to give correct and unbiased data without omitting or ignoring any information. Assuming that science is a human discovery and a creation, there are chances of errors. There are sometimes honest human errors caused due to negligence or inappropriate methodologies. However, beyond that there are errors involving deception and cheating. Making up data or results (fabrication), changing or misreporting data or results (falsification), and using the ideas or words of another person without giving appropriate credit (plagiarism)- all strike at the heart of the values on which science is based. It influences scientific progress and undermines scientific spirit of innovation, challenge and discovery. Scientific misconduct infects the entire set of values on which science is based.

Scientific ethics is very important for FAO as a neutral organisation, to provide all the information without any favour and fabrication. One of the important functions of FAO is to conceptualize all the relevant information of its work and fit it into a broad picture of the universe reflecting on the needs and demands of the member countries. Nevertheless, FAO is a secretariat and it has to depend on the member governments for all its information and activities, and sometimes member governments might give contradicting, biased, overstated or understated information, which FAO may, knowingly or not, have to accept and publish. Sometimes giving the accurate picture of the situations of the country may be politically and internationally not suitable for the image the governments. So they try to give incorrect pictures or incomplete figures that significantly influence the total world figures. Although it is undeniable that obtaining, gathering and analyzing data

effectively and accurately is also difficult in most of the poor countries as it involves lot of costs and infrastructure investments. This is an ethical issue of breach of science and scientific truth and sometimes conditional helplessness and inability to acquire and provide true and complete information.

2.3.4.8 Freedom of speech and FAO employees

Freedom of expression is considered as a basic human right, as accepted in the Universal Declaration on Human Rights, 1948. Freedom to think and independently being able to convey your thoughts in the work is always not easy and sometimes become coercion. Coercion restricts freedom of action, not by reducing the alternatives available to those who are coerced but by increasing the cost of pursuing the alternatives they favor (Feinberg, 1980). Employees are compelled to follow certain decisions and obligations, which may differ from their personal decisions and justifications.

It becomes a very significant issue when working in the private sector, which at many times has the obligations for employees to follow a certain set of standards and decisions, which could sometimes conflict with personal judgment. There may be a heavy price that has to be paid if employees deny those obligations or try to pursue other alternatives. It is also seen even in the public sector level when the junior staff has to accept and agree to the senior management decisions. Such coercion may arise when one represents an organisation in meetings or in media, if there is an obligation to represent the views of the organisation above all. Also in project designing or during evaluation, one has to follow the government's or donor agency's views. Conflict of interest is an inevitable issue in any working place, either in the public sector or private sector. Certain organisations have standard training manuals for employees on how to represent themselves. The issue to be explored is to analyze where such conflicts occur in an intergovernmental organisation like FAO. It might make a significant impact on discussions at the international level, if the staff of FAO is expected to simply follow the higher authorities and the voice of member nations without exploring their own expertise. However, there are also issues involved in the undue advantages taken by the staff in the organisations that have the easiest access to information technology.

2.3.4.9 FAO as an honest broker

FAO is an international organisation composed of 184 member countries, to coordinate global activities in the food and agriculture sector. FAO provides a neutral forum where all nations can meet to discuss and formulate policy on major food and agriculture issues. FAO approves international standards and helps frame international conventions and agreements. It also hosts major conferences, technical meetings and consultations of experts. This role as a neutral forum is sometimes a strength and sometimes a weakness. Being a neutral forum and a secretariat FAO is able to avoid conflicts as it voices the only the decisions taken by the member nations, who usually do not want to criticize severely any member nation. FAO secretariat is an honest broker in determining the policies and programs and member nations have confidence and trust in organisation's expertise and experience in working towards the goals of its mandate. It claims to be independent of specific ideological or national perspectives (Reforming FAO report). This role of neutral forum is also a weakness for FAO as it is dependent on the member nations for any international decisions. FAO tends to be reactive rather than proactive. FAO is only a mirror of the global discussions. It has to represent the voice of the member nations without its own judgment. It is a major lacuna as sometimes FAO has to present some data, which it thinks is insufficient, false or wrongly interpreted by the country and the secretariat cannot offend the countries as it works for the goals that are set by the member nations. It can only give independent and free advice but the priorities are set by the countries.

2.3.4.10 Transparency

In simple words transparency is openness of information, access to timely and reliable information. Lack of transparency is deliberately withholding access to information, or providing partial or misinformation. Transparency is a very vivid but difficult issue. It has several attributes to it. Information should be accessible to all in equal terms. Quality and reliability of the information is a strong attribute for transparency. Another important factor in transparency is relevance to be credible to the users (Vishwanath and Kaufmann1999). Increase in the flow of information helps especially in proper marketing and governance. It is also a significant tool in project design and its fair implementation; also in regulatory policy designs, as there are many stakeholders are involved. Transparency helps in avoiding conflicts and contradictions in the work whenever any

developmental work or research is initiated. Transparency is desirable not only for financial stability of markets but also for good governance of any organisation. Transparency is also a way of information dissemination as transparency avoids delay in discussions and further decisions. Transparency within the organisation is necessary for mutual support and consistent advice and planning. Also public disclosure of information sometimes prevents legal matters.

But there are limitations to transparency as well. How much transparency is required and at what level is debatable. Complete openness to information also can lead to corruption or misuse by others. Transparency challenges ownership rights, and the fears of misuse and mishandling demand for intellectual property rights. Very often multinational corporations and other private sector are charged with hiding useful information and exploiting it for their economic and financial gains. organisations should be transparent at a level where it does not become an obstacle in the decision-making process. There are some international civil society organisations like Transparency International that are actively fighting for the information systems to be more transparent and the ways to reduce corruption in the world (TI www 2001).

2.3.4.11 Consumer choice

Success and failure of any product depends on its acceptability by the consumers. The right to choose is the basic right of consumers, based on the ethical principle of autonomy. Technological advancements either in the food and agriculture or information technology have rather confused the consumer, because of either too much information or lack of information. Consumers are common people who generally get swept by the type of information given about the product. In the area of food and agriculture, recent debates on GM food have centered on the issue of consumer choice and it has become an ethical concern with the type of food that should be bought from the market. In forming their views about genetically modified food, consumers weigh the perceived benefits of accepting a new technology against the perceived risks. Since few of the currently available or forthcoming plant and animal GMOs present obvious benefits to consumers, they question why they should assume possible risks (FAO 2001b).

Consumer choice is based on the amount and type of information available for a product. Although there are other criteria that are important to consumers, like trust in the company, historical use of the product, price, for example, consumers have a legitimate right to information about any product they buy. It is related to the issue of transparency in providing relevant and sufficient information about the associated risks and benefits of the product. Labeling of food is considered as a way of informing consumers to make a rational choice. It can be applicable for any product whether it a genetically modified or not. It has been one of the largest voices ethical concerns in the GM food debate. It has also been basis for anti-GM food campaign started by some NGOs. Consumers should be given rational and reliable information. It should be simple, understandable and effective so that people can judge quickly and correctly before buying the products from the market. Consumer choice is also a part of market strategy for many enterprises. Private sector corporations try to lure consumers in many ways. For instance by discount or surplus things, or by stringent campaigns or advertisements involving celebrities. Also by introducing counter products or anti-campaign movements.

2.3.5 Biotechnology

Historically, agricultural research and its role in food production had been considered to be intrinsically good. Its overall norms and values were not widely questioned until the so-called Green revolution and use of chemical pesticides in the 1960s. There is a rising tide of shifting trends in agriculture production to a level where agriculture has been reduced to just the mode of production. Rapid modernization of agriculture is based on the assumption that it will increase production, which ultimately will benefit the poor. Initially, the basic objective of modernization of agriculture was implying mechanization and chemical control methods with improved irrigation systems in a manner that made environment adapted to the crops and cropping systems. Now with improvements in plant breeding systems with introduction of biotechnology, a goal of some interventions is to make the crops better suited to the environment using genetic modification. The basic raw material therefore is genetic diversity.

Humans have been altering the genetic make up of plants and animals for centuries through selective breeding in plants and animals to obtain desired characteristics and particular traits of desired species. With the improvement in the basic understanding of

the biological make up and processes of growth and development as well as increase in understanding of the genetic make up with other molecular and cellular processes, we are now in the position to apply this knowledge in a more considerable manner in plant and animals for agriculture and food purposes. However, there are two basic differences between the traditional selective breeding methods and modern genetic modification methods. Genetic modification enables single, well-defined genes to be isolated and transferred, whereas with traditional methods many thousands of genes are 'crossed' at one time. Secondly, genetic modification allows the introduction of a desired gene from one species, or Kingdom, into another (Frewer et.al. 2001).

The application of DNA technologies, involving genetic engineering to obtain GMOs; recombinant DNA techniques used for the production of transgenic crops and organisms, and somatic cloning has been applied for more than three decades in a wide range of applications in agriculture, medicine, the environment, food production, the manufacturing industry and research. In agricultural areas in many countries, genetic modification is done to grow herbicide resistant crops, insect resistant crops, virus resistant crops, salt tolerant crops, increase in food quality and high yield staple crops (Riddle 2002). In the field of medicine, genetic modification is applied to produce insulin to treat diabetic mellitus, production of human growth hormone, production of blood clotting factors VIII and IX, as well as treatment of cystic fibrosis, and research into human and animal diseases. In other areas it is used for environmental clean up of soil spills, treatment of contaminated land and water, manufacture of useful chemicals such as enzymes, plants providing renewable sources of industrial chemicals. Even with certain positive outcomes of the technology, it has come under sharp criticism and media focus for their potential negative impacts and contingent risks. There is an unprecedented and injudicious uproar because of the irreplaceable potentiality of the technique and the way it can change the course of nature and life. The issue is just not limited to agriculture and food, but goes beyond the animals and humans. It is a multidimensional issue and it has social, economical, ethical and legal implications; along with its discrete implications for the environment and all the biological systems. The United Nations has been active in promoting the safe and justified use of some technology, setting up proper international mechanisms so that the technology is not unduly applied. The conventions have been set up to follow certain responsible code of conducts in research and it should be done in the service of humanity.

2.3.5.1 Organic food

With much opposition to the use of chemical pesticides, with their unwanted and unintended affects on the environment and human health, organic farming developed to use only naturally occurring chemicals as inputs for agriculture. The debate over the use of GM plants and animals lead to producing food without the use of any modern biotechnology methods. "Organic food" is based on the principle of using raw materials from nature without modifying and without the use of any synthetic fertilizers and pesticides. The emphasis on organic agriculture is on using inputs (including knowledge) in a way, which encourages the biological processes of available nutrients and defence against pests, i.e., the resource "nature" is manipulated to encourage processes, which can help to raise and maintain farm productivity (Wynen 1998). Organic agriculture should be considered differently from integrated pest management (IPM) techniques as it completely avoids the use of any "non-natural" materials and techniques. Codex Alimentarius Commission (CAC) describes organic agriculture as "holistic production management systems that emphasizes the use of management practices in preference to the off-farm inputs taking into account that the regional conditions require the locally adapted systems" (CAC 1999).

Organic food has recently become very trendy for some parts of society, with growing concerns over GM food. In the 1990s there was a debate whether GM food could be called organic if it avoided chemical inputs in agriculture. For various reasons, at the end of the 1990s, organic food producers clashed with promoters of GM food. The organic food activists consider their food as a wholesome food without any detrimental affects on humans and environment as it is grown with utmost care and the natural resources are used as raw materials; and they claimed that it is sustainably acquired food. But there are some questions raised about the human health safety aspect of the organic food. There is a view that organic food is becoming more and more responsible for the increase in the food-borne diseases, as it is more prone to bacterial and fungal contamination; and it is capable of getting rotten fairly quickly and thus have high risk of pathogenicity. Such doubts are very significant with regard to food safety and human health concerns. There are also questions over the environmental pollution from organic agriculture, and doubts about whether it is sustainable.

2.3.5.2 GM food

The controversial appearance of genetically modified (GM) food in the market marked the beginning of the new level of public ethical debate with a focus on technology, agriculture and economy. The controversies surrounding GM food, which is one of the major types of "novel food", are debated widely for the reason that genetic engineering allows modifications in the genetic make up of crops, vegetables, fruits and also in animals, and also in the transfer of genes by artificial means, that disregard what appear initially to be natural boundaries. Although humans had been developing ways of improving the food for millennia, genetic modification is more rapid and only desirable characters can be acquired (Donaldson& May 1999). With the technology at hand, it is also being commercially and socially exploited to develop any type of characters that were not possible in the past. The issues have become more complex and intertwined with social and environmental concerns that are also sometimes causing spurious fears among people who are being carried away by the unprecedented Frankenstein stories. The arguments against GM food are many times poignant, lacking science-based evidence. Food and agriculture is also a big business, therefore food manufacturers will never intentionally try to introduce something that would result in deleterious effects on consumers health. There is no scientific evidence showing GM food is bad for health. Most of the current arguments have been emotionally and sentimentally charged, without any factual evidence. Although there are still some questions raised over the health benefits of GM food, especially the lack of long term certainty, lack of clarity has made the issue urgent.

Organisms are genetically modified to acquire more yield, high nutritional content, improve food quality, resistance from diseases, long term storage or delayed ripening etc. Genetic modification provides a great opportunity for solving food insecurity, and malnutrition in the world (UNDP 2001a). The first commercial genetically modified whole food was Flavr Savr tomato produced by a US biotech company called Calgene. It was modified for late ripening, to preserve during transportation and distribution to the market. FDA approved it be as safe as conventional tomato in 1994, Since then a number of crops had been modified for various benefits, especially for insect resistance, herbicide resistance, increased nutritional content. Some of the other crops that are modified include, corn, soybeans, cotton, rice, canola, sugarbeet etc.

2.3.5.3 GM labeling

One of the internationally accepted solutions for the introduction of GM food or in the market for public acceptance was to put labels on foods that had been modified for any purpose. Labeling is a way of information dissemination about the food, so that consumers can make appropriate and rational choice, based on sound scientific evidence. Labeling is not a new method. Internationally recognized barcodes on food and labels explaining nutritional contents or expiry dates already exist on the products. The Hazard Analysis and Critical Control Point (HACCP) is another procedure for labeling that is already being followed internationally.

The issue is not so simple and different countries have different regulations for markets at domestic and international level. The problems in labeling start with, if it is at all necessary to put label or what to put on the label. How much information is necessary and should be provided to the consumers to make their choice? Should there be any international labeling standards or not? What type of information should be given on label? Should it be same for all the GM food? How is it going to effect international trade? What should be the percentage level when a food can be labeled as GM? The Codex Alimentarius Commission (CAC) ad hoc Intergovernmental Task Force on Novel Foods Produced by Biotechnology has developing international guidelines for labeling of GM food, although there are many disagreements on content of the labels (CAC 2002 a, b). There are questions over whether the whole food should be labeled as GM or only ingredients (enzymes in making cheese). Another issue is the system used in safety assessment, based on substantial equivalence, in which food produced through genetic engineering is compared with its natural counterpart for its components and nutritional values. Many countries like EU, Japan, New Zealand and Australia have passed labeling laws, although there has still not been mutual agreements at international level.

2.3.5.4 GM environment concerns

Current debate on genetic modification revolves around two major risks: the food safety concerns and the risk to the environment. Environmental impact studies are generally on the long-term basis and may take decades to fully understand the repercussions. The environmental impacts of introduction of GMOs can be ecological or genetic (FAO 2001c). One of the fears is the invasiveness of GMOs and their unintended

effects on the on the non-target species, through cross-pollination and gene flow. The non-target species may be affected through competition or predation. The competition between the genetically modified crops and its wild relative may cause a burden on wild relatives, which might die out of competition. The grazing animals and birds that depended on the wild relatives for food and breeding are threatened with the change in the environment, and may face mutations that may not be recoverable. There might also be loss in the species diversity as many animal species would tend to migrate to different places for food and nesting.

Introduction of GM plants in the farming systems may require different agricultural practices and different ways of land use and that would likely to have some effect on the growth and development of other plants and also on animals. There are concerns that large scale planting of GM crops are going to create selection pressure on the neighbouring plants to develop biotypes to compete, especially in GM herbicide resistant crops. There are concerns that horizontal gene transfer may change the soil chemistry, which harbors many micro-organisms populations. Also, if there is a vertical gene flow occurs, there are chances of unintended genetic mutation in the relative wild species. (FAO 2001d). One overall environmental impact that is feared is the change or more likely reduction in the biodiversity.

2.3.5.5 GM ethics

Ethics is not as a word, but the concepts and ideologies behind implying ethical norms have been constantly changing throughout history of humankind. With biotechnology and genetic engineering taking the top place in the scientific endeavors and its relation to human life and other forms of life, ethics of genetic modification is a prominent topic discussed in international forums. Debates related to genetic modification have principally focused on plants, environment, modifications in mammals, humans and biomedical research. In agriculture, genetic engineering has generated plants with an innate resistance to pests and tolerance to herbicides, and natural disasters like droughts. It has enabled the production of fast-growing and cold-resistant fish; cloning of genetically enhanced breeds of livestock for better meat and disease resistance; cheaper, more effective vaccines against livestock diseases as well as livestock feeds that increase the animals' ability to absorb nutrients; and its application in forestry has been studied

with a view to increasing useful traits in plantation trees such as poplars. These developments could have a positive effect in terms of environmental impact and farmers' production costs, however, these have been difficult to implement in regular production system because of the socio-economic, religious and ethical concerns. Usually, risk assessment, health and safety trials before introducing to environment and markets have been used as a tool for ethical justifications. But these scientific explanations of safety have been difficult to convey and convince philosophers, sociologists, religious groups, who demand no venture in the natural laws. On the other hand it could be argued that genetic modification is one of the most deeply and widely studied biological science for safety and precautions.

The ethics of genetic modification have been difficult to conclude given the diversity of the prospective implications on the environment and the ordinary lives. Even at the international level, UN agencies have not been able to formulate any regulatory mechanism based on ethical principles alone. Although FAO is the largest assembly of experts from all over the world on food and agriculture issues, its unique nature of being a secretariat does not allow it to take a stand on ethical issues. Nevertheless, FAO initiated an ethics in its priority programs in 1998 for interdisciplinary action across its technical and normative divisions. Other UN agencies like WHO has also initiated ethics programs and guidelines in the medical sector. These could work as a model for many developing countries who can follow them to develop their own programs and policies in the ethical issues of genetic modification.

2.3.5.6 Biosafety training

Since the beginning of agriculture till today, human beings have used, modified and exploited nature for a desirable environment, rather than adapting themselves to natural discourse. With the current pace of environmental degradation and introduction of genetically engineered organisms, there is a big threat to safety of nature in its natural form. To prevent further loss of nature, its biodiversity and other resources, safety of technology has become a forefront matter. Safety cannot be measured directly but could be predicted alone and this fact is the biggest obstacle in practical planning for the application of technologies. The words "safe" and "safety" are ideal concepts, which are desirable, but yet unattainable in absolute terms. It is rather based on evaluation of risks

of applying particular technologies. It is a prerequisite in all the biotechnology developments and all the biomedical research.

It is difficult to define biosafety in one standard definition, as it is considered in different aspects, depending on the processes as well as the entity involved. Interestingly it has not been even defined clearly in the Cartegena Protocol on Biosafety, which is internationally acclaimed. We can consider biosafety as ensuring protection of living organisms and the ecosystem against chemical, physical and biological hazards that may directly or indirectly affect integrity of organisms. Safety of living beings can be threatened in the laboratory, workplace or natural environment. Biosafety is usually measured in terms of risk assessment of the potential hazards, exposure to risks and risk management; containment issues and several other factors are taken into account. Biosafety of GMOs has been internationally debated at various for different reasons, because of its implications on the trade, health and environment.

Developing countries lack technical expertise, human capacity and economic resources to plan, formulate and develop proper programs and regulatory framework for applying biotechnology in agriculture and medicine. Usually technologies are blindly copied without proper assessment of the environment and social conditions which results in failures and big losses. Understanding a technology and applying it in a judicial and proper way, avoiding environmental harm, and other beings of this planet is one of the goals of FAO and other UN agencies to teach to people of the poor countries. It involves training, and giving technical advice and logistical support to governments and also to local people at rural level through training of the trainers who go and rain farmers at community level, extension managers, workshops, help in setting up regulatory framework according to the priorities of the countries. These are aimed at building institutional and individual capacity by sharing industrialised country experiences in biosafety regulations, risk assessment and management of GMOs with scientists, policy makers, and special interest group representatives. The overall goal has been to assist the countries in the region to gain enough knowledge and confidence to take regulatory decisions.

2.3.5.7 Terminator genes

The Technology Protection System (TPS), developed through the efforts of United States Department of Agriculture's Agricultural Research Service (USDA-ARS) and Delta and Pine Land Company (D&PL), now owned by Monsanto, was patented in 1998 for control of plant gene expression (USDA 1998). It aims that saved seeds containing proprietary genes are not being replanted without adequate payment for the technology. One of such technologies ironically named as terminator technology by RAFI, consists of introducing a transgene in the plants that grow normally but produce sterile seeds in the following generation. In general terminator technology involves 3 steps: 1) Terminator genes are added to a crop; 2) Seed company initiates the terminator process before selling the seeds by adding an inducer; and 3) Farmers plant the seeds, grow the plants and harvest mature but sterile seeds.

Terminator technology has been the focus of much attention. The promoters of Terminator Technology and Technology Protection Systems hope that it would prevent the transgene movements. Also non-viable seeds produced on TPS plants would prevent the possibility of volunteer plants where rotation is practiced (D&LP www 2000). But there has been growing concern about its impact on the poor farmers of developing countries who generally practice saving the seeds for the next season. Other related issues include loss in biodiversity, economic viability, concerns for food security, domination of multinationals and threat to free market and global economic liberalization process. This controversy has generated other issues related to the use of other Gene Use Restriction Technologies.

2.3.5.8 Monsanto

Monsanto is one of the most infamous multinational agri-biotechnology company. Monsanto company symbolizes crop biotechnology. The controversies revolving around Monsanto have made it more infamous for its achievements rather than appreciation. Initially started as a company producing chemicals for food and pharmaceutical industries, the agriculture division was created only in 1960. Since then the company has been involved in production of insecticides and herbicides until venturing into agriculture biotechnology in the beginning of 1980s. The first genetically engineered product for the company to be brought to market was insect protected potatoes and then most infamous

herbicide resistant roundup soybeans (Monsanto www 2000).

Monsanto has been in the center of some of the famous controversies regarding GMOs. Some of them include the Bollguard cotton, which is a variety of Bt cotton, where Monsanto claim that transgenic Bt cotton can control 90% to 95% of the damage caused by bollworm. There have been tests and studies conducted on its environmental affects and also the effectiveness of the transgenic cotton. Controversy is still not settled and there are claims and counterclaims from the scientists on various aspects of this transgenic crop (Hagedorn 1997). Another controversy in which Monsanto was involved, was regarding the use of rBGH milk, which is produced using Monsanto's recombinant bovine growth hormone. It is alleged to be harmful to cows and also humans. rBGH is trade named Posilac, and is also known as recombinant bovine somatotropin (rBST). Monsanto did not release the sales figures although it claims that it has become the largest selling dairy animal drug in America (Akre 2001) One controversy also revolves around Alachlor, herbicide produced by Monsanto, considered to be a carcinogen. It is believed that during experimental trials, exposure was done well below the carcinogenic level to prove it as an acceptable risk (Hatfield 1999). And the last but most famous controversy is about the Roundup ready soybeans that that were developed through genetic engineering to be herbicide tolerant. the soybeans resist Roundup which is Monsanto's trade name for glyphosate, the largest selling herbicide in the world. Roundup Ready Soybeans require the use of Roundup during the entire growing period. Farmers, environmentalists and consumer groups have expressed growing concern that the use of the soybeans may lead to greater chemical use in agricultural fields. By entering into an agreement with Monsanto, farmers will no longer be allowed to stockpile their seeds. They will be required to buy Monsanto's Roundup Ready Soybeans with each planting season (Dean 1998).

2.3.5.9 Animal cloning

Animal cloning dates back to late 1800s when Hans Dreisch produced cloned two sea urchins by splitting 2 celled embryo (Catholic World News 1998). Since then there were many attempts in cloning animals and the first successful cloning in vertebrate animals was reported in 1952 in lower phyla especially amphibians like frogs and salamanders using embryonic cell lines using nuclear transfer technique. Successful cloning of Dolly

initiated a new era of cloning of mammals using adult differentiated somatic cells with the same process. Subsequently there are many attempts made to various animals for different purposes, although the success rate has been very limited.

Animal cloning has been used in commercial farm production for good meat, good leather or wool, milk or even for medicine is considered. Already there are successful attempts to transfer human genes that produce useful proteins into sheep and cows, so that they produce, for instance, the blood clotting agent factor IX to treat hemophilia or alpha-1-antitrypsin to treat cystic fibrosis and other lung conditions, also naturally occurring polyclonal antibodies for which at present there are only human donors. Other advantages involve cloning of endangered species, study of serious animal diseases or cloning of dead pets is considered another advantage by some. Nevertheless, animal rights activists have raised many objections and ethical concerns. Objections include the shortening of life span of cloned animals, human selfishness, against animal rights and that human beings have a duty to respect animals. It resulted in banning of food and food products from cloned animals. However, recently some governments have started to lift the ban after safety tests. For instance, the Japanese Ministry of Agriculture, Forestry and Fisheries announced on 14 August 2002 that beef and milk from cows cloned from the cells of adult animals are safe, and the meat can be consumed.

2.3.5.10 Human cloning

Human cloning refers to the production of genetically identical human beings either by embryo splitting or nuclear transfer. Since cloning of *Dolly* it is one of the most debated topics. The idea of extending the technology to create humans has sparked scientists, religion, politics, ethics and industry and even ordinary people generating many traditional ethical and religious concerns. Religious groups have named it as something "playing with God" or interfering in natural law. The Vatican Church called for an immediate ban on human cloning stating that it is procreation of life in the laboratory with radical manipulation and giving an industrial approach to production of human beings. (McCullough1999). Other religious groups of strong faith also added comments saying that soul cannot be duplicated or each human being is born in the image of God. Ethical concerns are raised for losing our uniqueness and our sense of "self", uncontrolled scientific endeavor to create a " brave new world". The Human Genome Organisation

(HUGO) Ethics Committee also made a specific statement calling for caution and acceptance and upholding of human dignity and freedom; acknowledging the possible effects on clone in society (HUGO Ethics Committee 1999). The fear of cloning is to produce a technological human being, which could be identical with those existing or ideal in performance.

Nevertheless we cannot ignore the potential medical benefits of the technology if applied in a sensible way with a good purpose and honest motivation of doing no harm. Somatic cell nuclear transfer technique could either be applied for reproductive cloning or therapeutic cloning. Reproductive cloning has been suggested as a last resort for couples who are unable to conceive via any other method and wish to have biologically related child. Therapeutic cloning is meant for research and treatment of some genetically inherited diseases, spontaneous mutations, which involve creating embryos and stem cell lines. Cloning for therapeutic purposes has also come under criticism for creating a potential human being and a life and later destroying it for our own sake. Many people regard an early embryo as an individual with fundamental human rights and thus its destruction is equivalent to murder. It is one of the reasons that many countries have banned creation of human embryos for research and treatment. However the American Society for Reproductive Medicine has declared that human cloning by artificial embryo splitting was an ethical procedure for infertility treatment (ASRM 2000). Also in scientific debates there are many practical obstacles debated like low efficiency and frequency of developmental abnormalities etc. Over all, the scientific and ethical debates surrounding cloning are largely based on creation of life or when does life begin? The debate is not yet conclusive due to insufficient empirical evidence to convince that technology is intrinsically safe or unsafe.

2.3.5.11 Vaccines

Traditionally vaccines were manufactured by injecting infectious, weakened or dead bacteria into an animal to which animal's immune system produced defensive antibodies. They were later removed as a vaccine for human use. In that process, there were lot of animals sacrificed, the method had been slow and less cost effective. Genetic engineering has provided an alternative to make new, highly effective types of vaccines to protect animals or humans from diseases. Vaccines can be made quickly, cheaply, in large

quantities and without the need to use animals. It involves removal of DNA from disease causing bacterium, genes carrying the code for the protein being cut and inserted into DNA of yeast cells that later produces the proteins that could be used in the vaccines. These have been termed as "DNA Vaccines". They have become a common use in medicine, veterinary medicine and fish farming. However there have been doubts about the success of such vaccines for a long time arguing that many first generation live, genetically engineered vaccines are inherently unpredictable, and possibly dangerous.

Because of problems in delivery of vaccines to remote areas, and lack of effective vaccines for many infectious and contagious diseases, there have been attempts to produce vaccines in the plants and fruits in the edible form, which is easier to administer to children. For instance, potatoes and bananas that might protect against Norwalk virus, a common cause of diarrhea, and potatoes and tomatoes that might protect against hepatitis B. Edible vaccines offer exciting possibilities for significantly reducing the burden of diseases like hepatitis and diarrhea, particularly in the developing world where storing and administering vaccines are often major problems. In developing countries many times vaccination programs fail due to high cost and logistical issues, such as transportation and the need for certain vaccines to be refrigerated, which thwart effective vaccination programs.

2.3.5.12 Product substitution

Product substitution refers to synthetic production of naturally occurring products. The food industry is flourished with tailor made products that match the taste and effectiveness of the naturally occurring products. They are either produced as cooking aid, health care products, pesticides and animal feed or feed supplements and as fuel. Vanilla, salt, yeast, gelatin, proteins and vitamins like Cobalamine and riboflavin are some examples of synthetically produced ingredients commonly used in food as substitutes. In agriculture there are examples of synthetic pesticides and herbicides being used for pest management or use of synthetic BST in animal farming. This substitution makes the products readily available and affordable for ordinary people. Some of the advantages of such synthetic production is that it is cheaper, readily available, long life so that can be used as preservatives, enhanced flavor etc.

The issues come up for adverse health affects and environmental affects. There are issues of labeling of synthetic ingredients to inform people to avoid adverse health affect to those allergic, are often debated. The religious followers have also debated on this issue depending on the source of origin of the synthetic components. For instance, use of synthetic glycerol is sensitive to Muslims, if it is of animal origin (www.soundvision.com). Animal rights activists raise animal rights and welfare issue in the use of synthetic products being used in animal feed. Environmental concerns in using synthetic pesticides have long been debated in history. Product substitution is being considered to grow more with biotechnology entering food and agriculture, hence the issue is hotly debated for ethical concerns.

2.3.6 Sponsorship and funding

Sponsorships and funds are generated for scientific and social research, developmental programs at national or international level, or as an aid for something. Sponsorship is a support in any form like money, infrastructure facilities, information provision etc where as funding is usually considered only as monetary help. Many times such donations become a payoff for specific outcomes. The authenticity of such donation is questionable if particular results show some very evident favour or satisfy some demands of sponsors, especially if it is a public institution or public research. The issue becomes more critical if the sponsoring agencies are private companies or independent foundations because of non-trustworthy image of the private companies. Government sponsorship or other international public funding is usually considered neutral with no hidden agendas.

Several issues come up while accepting grants or sponsorships from agencies. The issues start from who is sponsoring which project and amount and the type of sponsorship is done to the organisation. The people involved, selection or rejection of specific projects or certain approach to projects that might be attractive to sponsors, not revealing the complete and true outcomes and there are many more that can be considered. Sponsorship and funding is an important issue not only in conducting scientific research but also in developing programs and policies for the countries as it directly affects the communitarian development in countries.

In response to demands by the developing countries the Economic and Social Council of United Nations (ECOSOC) established a commission on transnational cooperations with a mandate to negotiate the code of conduct for transnational corporations (TNCs).

2.3.6.1 FAO sponsorship

FAO is directly involved in designing and implementing projects at global level. It gives practical help to developing countries through a wide range of technical assistance projects. It has a specific investment center and Technical Cooperation (TC) Department that has the overall responsibility for the operational activities of the organisation, including policy assistance, investment support and the overall management of activities. The TC Department mobilizes resources for operational activities from governmental, private sector and other non-governmental sources. FAO is not a funding agency so it depends on others for its operations. Basically the Ministry of Agriculture of different countries provides funds to the core budget of FAO and there are extra budgetary funds for international development programs to which usually Ministry of External Affairs or Ministry of Finance of countries donate. FAO also creates trust funds for bilateral or some multilateral programs to which other international organisations donate.

In sponsorships and funding projects, ethically, donors and recipient need not to know each other. However, at practical level, lot of issues might come up when FAO seeks funding from different agencies. Being a secretariat FAO has to follow the demands of the member countries and it does not hold the authority for decision-making. Sometimes countries don't have the capacity to properly define their priorities and agendas before seeking funds, especially developing countries. Donors also demand some specific targets if the contribution is big. Funding and sponsorships sometimes is not enough or very slow to propel the projects to the end.

2.3.6.2 Corruption

Corruption is one of the most vividly discussed topics in the media all over the world, especially corruption at highest levels. It is a universal problem of both developing and developed countries. Corruption is found in every section of society, be it politics or bureaucracy governance or private industry which suffer the most, or academics, scientific research, media, or ordinary citizens. All the countries suffer from corruption at

one or the other level. It is possible that United Nations, which is considered as most trustworthy by people may also face problem of corruption. It is very difficult to define corruption as it has different patterns and different manifestations. It may be at individual level or collective. The working definition of the World Bank is that corruption is the abuse of public power for private benefit (World Bank). So corruption poses fundamental questions about the relationships and boundaries between public and private interests. The main forms of corruption are bribery, embezzlement, fraud and extortion (Amundsen 2000).

Corruption is seen as counter-productive to the much needed economic and political reforms, accountability, transparency, and good governance. It affects socio-economic development with ultimately the deepest impact on individual human beings. Corruption and human rights have common grounds. It deprives human beings from exercising their rights or restricts them from fully exploring their potential. It perpetuates discrimination and leads to infringement of rights. The impacts of corruption may be social, political, economic, and ecological. Corruption is most prevalent in poor countries like Uganda, Nigeria with Bangladesh on the top; and some richest countries being least corrupted led by Finland, Denmark and New Zealand (Transparency International 2001). This emphasizes that Corruption is widespread in developing countries and has very serious repercussions on their peoples' quality of life - above all that of the poor and disadvantaged.

There are many anti-corruption campaigns started by various governments and international organisations but it is still persistent. The Global Programme against Corruption was launched in 1999 by the Centre for International Crime Prevention (CICP) of the United Nations Office for Drug Control and Crime Prevention (ODCCP), in collaboration with the United Nations Interregional Crime and Justice Research Institute (UNICRI), to assist Member States in their efforts to curb and prevent corruption by increasing the risks and costs of abusing power for private gain.

2.3.6.3 Company money is corrupt

The image of the private sector is that it is always profit oriented and is not sensitive to the terms like ethics or morality. Companies equal corruption is a mindset for public

sector. Pharmaceuticals, life sciences companies or natural resource companies are well known for political party financing for bureaucratic and political favors for markets. They allure people by giving them free gifts and financial support to seek favors. Since the profit margin for private enterprise is usually big because of the efficiency and care for the costs involved, they are expected or sometimes forced to enrich the public resources by sponsorships as a mutual understanding between public and private sector cooperation. Companies also face this problem of "forced financing" if they wish to pursue some goals in a special trade or environment, which is considered as a trade off. Nevertheless corporate participation is also very necessary for industrial and economic development of a country or their aid sometimes can be very important for information sharing and information dissemination, for instance donations for holding conferences or distribution of information through brochures or papers.

In the past few years, big multinational companies are known to have developed their codes of conduct on issues that top the international agenda. Some dismiss this approach as a public relations strategy to ward off government regulations and make companies look good to the consumers. It is needless to say that for good businesses, good name and good image is a selling point. Proponents argue that voluntary standards help companies to be flexible and easier to implement their business than traditional regulatory systems. They set up foundations or donate to international organisations for various humanitarian aid and developmental programs. Ethically, donations are meant to be with no strings attached. Whenever the donations are accepted it is important for national and international organisations to see the characteristics of the enterprise, its business and reputation.

2.3.6.4 The World Bank

The World Bank is one of the main leading international public organisation dealing with financing of the projects to the member countries and multilateral developmental programs. Founded in 1944, World Bank has since then focused on developing countries for stable, sustainable and equitable growth. It emphasizes need for investment in health and education, while focusing on social development through good governance and poverty reduction. By giving loans, policy advise and technical assistance to poor countries, it helps in strengthening the ability of the governments to deliver quality

services, efficiently and transparently, protecting the environment, supporting and encouraging private business development and promoting reforms to create a stable macroeconomic environment, conducive to investment and long-term planning (WB 2000).

There is a mutual inter-dependency between FAO and World Bank. FAO depends on financial support from World Bank in return for its expertise for projects. However, it is felt that World Bank's operational directive sometimes is stringent for programs and developmental aid. Being a financing agency, it can affect the direction of a project from its original design that suit its priorities, although there are very rare cases known about such interference that have led to dramatic changes in project design or the outcomes. Therefore World Bank plays a crucial role in international development, especially in poor countries.

2.3.6.5 Private sector

In common understanding, the private sector is considered as big industries, multinational co-operations that are for profit organisations that have vested interests. They are so big that it is difficult to understand their agendas, strategies and motives. New patterns of globalization have accelerated the internationalization of industry and helped in reshaping industrial structure and image at the global level. In the past few years there is a general acceptance among people working in public institutions that private sector participation is unavoidable and their involvement is necessary for development. At international level, United Nations Organisations like, UNDP, FAO, WHO and the World Bank have developed strategies and policies to work closely with "big private sector" in all sectors. Problems come when some of the interests of private sector is not endorsed by public institutions.

Various guidelines are produced for partnership with private sector. For example, FAO policy for partnerships with private sector (FAO 1999). However many of the guidelines do not define what a private sector is? Theoretically we can categorize private sector into two types, namely big and small and other non-profit groups. Big private sector refers to the companies and big enterprises that are involved in more than one kind of trade. Small private sector may be a small shops or small scale farmers that do their business at local

community level. Whenever partnership programs are established or policies are made they are made with keeping big private sector in mind. However, it is necessary to make a distinction for big and small private sector. Small private sector faces big challenge in the era of globalization and liberalization. They face huge competition with big private sector that dominates the markets and influence global governance. In the policies for trade and private sector participation, this small-scale private sector has a perspective of "stakeholders", which sometimes influences their equal participation.

2.3.6.6 Developing/ developed divide

The term 'developing countries' is used to refer to much of Asia, Africa and South America and contrasts these with 'developed or industrialised' countries where industry and agriculture, health care; research and development are more industrially advanced, as in Europe and USA. This distinction is a common consideration whenever things are pursued in practice at international level. Be it a technological innovation, policy development, market strategies, or scientific adventure, the gap does has significant implications. More than 80% of the world population lives in poor countries, and the gap is considered widening rather than narrowing. The gap exists in all spheres of life whether it is economics, health care, industrial, education and knowledge, environment or technology, digital divide, lack of expertise and most importantly the quality of life. Market-driven processes of globalization, integrating national economies into a world economy, is an asymmetric one, with some winners but many losers, and widening the economic disparities among nations, and income disparities among peoples, even as it creates aspirations for consumption patterns and life-styles that cannot be sustained socially, culturally, politically or environmentally. Some reasons for the gap could be the social structure and cultural differences and conventional priorities for development (Bhardwaj 2001).

The fundamental question is why the gap is increasing despite global efforts being taken at international and local level? How does it affect developing countries at global level? Every UN organisation or other international bodies are actively involved to lower the gap through financial aid, practical aid through infrastructure development and technical expertise at government and community level. Examples are also seen in private sector participation in developmental projects. The reason for failures depend more on

developing countries that they lack capability to exploit their own tangible or intangible assets and generate new knowledge and technical competence that could be suitable to their respective environments. Lack of resources, either financial, expertise, knowledge flow, basic infrastructure all make it difficult to bring evident developmental changes. The issue has become more pivotal with advent of biotechnology in agriculture and medicine. In agriculture, genetic modification for better crops and yield; in medicine it is genomics for health care and disease eradication is typically talked. This gap not only affects international trade, environment, lifestyles but also equal participation from developing countries in the United Nations either as a technical expertise or in decision making which could divert the purposes and selection of policies and programs.

2.3.6.7 Donor vs. recipient demands

International projects and programs are carried out by donations to the agencies, and also by international banks and financial institutes. FAO's projects are financed by rich donations from the wealthy member states and also by the World Bank, IFAD, and also by regional development banks, like Agriculture Development Bank. There are also sponsorships by private firms, especially the agriculture companies and foundations. Member governments donate to the core FAO budget to carry out FAO's regular program of work. However, there are also bilateral and multilateral agreements that can take place outside of FAO's jurisdictions, in that case FAO's technical expertise is still needed in the field.

Ethical issues may arise when donor agencies select particular projects and put conditions on the process of the projects. Ethically donations should be unconditional, however it is usually not the situation. Sometimes donor agencies select a particular project for a particular recipient country that may not be the first priority of the recipient countries, which might influence project implementation and may be a misfit. It is especially a concern for developing countries that come under pressure because of economic compulsions that may hinder the aid in the other areas if they do not agree to the demands of the donor countries. It may also be an ethical dilemma for FAO when donations are done extra budgetary, for instance to the FAO's trust fund that is made especially for the bilateral or multilateral partnership programs for which FAO provides its expertise. It may happen that sometimes donor agencies may cut their funds in the

middle of the projects, if they are not satisfied with the development, in which case finding a new donor for the completion of the projects is a difficult task.

Moves are currently under way in some industrialized countries to reduce foreign aid. Although such cuts will undoubtedly retard economic growth and social development in developing countries, donor governments inevitably evaluate their foreign aid programs not only as altruistic activities, but also as political and economic investments. Reductions in support for aid to agriculture are often buttressed by the fears of some donor country producers, who believe that rising production in developing countries will take away export markets. *Foreign Assistance to Agriculture: A Win-Win Proposition,* an IFPRI Food Policy Report, argues that by making such cuts donors may be harming both developing countries and their own economies. The report shows that the concerns of developed-country producers are unfounded and that foreign aid to agricultural research not only generates broad economic growth in recipient countries but also creates developed-country employment by expanding developing-country imports (Anderson et al 1995).

2.3.6.8 Governments

Governments and governance are inseparable although they are different. The State has to play an activist role for good governance, though this could be different in different societies and depends on their stages of development. It is the duty of each government to ensure long-term sustainability, avoid social upheavals and breakdowns, and also a responsibility for outcome of environmental degradation and social insecurity as a result of unsustainable global patterns of production and consumption. Governance include some basic attributes for governments like its accountability and responsiveness to people's need. It has to be participatory and it should have the goal of consensus building both at national and international level, it should be transparent, effective and equitable. However, conflicts come up when the objectives are not clearly defined, also when are not compatible at cosmopolitan level.

UN specialized agencies like FAO which work as a podium for international dialogue and discussion are confronted with satisfying needs and demands of the member nations. Being an honest broker and a secretariat FAO can only provide suggestions but cannot enforce the suggestions. So the role of good and honest government is essential for

international reforms. Their deeper and wider participation and a source for complete, genuine, reliable, efficacious information would be key for international organisations to do a good work. One irresponsible government can affect many other countries that are trying to achieve similar goals. Corrupt governments may not like to show authentic figures or give actual account of the existing situation within their countries, which may result in wrong, incompletion of reforms and capacity building programs with a waste of time, resources and expertise.

2.3.6.9 International laws

One of the roles of United Nations is to establish internationally binding laws, conventions, guidelines or UN declarations, and agreements and other regulatory mechanisms. Such mechanisms are formulated to ensure coherence and consistency in policy integration in the economic, social, health, agriculture and environmental and trade, and human resource development at global level. Although governments are primarily concerned with national needs but there is an increasing realization that many of the relevant issues transcend political boundaries and are, in fact, global by nature. Typical examples are environmental protection, natural resource consumption, sustainable development and climate change, and their ultimate affect local they affect local. They help to create an ethical environment in where countries have to balance their priorities and set their agendas on cross cutting issues. International regulations help countries to formulate their domestic laws as an example where majority of the people agree. The importance of internationally binding legal conventions was also deeply discussed in the 56th General Assembly in the year 2001 (UN press release 2001).

International binding regulatory mechanisms result in political and legal obligations on governments; signatories to them have explicit requirements and privileges to them. This may sometimes counter balance with domestic laws or even with other international treaties. Since each international treaty is a responsibility of the UN agency which is most closely working in that sector or is directly linked, many times some issues get overlooked considering responsibility of other agencies or to be addressed by other treaties. It also impacts prerogatives of those who are not binding to it, which might have far reaching implications for nations, especially poor countries. Another aspect to it is that

sometimes, rich countries dominate on articulation of treaties that might be beneficial to them.

2.3.6.10 Over-regulations

As discussed in the previous section, international conventions are important for global good. There are certain global issues like biodiversity or climate change where there are several international regulatory mechanisms addressing them. For instance for biodiversity, apart from Convention on Biological Diversity (CBD), there is Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on the Conservation of Migratory Species of Wild Animals (also known as the CMS or the Bonn Convention), Convention on Wetlands (known popularly as the Ramsar Convention), the World Heritage Convention (WHC) etc all addressing similar issues (UNESCO 1972). Cooperation and synergy between international regulations that address the similar issues is essential for addressing and resolving the issues completely. A good example of such cooperation is seen with conventions that address biodiversity and other related issues, where CBD and other global conventions have taken steps to have joint efforts to address issues (CBD www). There are also international laws and agreements that may be more stringent to follow for the nations.

All these international regulatory processes in themselves encapsulate the strategies and frameworks that countries can follow. However, it may also pose problems for the countries when they enter bilateral or multilateral trade or negotiations. The transboundary nature of international corporate governance faces this problem a lot. Be it a TRIPS agreement or Biosafety Protocol during negotiations. It is also an issue for the UN agencies when they try to do field work at local levels. Countries may be signatories to some may not be signatories to others, which make it difficult to organize and implement reforms and development programs. This is also a concern while formulating new mechanisms, there are chances of overlaps or contradictions in making statements.

2.3.6.11 Trade barriers

Globalization of market-based economy has called for changes and addendums in international trade. At the present time business is no longer a bilateral issue, but rather a multilateral issue with outward-looking economy. The General Agreement on Tariff and

Trade (GATT) was negotiated based on this philosophy, leading to the establishment of WTO. Trade has become a tool not only for economic prosperity but it is also used for cementing relationship between nations, ensuring peace and prosperity. Negatively, trade is also used as a barrier for economic development. Sometimes if they do not succumb to the demands of the rich countries they are drifted away with trade barriers, where their domestic products loose the markets abroad and thus fail to bring foreign exchange. Also sometimes the standards for exports are set based on developed economies, which becomes a barrier to trade as the products of developing countries do not qualify those standards. Domestic pressure on the local industry grows if the multinational companies launch their products in the developing countries markets.

Especially with biotechnology venturing into food and agriculture, the issue of trade barriers has become more crucial with developing countries trying to reach out to technology and economic gains. Issues of biosafety, safety of technology, methods of risk analysis, risk management or what percentage should be considered as GM, issues of process versus products and issue of traceability are some of key issues usually taken up for debate. The deepest affect is on human lives in food and agriculture trade because right to food is a fundamental human right and should not be considered as tool for any kind of settlements. An example was seen in the gulf war in early 1990s, when FAO launched a food for oil trade in Iraq (FAO 1996).

2.3.6.12 World Trade Organisation (WTO)

The World Trade Organisation (WTO) is the responsible governing body for international trade. Its role is to help trade flow as freely as possible, to achieve further liberalization gradually through negotiation, and to set up an impartial means of settling disputes. Established in 1995 after Uruguay round meetings on General Agreement on Tariff and Trade (GATT), WTO has since then been actively involved in negotiations and agreements for trade in almost every kind of international trade, from textiles to food. Basically it looks into goods and services, intellectual property and dispute settlements (WTO 1995). About 100 of more than 140 member countries are developing countries of WTO. One of the roles of WTO is to make the trading lines less rigid between developed and developing countries. However, in practice there are always certain sectors where problems remain, for instance, fundamental reforms in agriculture trade and the

environmental concerns that come up during agreements, and WTO has no specific agreement dealing with environmental issues although there are certain provisions in other WTO agreements. For example, GATT article 20, GATS article 14, TRIPS article 27; TBT and SPS agreements. The Tuna-Dolphin dispute is a famous example of existing lacunae in WTO agreements.

With GMOs coming into agriculture and food, and agriculture-based industries, it has a deep impact on trade. The primary issues of subsidies on export goods, competition, restrictions and market access and other trade distorting issues have become more intense with genetic modification. Issues of food security, food safety, rural development, food aid, consumer information and labeling, animal welfare, safeguarding environment are also touching WTO's regular agenda. Therefore WTO started considering "non trade concerns" in agriculture negotiations recently after Doha meeting in 2001. The governments agreed for "*special and differential treatment for developing countries shall be an integral part of all elements of the negotiations and to be to be operationally effective and to enable developing countries to effectively take account of their development needs, including food security and rural development and confirm that non-trade concerns will be taken into account in the negotiations as provided for in the Agreement on Agriculture*" (WTO 2001). With WTO handling business of food and agriculture, and FAO implementing food and agriculture, the compatibility between the programs and polices of FAO and the agreements for trade in food and agriculture becomes necessary for environmental sustainability and cooperation between countries.

2.3.7 Environment

All the issues related to biotechnology and other industrial innovations are related to the environment; whether it is the natural environment or the environment as surroundings like socio-cultural, economic and trade, national and international politics. However, scientific and industrial endeavors pose direct harm to nature which constitutes the physical environment and which is the soul contributor to human existence. Since the beginning of agriculture as a practice, human beings have adapted nature to create their own environment. Human beings have known the extrinsic value of environment with the notion that nature is a "life-support system" and with human intelligence it can be best used. Starting with selection and choice of food to fly in air, every venture has an impact

on nature. The intrinsic value of nature had so far been neglected; but with consequences becoming weighty and immeasurable and the realization of human beings obligation to "mother nature", there is a realization of that value with a feeling that loss of nature is loss of life, there is a sudden momentum where environmental consequences are foremost consideration in any domestic and global negotiations and technological modernization.

Environmental impact assessment studies have become a regular part of any analysis. The studies are done for all ecosystems depending on the technology. However, environmental conditions in each region and each country are different so each innovation will have a different impact on each region. In agriculture production systems, the natural vegetation and wildlife, with water and land ecosystems are directly affected. Loss and damage to one ecosystem would have severe consequences to whole environment. However, the importance of which natural things may be culturally different and diverse, for example certain cultures have a spiritual and religious importance for environment, some people may praise just because it is beautiful or it exists. If we consider agriculture as a social activity, social environment and cultural values would also be somewhat contributive to perish or flourishing environment, with technological invasion. Although it might be arguable how far we should environment? Should we lose human lives at the cost of saving environment? What is an ethically acceptable interference in nature?

2.3.7.1 Biodiversity loss

Biological diversity or biodiversity is the totality of genes, species, and ecosystems in a region that constitute the wealth of life on earth. Biodiversity can be divided into hierarchical categories -- genes, species, ecosystems, and culture -- that describe quite different aspects of living systems. For millennia, the natural barriers of oceans, mountains, rivers and deserts provided the isolation essential for unique species and ecosystems in a region to evolve. Globalization with free trade and tourism provided opportunities in spread of species either accidentally or deliberately resulting in inadvertent ending of millions of years of biological isolation. Global estimates reveal that there are only about 10 million species in all existing and less than 2 million have been classified, which is estimated as more than 95% loss of total species that once existed on this planet.

Paleontologists consider that human contribution to extinction started less than 30,000 years ago when hunting of large mammals apparently caused or contributed to significant extinctions in North and South America and Australia. These three continents lost 74 to 86 % of the genera of "megafauna" (WRI 2000). The root causes for biodiversity loss is considered as deforestation with progressive agriculture development for ever increasing population, overconsumption of natural resources, environmental pollution through industrial development, ineffective regulations to prevent loss and human beings careless attitude safeguard nature, are some primary reasons for loss of biological diversity. It is projected that maximum threat to the wildlife is in Asia and Pacific regions. With introduction of GMOs the magnitude of this loss is feared to be deepen. Fears include accidental gene flow resulting in erosion of native varieties, competition between native species, loss of pests and other insects, microorganisms, loss in plant varieties, fear of monoculture etc are some of the concerns. In food and agriculture, biodiversity directly contributes to increase productivity, adaptation of crops and other organisms, helps in maintaining ecosystems, moreover help in developing ecological knowledge of the farmers.

The secretariat of the United Nations Convention on Biological Diversity (CBD), FAO, UNEP, UNDP are some of the agencies that are directly involved with safeguarding biodiversity and preventing further loss. IPPC under FAO, CBD, Biosafety Protocol under CBD, CGIAR, UNCCD, UNFCC, SPS under WTO are common international working mechanisms for issues related to biodiversity.

2.3.7.2 Sustainability

In simple terms we can say sustainability is the ability to keep something in existence and going. Global sustainability is a complex issue that enfolds environment and use of natural resources with climate change, global production systems for sustainable economies, human beings and their cultural diversity with goal of global equity. Expansion of agriculture land with increase in technology friendly production systems has caused erosion and loss of land, water and natural habitat. Industrial pollution has added to climate change and increased threat to human lives. It has affected ecosystems, human resource development, their cultural values and aspirations leading to increase in gap in the quality of life. Loss of biodiversity, waste production, diseases, unclean environment

are some of the consequences of too much human intervention in the nature. According to FAO, sustainable development in agriculture refers to the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for the present and future generations. Such sustainable development (in the agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable.

There is a general acceptance that the imbalance of present world economic conditions makes it extremely difficult to bring about sustained improvement in the world's environmental situation; accelerated and balanced world development and lasting improvements in the global environment require improved world economic conditions, especially for the developing countries. Hence sustainable development or sustainability of resources with human development has become a global talk, and is a part and parcel of any developmental framework. In 1972, the UN Conference on Human Environment initiated the process of a global initiative for developing a sustainable future. Twenty years later, the Rio Declaration on environment and development set an agenda for the governments to look for the broader perspective of the sustainability emphasizing on conservation of natural heritage with a human development strategies (UNEP Rio Declaration 1992). The United Nations Agenda 21 also includes means and measures for acquiring sustainable development strategies for nations, focusing on transfer of environmentally friendly technologies and role and the use of the sciences in supporting the prudent management of the environment and development for the daily survival and future development of humanity (UN Agenda 21 1999).

2.3.7.3 Future generations

Consideration for future generations well being starts at individual level, with all human beings trying to provide best for their offspring. It is also a universal moral ideal to think best for our forthcoming generations. Human activities with market oriented goals and exploitation of natural resources have resulted in the present deteriorating condition of the environment. It is expected that in the next 30 years more than 3% more of the earth surface will be absorbed into cities with disastrous affect on wildlife and

biodiversity, acute water shortages, depleting natural resources and increase in air pollution. There is not a single ecosystem left which is not in a perishable situation. This is an eye opener for present generations also; if the projected trends are continued. If we consider that human beings are at center of concerns for sustainable development and our future generations have a right to healthy and productive life in harmony with nature; urgent steps are needed to save what is not lost. These should be universally acceptable and practically equitable and applicable.

The choices we make today whether at individual level or at global level have serious consequences on the future of human existence and other organisms as well. The earth is poised on a precipice, and time is running out for making tough political and economic choices that can pull it back from disaster. Global partnership and joint efforts are needed to meet equitably the needs of present and future generations. We have a duty to leave a healthy and viable world for our future generations. The quality of life for the present generation should not be compromised with leaving an unsustainable environment for future generations.

2.3.7.4 Liability

Liability is a legally enforceable obligation. Liability makes a legal responsibility to two parties conducting business not only to each other but also to others that might be affected in that process. It is used as a tool against keeping trade secrets and accidental or intentional damage done while performing something. Domestic liability laws have been common in the legal system. Liability has been used in business, health, scientific research and employment as tool for social justice. It is a tool to redress unfair and wrong issues arising between the two parties while trading and partnerships.

Establishing a liability regime is now a common agenda item in UN agreements and negotiations as well. Especially, in the negotiations related to environment and agriculture business liability is given a due focus. It has been used in issues of biodiversity loss or environmental pollution cases. It helps in avoiding environmental damage and conducting smooth process and forces industry to create environmentally friendly technologies. In food and agriculture, for a long time liability issues have come up only in the trade, mainly issues related to quality and quantity of the agricultural goods and an invasion to

others boundaries for agriculture and fishing. With the introduction of GMOs the liability of environment is a serious matter in question. The problem of transboundary nature of GM animals if released into the environment and biodiversity loss, contamination of the natural vegetation, pollution of land and dumping of agricultural wastes in ocean and affect on the aquatic life and its affect on the human beings, can be listed as some examples of liability issues related to agriculture.

Several UN conventions have been carefully looking into such issues. For instance, the UN Convention on Law of the Sea in 1994 discussed this issue in depth, describing responsibility, obligations and liability of the countries for the use of Marine Environment. The Convention on Civil Liability for Bunker Oil Pollution Damage in 2001, CBD and the Cartagena Protocol on Biosafety, are some examples of where liability regimes are taken into consideration. The European Commission also released a white paper on environmental liability focusing on how polluters will pay.

2.3.7.5 The commons

Use of nature and its products is a universal right to all human beings. However, geographical barriers and political boundaries have divided land, water and airspaces between nations. The air we breathe or the water we drink are supposedly for common use. The environment is inherently a common property, a pubic good. Environment in itself has no regulations and policies. Policies are made when human beings confront with their environment and exploit it for their personal good. The question of what is a public environment, whether land, water, or forests which means it is no one agent's property, has been a struggling question in any local and international debates. There is a long tradition about rights and restrictions of access to common environment with duties to replace those public good for other users and future generations to come. But to keep some environment as a common property is an ethical regard for safeguarding environment for its own value.

Environmental policies are made for not only preventing pollution of environment but also as a tool for managing this issue of commons. At international level, there is another factor in question in the management of environment; which is "shared". There is a subtle difference between a "shared environment" and a "common environment". The shared

environment can be considered as a defined area as bilateral or multilateral property whose harm is a responsibility and liability of the parties and it is a right to use that space and the resources with mutual coercion and mutual agreement. The term "commons" is embedded with a philosophy that natural heritage is a common ecological concern for all human beings; which is not defined by geographical and political boundaries. It is an important concept in trade, food and agriculture, because developments in the agriculture production systems have a direct impact on the environment and its biological heritage. The common environment such as forests, grasslands, oceans can be harmed by overuse or pollution due to agricultural activities. The commons could also be related to other organisms as well, and their right to the nature that is free of human activity.

The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was a progressive declaration of ecological and ethical principles for its time. UN Convention Concerning the Protection of the World Cultural and Natural Heritage in 1972 also emphasized that "deterioration or disappearance of any item of the cultural or natural heritage constitutes a harmful impoverishment of the heritage of all the nations of the world" Several other conventions such as the Law of the Sea and CBD have legislated this moral concept for nations to be binding.

2.3.7.6 Water access

Water is a basic necessity for life. It is most important resource for agriculture. More than 70% of the earth is covered with water with more water stored in the ground than on surface of the earth. We even can say we are always surrounded by water either as water vapour, liquid water or ice. Yet of the total water present on earth only 0.3% of the water is usable and more than 97% in oceans an around 3% as ice. So the usable water for human beings is only as ground water, fresh water lakes, rivers and streams. So human survival essentially depend on that 0.3% of the usable water. This is the primary base for all the issues related to the access to water. At present about 20 % of the world's population lacks access to safe drinking water and about 50 % lacks adequate sanitation. Global freshwater consumption rose six fold between 1900 and 1995 - at more than twice the rate of population growth. About one-third of the world's population already lives in countries with moderate to high water stress - that is, where water consumption is more than 10 % of the renewable freshwater supply. Secondly agriculture is the single largest

consumer of fresh water resources using a global average of 70% of all surface water supplies (Ongley 1996). The problems are most acute in Africa and West Asia. Lack of water is already a major constraint to industrial and socio-economic growth of many developing countries, including China and India.

Access to freshwater for agriculture and daily usage has become a universal problem with environmental pollution. Dried arid lands, shortage of rainfall with soaring prices of food, droughts, problems in irrigation, less availability of drinking water, waterborne diseases are few to mention as problems of water access. Water based industries also face severe shortage of water and it had drastic affect on their businesses. According to the UNEP's Global Environment Outlook report 2001, "if present consumption patterns continue, two out of every three persons on Earth will live in water-stressed conditions by the year 2025".

2.3.7.7 Water quality

Water access, water quality and water management are interlinked issues. As discussed above, there is an acute water shortage for agriculture, industry and daily usage. However, some of the problems can be washed away by good water management and improving the quality of the water. Water quality is not only important for drinking and irrigation but also for bathing and washing. Clean fresh, pure and natural water also one of the choices for recreation. We can regard a good water quality as a universal health concern. Access to safe water is not only a basic need but also a fundamental human right. A Major cause of contamination for surface water is industrial pollution and excessive use of pesticides. Fertilizers in agriculture have contributed to degrading ground water, which is the major source of irrigation and daily household needs in most of the developing countries. Poor sanitation and bad water situation are major reasons for the global burden of diseases. More than 5 million people die annually from water borne diseases. According to WHO about 80% of the people in Asia live with poor sanitation and bad water quality (WHO 2002a). The situation is even worse in the rural areas.

Proper water management can improve water quality. Most of the citizens of Jordan and Israel, for example, two of the most 'water-scarce' countries in the world, have access to adequate supplies of safe water, largely as a result of an effective irrigation strategy.

Actions are needed for proper waste disposal management, environmentally friendly agriculture and waste avoidance. Bad water quality not only affects the human lives but other organisms in the ecosystem as well. Excessive waste disposal into oceans have caused the loss of many aquatic animals, poor crops is the result of excessive use of fertilizers and chemicals changing the biology and texture of the water and soil. Although genetic modification for salt tolerance and drought tolerance is considered as one option for agriculture but still it cannot be expected that it is going to have a major impact in changing global environmental situation. Aquaculture is now recognised as a major problem in freshwater, estuarine and coastal environments, leading to eutrophication and ecosystem damage. The principle environmental and public health dimensions of global water quality are loss of biodiversity and ecosystem dysfunction, Contamination of marine ecosystems from land-based activities, contamination of groundwater resources, global contamination by persistent organic pollutants and loss of human life. The cost that human beings would have to pay might not be recoverable if urgent steps are not taken.

2.3.7.8 Land access

Land is not only a physical entity but a broader integrative view also includes natural resources: the soils, minerals, water and biota that the land comprises. Land has a spiritual, patriotic and social and political meaning for all but for a farmer it is his survival factor because land provides a variety of services essential to the maintenance and integrity of his livelihood as a productive entity of the environment. For a farmer not only access to land is important but also the characteristics and quality of land is equally important. Land access is an important social issue for living and shelter, for conducting business, for example. The crises of the land due to overpopulation and has given land an importance where in some cultures the amount of land one possesses determines one's wealth.

In developing countries the economies being largely agriculture based access to land is a basic issue for growth of economy. Overpopulation with agriculture-based economies in developing countries have reduced the availability of land. People need land for housing and shelter, for conducting business and with growing space for industries have limited farmers to smaller lands for cultivation, and that land also being degraded due to several other factors has made the situation much grave. In Asia and Africa, where farming is

either community based where farmers have no land or farmers possessing small land for cultivation; introduction of industrial agriculture by governments as an option for rapid economic growth has damaged the situation more; with farmers losing their limited lands to governments or private companies. This is an important concern for equity and sustainable development because access to land is the basis for thriving rural sector. This has resulted in conversion of forests into agriculture lands, with final affect on biodiversity loss, global warming climate change; a few to mention.

Land is also an issue of "commons" in case of forests and the rights of other countries to "on ones land". It equally applies to other organisms also that habitat the land. Based on this philosophy Aldo Leopold proposed a "land ethic" changing the role of human beings as dictator of the land to mere members of it.

2.3.7.9 Land management

Expanding human requirements and economic activities are placing ever increasing pressures on land resources, creating competition and conflicts and resulting in sub optimal use of both land and land resources. An integrated approach for the sustainable use and development of natural resources, including the soils, minerals, water and biota that land comprises is indispensable. The need for integrated land management strategies stems out of the unprecedented population growth with ever increasing demands of society on land, water and natural resources and other environmental entities. Intensification of agriculture, deforestation, soil desertification, over exploitation of natural vegetation, conversion of mountains to agricultural land, crisis of clean and safe water are some of the results of human activities that has made land management an urgent issue. This has even resulted in conflicts and competition over access and rights to land, water and biological resources. People also migrate from one land to another; plains to forests and mountains for better survival, better production, peaceful life and also for spirituality. In practice, in many developing countries, it has affected food security, environmental balance, and loss of human lives and loss of the green.

Effective land management is fundamental criteria for a farmer for good productivity. Deteriorated soil conditions, increasing industrial and urbanization pressure, lack of access to land, increased vulnerability to climate changes are some reasons for low yield

and low returns, and that has a deep impact on their livelihood. For a farmer, degradation of the land is the most important concern and it include soil compaction, soil and water erosion, soil fertility decline, reduction of biomass, salinity, loss of soil biodiversity and other physical and chemical alterations as a result of inadequate drainage and misuse of soils, as well as loss of soil biodiversity. According to the International Soil Reference and Information Centre (ISRIC) and the United Nations Environment Programme (UNEP) Asia has the highest %age of the world's degraded lands (38 %), followed by Africa (25 %), South America (12 %), Europe (11 %) North America (8 %) and Australia (5 %).

Various UN organisations have been directly involved in developing programs and policies for land management. FAO's Land and Water division is responsible for implementing coordinated programs projects with member governments and other UN institutions in agricultural water use efficiency and conservation; land resources, soil fertility and plant nutrition policies, planning and management; Integrated land, water and plant nutrient management; water logging and salinity control, and environmental effects of irrigation and reclamation of problem soils through information systems, technical support, field work and also extending loans.

2.3.7.10 Roads

Essential for land travel and transportation, roads are the surface mode of communication. Smooth, clean and big roads please almost everyone because they prevent physical harm to people and vehicles and also they save time. Roads are a link between people, villages and cities; also between countries. New roads may induce development in previously undeveloped areas, and change in the life style of indigenous people. Roads are agents of change and can be responsible for both benefits and damage to the existing balance between people and their environment. However, there is a growing awareness that roads have uncompromising environmental impact. Construction of roads result in loss of productive agricultural land, damage to sensitive ecosystems like forests, land, water. Sometimes it is also the reason for people to evacuate land and resettle at a different place. It disturbs their sustenance since they have to change or find new ways of income generation. This resettlement has a demographic impact as people move from villages to cities resulting in accelerated urbanization. Other serious impact could be epidemic with disease spread. Long term affects are on environment include soil

erosion, changes to streams and underground water, and interference with animal and plant life resulting in floods and landslide and ultimately loss of life. Although it can be argued that other means of transportation like railroads and aeroplanes are also responsible for some of the environmental problems, but roads provide basic means of transportation which are more accessible and affordable to people. Roads also tend to take up more land than railroads.

International efforts are needed to find ways of constructing roads that can harmonise with the surrounding environment and serve multiple users. Many developmental agencies like UNDP, World Bank, FAO, UNEP have initiated steps for including Environmental Impact Assessment studies of construction of roads. They focus on the existing environmental and local situation, expected changes, local economy, rural areas versus urban areas, post maintenance procedures, environmental versus social assessment. Such efforts are coordinated with land management and land-use planning projects with a focus each specific region separately.

2.3.7.11 Energy

Energy and environment are essential for sustainable development. Energy is required for any development and its crises affects socio-economic development, environment, and lot of social concerns like poverty, health, gender issues. Starting from the daily household work, it is needed everywhere, for industry, transportation and agriculture. It is estimated that currently 1.5 billion people in developing countries lack access to commercial electricity services, and about 2 billion people use fuel wood or dung for domestic use in villages (UNDP 2002) It has detrimental affect on environment, health of women due to air pollution, loss of time and a big burden on women and children. Largely it limits income generating activities, blocking poverty alleviation, limiting economic growth, educational attainment, availability of health services, threatening environmental sustainability, and limiting women's full participation in society and further entrenching rural-urban disparities. Hence availability of energy is key to ensure food security and sustainable development. Another most important impact is the lack of motivation to work because of the problems related with the energy crisis.

The world's oil reserves are estimated to be about one trillion barrels. At the present rate of consumption it is estimated these reserves will be exhausted in 45 years (Hicks 1997). The 1992 Earth Summit in Rio de Janeiro, declared that the mass consumption of oil and other fossil fuels has aggravated global environmental problems, such as acid rain and the 'green house' effect. Threat of losing non-renewable resources and the amount of environmental damage has resulted in producing energy by other renewable resources like wind, sun, water, biomass fuel and nuclear energy. These renewable energies contribute strongly to increment in labour efficiency and income generation and prevent environment damage in rural areas. FAO and other UN agencies like UNEP, World Bank have launched special training and education programs for rural people in developing countries for producing bioenergy that is environmentally and economically friendly. An integrated approach is needed for production of energy that is environmentally friendly, economically feasible and locally acceptable.

2.3.7.12 Ecosystem damage

Ecosystem damage is principle consequence of any human activity. Humanity is collectively changing the composition of the atmosphere and transforming the Earth's ecosystems at an unprecedented rate, and in the process causing widespread damage to the life-support systems upon which we, and every other living thing, depend. The result is "unhealthy" ecosystem on the verge of death. Ecosystem health can be defined as the interface of ecological and health sciences, draws upon the social, natural and health sciences. Its central focus is the relations between human activity, ecological functions, and human health (Rapport 1998). For past several years, there have been several science based steps been taken to bring environment back to "healthy" condition. The steps include using environmentally friendly technologies, use of renewable resources, growing of forests, avoiding killing and better management of animals either in farms or in wild, conserving natural vegetation as national parks and sanctuaries, recycling, separation of garbage and waste avoidance. Nevertheless parallel continuance of human beings unethical and environmentally unfriendly interference in natural discourse in one or other region of the world has not improved the situation much. Conservation ethics so far has been rhetorical.

There is a need for a precautionary principle approach both in private and public decisions for careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment because each human activity has had serious implications on environment with consequences on legal, social, economic, health and even educational reforms. For instance, excessive air pollution resulted in global warming with its consequences on natural vegetation, human health, increasing sea levels from melting ice; also increase in ocean temperature with a profound impact on aquatic animals. Agriculture had its own impact on natural vegetation with disturbing "home" of other organisms resulting in increased migration of animals, loss biological diversity, soil diversity, salanity and water loss. It is feared that introducing GMOs will contribute to further loss. Dumping of garbage in oceans and wastes from industries re primary causes of loss in aquatic diversity and pollution. Such human activities have had equally significant impact on human lives and human health.

2.3.7.13 Ecolabels

Ecolabeling, environmental labeling and green labeling are based on the common use of labels or symbols to designate preferred products. It is a certification used by some organisations for the products generated through sustainable management practices that cause minimum or no harm to the environment. Environmental labeling is being promoted in a number of countries to encourage cleaner production and raise awareness among consumers of the environmental implications of consumption patterns. It has become a trendy word for improving ecosystem stewardship. It has so far been very popular in aquaculture and forestry, slowly agriculture commodities are also being thought for ecolabeling. One of the reasons for such ecolabeling is that industries are also becoming sensitive to environmental concerns. A number of companies have tried to develop a green image to increase market share, for instance by promoting environment-friendly products and allocating a proportion of their profits to environmental conservation activities. Many countries have also pursued policies to encourage cleaner production and developing the required new technologies. The FAO work programme planned for 2001 included both increasing support for, and increasing concern about, ecolabelling of products from natural resources.

Ecolabeling is used as a tool in the trade for certification of products as environmentally friendly. Ecolabeling schemes enable foreign consumers to choose goods produced in an environmentally benign way. Although it has positive impacts and pressure on both public and private sector to produce products that do no harm to the environment, it can also be a source of trade friction especially in markets dominated by developing economies, such as textiles and timber based products. (World Bank 2001). Domestic industries have more say in defining ecostandards than do foreign competitors. The standards are likely to favor technologies that are feasible in industrial countries rather than the input mix and technology set of developing countries. That can affect the environmental choices of a country.

2.3.7.14 Air pollution

Air pollution, either indoor or outdoor, is a universal environmental and health problem. It affects developed and developing countries alike. Any human activity contributes to air pollution either as smoke, gases and dust. Sometimes natural phenomenon like volcanoes also contribute to it. The main sources of air pollution are traffic exhausts and smoke, gases coming from factories. It affects human health in the form of respiratory ailments, can enter blood stream and damage other organs. Deposition of air pollutants in environment can also contaminate food and water. An estimated 3 million people die due to air pollution every year. Indoor pollution caused by burning coal and firewood and indoor air exposure to suspended particulate matter causing acute respiratory infections is one of the leading causes of infant and child mortality in developing countries. In Asia, such exposure accounts for between half and one million excess deaths every year (WHO 2001).

The environmental impact has been equally alarming. Ozone depletion due to CFCs, main cause of eye damage and skin cancer, green house gases, other gases, sulphur dioxide, methane and nitrous oxide are some example that have contributed to global warming and climate change and their impact on all ecosystems. Air pollution has its negative affect on natural vegetation and agriculture as well. Added heat stress, shifting monsoons, and drier soils may reduce yields in the tropics and subtropics, whereas longer growing seasons may boost yields in northern Canada and Europe; according to UNEP. Hence the agricultural consequences of climate change due to air pollution would have

significant impact on national and regional food security, the most vulnerable being the poor and rural people in developing countries where the mode of income is agriculture based. The indirect affect is in the form of loss of manpower and loss of animals due to diseases and sickness. Other well known environmental affects include increase in sea level to 25cms in 100yrs due to climate change, flooding and coastal erosion, loss of aquatic and forest biodiversity and extreme conditions of deserts and arid regions.

The United Nations Framework Convention on Climate Convention adopted in 1992 at Rio Earth Summit is the centerpiece of global efforts to combat global warming. Recently adopted Kyoto Protocol in 1997, strengthens the international response to climate change. In the past the 1979 Geneva Convention on Long-range Transboundary Air Pollution, which entered into force in 1983 considered air as one of the "commons", air pollution in one region of the world can have equally drastic affects on other regions; followed by Montreal Protocol in 1987 to eliminate the production and consumption of ozone-depleting chemicals has helped to prevent some global warming and climate change.

2.3.7.15 Access to genetic resources

Most of the agriculture in one region of the world is dependent on genetic material that originated in another region for over 50% of the basic food production and in some regions it may be more. For a farmer, it takes years to find and grow the best variety of the crop that is the ultimate source of his well-being. This research is done for years through selection and crossing and the best seeds are selected through experience, farmer to farmer knowledge exchange, environmental consideration, and of course market flow in a very informal set up. For many years it was considered as the secret of farmers that determines his socio-economic livelihood. Genetic engineering has threatened that "farmer's secrets" and the risk of genetic drift has made it difficult and expensive for farmers to market an original product. The threat to traditional agricultural practices with the introduction of fast, high yielding, desired trait and economically more beneficial crops through genetic engineering have put up a stern competition between traditional agriculture practices and industry based agriculture that focuses on collection of best seeds that could be enhanced more to desired traits through genetic engineering and then sold again. Farmers need to buy them either from private companies or governments or

research institutions. This has created tremendous mental and socio-economic pressure on farmers.

Collection of germplasm from fields of farmers and also from forests, for different crops and other natural resources for the conservation of biological diversity all over the world had been done all over the world by UN and private sector. Seeds, the most valuable thing for farmers; stored year after year have been collected in the process of germplasm collection. This has ignited the issue more in the developing countries; usually considered as a resource rich. Every country's genetic resource are considered as a property of the country, its conservation is important for biodiversity and unexpected natural disasters. Farmer's and breeders should have an access to the genetic resources for good productivity and choice of better varieties for sustainable agriculture and food security. This access can be tangible; for example access to the good seeds or intangible in the form of information to best seed availability.

In 1992, many governments of the world signed the Convention on Biological Diversity (CBD) for policy formulation and legislation for the access to the genetic resources. Commission on Genetic Resources in Food and Agriculture (CGRFA) under FAO, with the help of its 161 member countries is a globally responsible for the issues related to genetic resources. The CGRFA facilitates and oversees cooperation between FAO and other relevant intergovernmental and non-governmental bodies, including Convention of Biological Diversity (CBD), the International Plant Genetic Resources Institute (IPGRI) and the UN Commission on Sustainable Development (CSD).

2.3.7.16 Genetic resource ownership

Ethically, many say genes are no ones property (Macer 2002). Inherently genetic resources have no geographical boundaries and the countries are globally interdependent on their access to genetic resources. Plant genetic resources are the basis of both modern and traditional agriculture. However, each country's biodiversity is considered as its property. Decoding of genetic codes of crops with a closed room research on best varieties; fear of losing heterogeneous landraces and replacing them with modern varieties produced by laboratory testing and followed by patents, all have social and economic disruption for farmers. For centuries farmers were considered to be most

knowledgeable in best varieties of plants. This ideology has been significantly altered with scientists collecting germplasm *ex situ* in the gene banks and research centers. For many years, genetic resources have been collected, used stored, and modified in the centers all around the world. People either directly or indirectly involved with agriculture business have been affected by it. Especially for farmers, such collection and its use for genetic engineering has significantly increased the economic uncertainty of family farmers throughout the world.

Of so many commitments, three primary goals of CBD are biodiversity conservation, sustainable economic development, and socioeconomic equity. Access and ownership to these genetic resources has been considered an important concern for biodiversity and socio-economic progress of any agriculture based economy. This progress largely is dependant on each country's policy for agriculture. The issue starts from whether stakeholders have rights to ownership in agriculture business. Many groups have claimed to have rights on genetic resources. They include farmers, cultural groups, rural communities, industry corporations, scientists, governments, environmental groups etc. Sometimes issues like customary right and legal rights also seriously hamper the process to facilitate a successful policy. Knowing the transborder flow of the genetic resources the issues of Intellectual Property Rights also complicate the issue. At the international level, competition is likely to become increasingly fierce among countries in the same region that share many of the same crops and are competing in the same markets.

2.3.7.17 Benefits of genetic resources

The first objective of the CBD is "*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*". Genetic resources are the ultimate source of evolution in nature. Collection and storage of germplasms in the gene banks has been done for more than two decades now. It has the foremost benefit for the nature that lost and endangered species could be re evolved and brought back to nature and secondly new, better yielding varieties that are able to sustain in harsh environment s could be introduced. Also it could be beneficial to spread biodiversity from one region of

the world to other. This is immensely important due to the climate change and global environmental deterioration.

Anthropogenic benefits of genetic resources are the main benefits that are vital for total sustainable development. It is important to define the term benefit sharing which usually becomes a contradictory issue in international agreements. Benefit sharing could be seen in terms of economic, social and environmental and scientific benefits. The prospected benefits have been the core reason for IPR and farmer's rights debate. The economic benefits may come in the form of royalty for using genetic material and traditional knowledge or as a liability for the damage done during research. However, the process could be dependent on the ownership rights of the countries. Genetic resources contribute socially by bringing in sustainable growth in the production patterns thereby bringing equity in communities. UN agencies like FAO, CGIAR, UNDP and UNEP are directly involved in transfer of technology programs at rural level so that farmers, especially in the developing countries can use traditional knowledge in a better way by using methods best suited for their environments and save the landraces and traditional varieties that have good value in natural biodiversity and good market value as well. The main environmental benefits are preserving earth's biodiversity and scientific benefit is regarded as possession of knowledge and material to produce better crop; for food security and malnutrition.

2.3.7.18 Conservation of genetic resources

Conservation of biodiversity has many values. It is important for harmonious balance of the environment and sustainability, important for crop variety and choice of food for people, as a resource of medicine and timber are direct values. Nature has an extrinsic value as being beautiful and giving comfort. A large numbers of landraces and wild relatives of cultivated crops have been sampled and stored in *ex situ* gene banks for more than two decades now. With environmental degradation and loss of genetic diversity, it is considered as a back up for lost and endangered species. Such collection is also important for prospective benefits as their storage and utilization may be potentially beneficial for agriculture and industry, in particular pharmaceuticals. *In situ* conservation or on farm conservation of the crop genetic diversity refers to the continued cultivation and management by farmers of crop populations in the agro-ecosystems where the crop has

evolved. With genetically engineered crops coming around, the need to prevent the original landraces has become a requisite. In situ conservation is also needed for wild relatives of crop plants, which include the progenitors of crops, as well as species more or less closely related to them, constitute an increasingly important resource for improving agricultural production and for maintaining sustainable agroecosystems. They have contributed many useful genes to crop plants, and modern varieties of most crops now contain genes from their wild relatives. Moreover, an effective and adaptive farm management is essential for preserving crop genetic diversity in the farm fields.

Not only do genetic resources evolve differently when conserved *ex situ* and *in situ*, but the distributions of their economic benefits and costs also differ in fundamental ways. The costs of genetic resource conservation in gene banks are now borne largely by public investments, and consumers (as well as farmers who are consumers) benefit indirectly from the genetic resources incorporated into improved crop varieties when output expands and prices decline. By contrast, both the costs and benefits of conserving genetic resources *in situ* are felt directly (and in a very immediate sense) by the farmers who grow them (IPGRI 2000). In most of the rural areas in developing countries, farmers live in heroic circumstances. They are dependent more on environment for their production, facing shortage of rainfalls, droughts, water shortage for irrigation, pests, soil degradation because of small land, and economic restrictions either to buy seeds or agriculture equipments are some of the "normal" conditions for agriculture. Most will gladly embrace any change that would improve their well-being. It could be new varieties, GM or technical support for improved farm management. This may be crucial in protecting and preserving landraces.

2.3.7.19 Exotic species

Exotic species are species that are not indigenous to a region. Usually considered as "non-native" or "alien" species they are accidentally or purposefully introduced in an area different from their origin. They may come from other part of the country or other country or even continents and watersheds. All plants, animals, and other organisms may become exotic species. They adapt to the local environment, mix, grow and evolve with other native organisms and species. When an organism becomes an exotic species, it may be due to symbiotic relationship with mutual evolution, or it may also become a pest and

parasite in the local environment because the species that help to keep a check on it may not be a part of the new environment. The success of exotic species often means a drop in the diversity of native species and degradation of wild areas. The impacts of alien invasive species are immense, insidious, and may be irreversible, biologically and economically.

Genetically engineered crops are also considered as exotic species and there are fears of losing landraces and crop biodiversity in the agro ecosystems. There are fears of genetic drift and gene flow from GM crops to the land races and their wild relatives causing changes in the taxonomic and morphological changes in the original varieties. The side affects include the loss or change in the diversity of the insects or other organisms dependant on them. There have been considerations for using sterile or less fertile GM crops to reduce the magnitude of non-target effects. Genes to reduce flowering would be useful to control the spread of exotic plants and trees, whether they are GM or not. The spread of exotic species into ecosystems where they are not wanted is a much more serious threat than is the addition of one or more genes via GM. However, in case of agriculture many crops have been planted as exotic species through out the world for many years now. For instance, cassava and yam, native to South America has been grown through out the tropic; Azuki beans originating in Japan and China are grown in India, Thailand and many other countries and the most common being cultivated potatoes that are found in all shapes and sizes through out the world originated in Andes mountains of Peru and Bolivia and have been cultivated for more than 2000 years. Also exotic fruits are popular in the markets. Evidently, this reflects that agriculture has been deeply dependent on species and they also contribute to food security.

2.3.7.20 Natural resource management

With limited natural resources to give a high quality life to the ever increasing population of the world, better management and sustainable use of natural resources has become indispensable. This has been duly recognized in Agenda 21, where it is stated that: *"Special attention should be paid to the demand for natural resources generated by unsustainable consumption and to the efficient use of those resources consistent with the goal of minimizing depletion and reducing pollution."* Unlimited extraction of non-renewable resources and pressure on the other renewable resources like, water, forests,

fisheries due to bad practices has declined earth's total productivity. These resources are the basis for life on this planet, and their exploitation constitutes the primary source of livelihoods for most of the world's population. As human population doubles, and as we try to improve the welfare of the three billion people who live on less than two dollars a day, pressure on these resources will only increase. Failure to manage these resources sustainably and equitably is in many cases already leading to conflict and disaster. Resolution of this challenge will be the key to sustainability.

Sustainable use of natural resources with minimizing pollution is the bottom line for natural resource management strategies and this will require great ingenuity and cooperation across nations and cultures. It is an interlinked process between equitable development and environment safety and conservation. It involves better management of agriculture, land, air, water, natural flora and fauna of the forests and mountains. This can be only achieved through long-term integrated strategies that focus simultaneously on improved productivity with economic development and with conservation and sustainable management of land and water resources. Management practices are needed at the field level to bring a substantial change.

These broad themes have been crystallized into two UN conventions dealing directly with conservation of natural resources: the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD). The Forestry Department and Sustainable Development Department of FAO are responsible for designing and implementing projects and programs for sustainable and equitable use of natural resources.

2.3.7.21 Fertilisers

All the crops and natural vegetation require nutrients either as macronutrients or micronutrients. Some nutrients like water, carbon, oxygen are naturally available in the environment, some are extracted from soil and some like nitrogen need to be converted. These nutrients are essential for good growth and productivity of crops. After every harvest, they need to be replenished for the next generation. In conventional agriculture, sometimes large-scale farming is monoculture, which depletes many of the soil nutrients.

These essential micronutrients are usually replaced by using inorganic fertilizers. Inorganic fertilizers were developed to increase plant yields by supplying plants with the necessary nutrients that are in short supply to stimulate growth. It is believed that approximately 25% of the world crops today are directly attributable to the use of inorganic fertilizers and due to this success, the demand for fertilizers has been doubling every 10 years. Fertilizers have usually been subsidized all over the world, especially in developing countries making them cheaper and affordable even for farmers of developing countries.

The green revolution was based on effective use of fertilizers and use of genetically improved varieties, bring in more productivity. The green revolution brought a revolution in developing countries; raising economies to a greater extent, and preventing expected famine in South Asia. However, harmful affects on the environment and social impacts of using excessive fertilizers were soon recognized. Dependency on chemical fertilizers whether nitrogen or potassium based, changes the chemical, physical and biotic properties of the soil. Also, it consumes a massive amount of oil and energy to produce to fertilizers. Also fertilized fields emit nitrous oxide that adds to green house affects. Inorganic fertilizers do not replace organic matter that is lost after the harvest. Concentrated fertilizers are toxic and cause severe health hazards when exposed to. Major input of nitrogen and phosphorus comes from agricultural fertilizer run-off and human and industrial wastewater, according to UNEP. When mixed up with water, it is one of the main reasons for eutrophication and loss in aquatic diversity.

2.3.7.22 Pesticides

Pesticides are used for preventing, destroying, repelling, or mitigating pests. Pesticides have been considered as the most effective form of pest management for a considerable length of time in history. They may be biological such as pheromones and recently genetically engineered Bt toxin, physical, or chemical agents used to kill plants or animals that are harmful to people and in practice. They are used in houses as; farms and agriculture fields, lakes and watersheds; infact almost everywhere. The first globally used chemical pesticide DDT was discovered in 1939. It was considered to be a miracle as being toxic to a wide range of insect pests and relatively non-toxic to humans, and it was persistent so did not break down in the environment. Also being insoluble it was not

washed away by the rain. It opened the whole range of broad range and narrow range of chemical pesticides such as organophosphates, organochlorines, carbammates, pyrethroids and many more produced as insecticides, herbicides, fungicides etc, targeting specific organisms that are been used in all sectors, with the rate of pesticide use per hectare of land being highest in Japan (17.7-kg a.i./ha) (WB 2000 a).

The harmful affects of pesticides were acknowledged after Rachel Carson's best selling book *"Silent Spring"*, alarming people of the side effects of use of pesticides on the environment and other species, finally launching the big movement for the environment safety. Bioaccumulation and biomagnification of pesticides has been a major concern in pesticide use as they deposit in the animals via the food chain. DDT, for example, severely reduced the rate of reproduction in many fish and birds. This has also raised consumers concerns about the effects of pesticide residues in foods, especially for infants, whose systems may not be able to convert toxic chemicals into harmless substances as readily as adult systems can, causing cancer and other neurotoxic affects. Pesticide exposure to farm workers has been another issue and for which each country and WHO has made standard precautionary guidelines. Persistent organic pollutants also include pesticide residues spread from one region to another affecting other ecosystems. Excessive use of pesticides especially in the urban areas to maintain, gardens and lawns has been a major contributor to deteriorating environment and health of people. Realizing this various efforts and strategies have been developed under Integrated Pest Management (IPM) to use other physical or biological methods for the control of pests that are not harmful to the environment.

FAO developed the *International Code of Conduct on the Distribution and Use of Pesticides* in 1990, whose objective is to "set forth responsibilities and establish voluntary standards of conduct for all public and private entities engaged in or affecting the distribution and use of pesticides and the need for a cooperative effort between governments of exporting and importing countries to promote practices which ensure efficient and safe use while minimizing health and environmental concerns due to improper handling or use." The Rotterdam Convention on Prior Informed consent in 1998 set out procedures for certain hazardous chemicals and pesticides in international trade. FAO developed a global IPM facility to assist interested Governments and NGOs to

initiate, develop and expand National and Local Integrated Pest Management (IPM) programmes.

2.3.7.23 Herbicides

Approximately 10% of all plant species are weeds, or we can say a total of some 30,000 weed species are known. Of these, 1,800 cause serious economic losses in crop production, and about 300 species plague cultivated crops throughout the world (Ware 2000). Found both in organic and inorganic forms, herbicides are been used for killing or inhibiting the normal growth of weeds and other unwanted plants. Based on their formulation, they could be considered selective to kill specific plants or non selective that can kill all plants.

Herbicides such as ashes, common salts, and bittern have been used in agriculture to sterilize the land for since ancient time, and still used by poor farmers who do manual and mechanical weeding. Herbicides are particularly used in the countries where agriculture is intensive and mechanized like, USA, Europe, and Japan. It provides a more effective and economical means of weed control than cultivation, hoeing, and hand pulling which involves a lot of human labour; especially in the regions where manpower and land shortage are major concerns in agriculture.

Herbicides are not only toxic to plants but also to human beings and animals. Usually herbicides are recommended to carry warning labels for their toxic nature as they may cause immediate death due to inhalation or irreversible skin and eye burns. Many times labels also carry warnings for toxicity to animals and especially fishes. Glyphosate, commonly known as Roundup is the world's most widely used herbicide and linked with increased risks of lymphatic cancer.

Excessive use of herbicides has also resulted in the occurrence of herbicide resistant weeds, which is constantly increasing. The origin of resistance could be due to genetic mutation or natural selection; latter being widely regarded as the most plausible explanation. About 100 weed species have been reported to possess resistance to one family of herbicides or another (Hager 2000) To avoid economic loss due to weeds and environmental damage due to the use of herbicides, herbicides resistant varieties of crops

are been introduced through genetic engineering. However, there have been concerns for weeds' and crops' wild relatives ability to acquire genes from the neighboring agricultural crops through cross breeding and gene flow, ultimately turning them into superweeds, some thing that is referred as "genetic pollution" and loss of insects and other organisms that depend on the wild relatives.

2.3.8 Animal issues

In almost every society, animals and human beings are interdependent in several ways. As writer Stephen Budiansky observed in *The Covenant of the Wild*, published in 1992, "Some remarkable and beautiful forces of nature were at work in producing the interdependence of man and animals, an interdependence that has eliminated much of the suffering and brutality of the wild." Animals play many roles in every society, as domestic pets, in zoos and aquariums for pleasure and as caretakers, as livestock in agriculture for helping poor farmers and as farm animals for food, in religion, for transportation, for scientific and biomedical research, for decorations and ornaments and many other ways. For a long time in history they were means of trade, transportation, and hunted for food and also kept as a legacy and wealth. But with the increase in the knowledge of animal breeding and development of technology, the production and use of livestock has increased tremendously and understanding of the need and importance of using animals has led human beings over exploiting animals for some time now. They are artificially bred for meat, for industrial purposes like, leather production, dairy industry, and textiles. This unlimited, inconsiderate and unsympathetic industrial use of animals has threatened their welfare and independent existence. There have been many movements all over the world against animal mistreatment and over exploitation by animal welfare groups; emphasizing the need for the recognition of animal rights, better treatment and humane and loving approach towards animals; and to consider animals as ends in themselves and not means of satisfying human needs.

In each and every country NGOs and animal rights groups have made governments and industries to establish specific guidelines and standards for animal use. There are international guidelines established by different UN organisations for the welfare of the animals and improving conditions of animals. However, animal welfare and animal rights

both are to be recognized as separate issues relating to animals. Giving rights to animals would mean considering animals as part of society rather than a "resource" for society where as animal welfare is our responsibility towards animals. The American Veterinary Medical Association (AVMA) has defined animal welfare as "a human responsibility that encompasses all aspects of animal well-being, including proper housing, management, nutrition, disease prevention and treatment, responsible care, human handling, and, when necessary, humane euthanasia." The animal welfare ideology is based on the view that animals are indispensable to human survival, quality of life, their well-being and mutual dependence is important for human well being. Henceforth use of any kind of animals, especially farm and poultry; also the animals for biomedical and scientific research, has generated many concerns and is hotly debated, although there are concerns of losing the endangered species of the wild as well. Animal diversity is equally important as plant diversity and welfare of animals is a duty of human beings for the animals that are dependent on them or give a companionship to them, particularly if they are a resource of livelihood.

2.3.8.1 Animal capture

Before industrial animal breeding started, productive use of animals was solely dependent on the skilful capturing of animals. Efficient capturing and hunting animals was considered a pleasure and an art for a long time in history around the world. Use of terrestrial animals for meat, and training them for pleasure, messenger services and transportation has been part of every society for thousands of years. Human beings have also dependent on oceans as another food resource in the form of fisheries as long as the human history goes. Another purpose of capturing animals was for sacrificing them in religious rituals; seen even today in traditions of many cultures. Even now at places where monarchy is system of governance such hunting and capturing of animals is a pleasure and a manner of royal fancy. Also in many poor countries the people of rural villages and indigenous tribes all over the world depend on direct capturing and hunting animals from the wild, oceans and rivers for food and other livestock uses. Efficient capture without much physical harm to animals is important not only to avoid physical injury and pain to animals but also it increases the economic value of the animals. Many types of traps are designed to capture animals in dead or alive forms. Some are very lethal like poisons or tranqualizers, bullet shots, baits etc that sometimes kill the animals on the spot or it's a

painful and very slow death. Sometimes live traps are done using cages and nets that are stressful.

With the development of animal breeding techniques, the capture of animals has been reduced to a greater extent for meat, transportation and also to some extent for pleasure because of the animal rights movements all over the world. It is mainly limited to rural areas and tribes that live in natural habitat. Although illegal poaching is still very prevalent in the wild forests for fur, leather and ivory, even though each country has laws against them. The countries where the animal capture is legalized many times they do not follow the required veterinary prescription legend for treatment and care of the animals after capture. In waters, the capture fisheries and the inland capture fisheries are the last biggest food resource that is hunted on industrial scale today. Especially for people living in the natural habitats are dependent on them as the biggest food resource. Especially cross border whaling and fishing have been politically very controversial issues at international level. The International Whaling Commission (IWC) was set up to negotiate and settle down controversies regarding whaling but remains controversial.

2.3.8.2 Animal husbandry

Animals used for traditional agriculture practices and also animals produced by various animal breeding techniques for commercial purposes require not only a basic care essential to survival but also some other similar basic needs to human beings. Animal husbandry involves raising and care of animals either at individual level or at industrial livestock production. This care includes for instance, comfort and shelter, ready access to fresh water, a diet to maintain the animals in full health and vigor; space for reasonable movement and company of other animals, veterinary care for abnormal behavior, injury, parasitic infestation, and diseases are some of the basic needs of animals to be provided in animal husbandry. However, animal care is usually not a very big concern in animal industry, and poor farmers in remote areas of developing countries who are faced with critical situations for their own livelihood do not have motivation and means to provide basic needs for their animals. The focus is mainly on production but not on provision for animals. Even animals in animal farms do not even have opportunity to exercise most normal patterns of behaviors. They are kept under small cages in dark, or too many in one place without enough space to move around, no sanitation and no diagnosis and

treatment; with bad flooring and no appropriate lights cause undue stress and strain on the animals. It also affects the quality of the animal products and economic loss is added. This is also an issue in using animals for biomedical research where many times treatment of animals in the laboratories is not appropriate.

Animal welfare groups and animal rights activists have drawn a lot of attention to misuse of animals through media. The situation is much improved in developed countries when compared to poor countries where animal husbandry is usually a secondary matter and the breeding is through natural selection by animals for personal use of animals at small, individual level. Good animal husbandry practices are essential not only for animal health but also for human health and better returns in the end. Every country in the world has established animal welfare laws for protection and better treatment of animals. FAO along with UNDP and UNEP have been actively involved in providing technical and financial help to poor countries to establish better environment for the animals, through training and awareness programs on animal breeding, animal food and sanitation and their well being.

2.3.8.3 Animal killing

Killing of animals has been a common practice since human beings started hunting in the wild. Animals are killed for meat, leather and wool, and in some cultures as a religious sacrifice and for pleasure. Poaching has also been prevalent for animals for decorations and ornamental work. For a long time human beings depended on traditional weapons like arrowheads, daggers, spears and harpoons that usually resulted in slow and painful death of animals. They are still prevalent in the tribes that inhabit in forests. Use of shotguns in modern times has also the same result. Since artificial animal breeding started and livestock production became a big global business, there have been global concerns for inhumane and unlimited killing of animals. Animal rights activists have been provocative through media for humane killing and some extremists considered animal killing more unethical than abortion. Animals are also killed if they spread diseases, for instance in the case of foot and mouth disease, BSE, and other prion diseases with a fear of transmission of diseases to human beings through meat, animal euthanasia is used. In addition, they suffer a tremendous 'unethical' wastage, as production in the laying strains

is gender dependant and the 'nonproductive' male animals like chickens, bulls are killed immediately upon birth.

There have been worldwide efforts to adopt ways for humane killing of animals so that death is spontaneous, animals don't suffer physical pain and psychological stress. Especially in the livestock industry where animals are bred and then killed for meat and other commercial purposes, there are certain conditions and requirements set in animal welfare acts of each country that need to be met before animals are executed. For example, clean execution place in a shed, spontaneous death using electrical shocks, single animal execution and avoiding other animals to not to see to avoid no psychological stress. Such facilities are commonly seen in most of the developed countries where meat production is mechanical, however the scenario is very different in developing countries where there are small butcher shops and animals are killed manually in open areas near watersheds in unhygienic conditions. This has a bad affect not only on animals but also on the environment, as the blood and other carcass are abandoned in open either eaten by other animals or get mixed in the watersheds causing diseases and pollution. This also has an economic loss because the meat and other products from animals under stress are usually of very low quality and go bad quickly. Aquatic hunting is also an important concern in fisheries and whaling. Over-fishing, along with killing of other aquatic habitants has been a serious issue at international level. Also captive of endangered aquatic animals like whales illegally has acquired international debates and lot of media attentions.

2.3.8.4 Animal transport

With the expansion of demand, livestock which is are already the world's largest land user, the production, processing and marketing of animals and animal products requires lot of transportation. For a long time in history, human beings depended on the animals for transportation of goods and for riding. The trends have been shifted with animals in the livestock industry being dependant on human beings for their uses. With shrinking land availability and increasing demand for meat and animal products, animals need to be transported from the animal farm houses to execution places for killing and then processing of meat, also sometimes they are transported for sale to markets for small retailers. This is a general trend followed all over the world.

Animal transportation requires lot of input if animals are to be transported in a healthy and comfortable way. It becomes more crucial if they need to be transported for a very long distances. Herds of animals being transported in big open trucks with animals often tied together, without any place for moving and sometimes even one upon other and poultry birds being put in very narrow cages is a usual sight of animal transportation in poor countries. Sometimes small farmers are seen taking their cattle to markets on foot for several miles. Animals face suffocation, bruises, injuries, exhaustion, and even death, due to heat or and compressed spaces during such transports. In developed countries, the situation is not that worst where there are enough economic resources to provide better environment for the animals while transportation. Animals are transported in closed trucks with proper lights, temperatures, space, sanitation and food during a distant transportation. Inefficient transportation also results in economic losses in the market because the bruises and injuries lower the market value of the animal and its meat. There is also a fear of diseases from the injured animals. This is an ethical issue given the dependency of human beings on animals the moral obligations towards domesticated animals that provide food, and other basic things for human survival.

2.3.8.5 Animal protein revolution

Asian dietary habits have been considered based on plant-based diet for a long time. Vegetarian diets had been considered best for long-term health benefits and animal based food was generally considered a Western tradition. However, shrinking land for agriculture, and environmental degradation for producing high quality crops has led to a dynamic increase in the global livestock production than any other agriculture sector. Given by population and income increases, by rapid urbanization and changing dietary habits, there is an unprecedented expansion of the livestock industry throughout the developing world where *per caput* meat production is expected to increase by nearly 50% between 2000 and 2020. The Global chickens egg demand is expected to grow by 35% and milk demand by 25% over the same period (FAO 2001). This is termed as "livestock revolution" and "animal protein revolution". Industrial production of livestock for food and protein is considered as a cheap, reliable, less manpower dependent alternative for combating food insecurity and protein deficiency found in developing countries. The projected benefits include a cheap resource of protein for poor, also increase in the

income generation for the small-scale farmers who traditionally have depended on the livestock, use of other animal products, enhanced animal genetic resources.

The shifting trends and diversified dietary habits have led to a considerable controversy about the risks and benefits involved. There are fears that increased demand of feed for the livestock will have a negative affect on other crops and farmers choice of growing staple crops. This will increase the prices of the cereals for the poor. Also higher production and concentration of animals near the cities and their processing will add to the pollution. The most important concern is the public health effects of increased consumption of animal fats and the rapidly increasing incidence of diseases passing from animals to humans. Increase in cardiovascular diseases, cancers, obesity and diabetes are linked to change in the eating patterns. Especially in East Asia and particularly in China the shift towards animal based food has been dramatic. Where as the trends in the West have been now towards promoting vegetarianism among people.

2.3.8.6 Animal relations in work

Human beings and animals are dependent on each other for a variety of reasons discussed above. Domesticated animals depend on human beings for their survival and their survival is crucial for human beings for socio-economic and sometimes even cultural and religious reasons. Human beings domesticate most social animals like cows, pigs, chickens, sheep, and goats for use. They may be kept in cages, sometimes being bound with feet being grown on metallic bases where they cannot socialize themselves with other animals. Because they are not considered "natural" they are subjected to demands and exploitation of human beings distinctively in agriculture where they share a special working relationship with human beings which should be mutually interdependent. In rural villages where the number of animals domesticated by farmers is less than those in the industrial livestock production, animals share a special bond during work because farmers and animals both are dependent on each other for manual and physical help. In rural areas of developing countries, farmers even today are dependent on animals like bulls and cows for ploughing and irrigation of the fields. They are also used for carrying grains to the markets, for milk; and eggs from poultry. This creates a special bond of understanding and as a part of the farmer's family. However, in commercial livestock production, the image of the monogastic animals is that of a "product" which needs to be

good for better sale. Improvements in the physical of animals through various breeding techniques is a mindset for economic returns rather than providing healthy and better quality of life to animals. It is also a critical question for the use of animals in biomedical research when animals are caged, tested, used and after the results they are thrown.

Since the commercialization for livestock animals, the nature of our relationship with other animals has come under increasingly close scrutiny. The discourse that surrounds human-animal relations is imbued with morality, anthropomorphic sentiment and idealism. Depending on the relationship, animals could either be mere objects of human use, or they should be respected and also moral agents that have equal rights. These issues are not only theoretically and morally important but also better treatment of animals is practically a gain for people who depend on animals for their livelihoods.

2.3.8.7 Cross-species disease

The problem of cross species diseases has existed since the beginning of human history in the form of zoonosis. However, transfer of pathogens causing diseases across species has become a more conspicuous global concern with greater human interference in nature. Diseases either animal to animal or animals humans have threatened lives of many people across the globe. The history of animal to human transmission goes as early as 1918 when swine influenza that started from pigs killed millions of lives in 2 years. Then HIV retrovirus that causes AIDS; and Ebola virus that were transmitted from primates to humans. The epidemic of cross species disease has resulted in the death of millions of lives all over the world. With all the biotechnology ventures for transferring cross species genes for xenotransplants, fears of more such epidemics for which there is no cure have increased. The pathogens are transmitted through meat in food, contaminated water, animal bites, sometimes touch as well and through xenotransplantation as well. Animal to human transmission of disease is not limited to bacteria or viruses. Scientists have traced how barely detectable pathogens called prions lead to "mad cow" disease in cattle. Forms of this disease can be transmitted to a large number of other species, including humans; we can contract the disease by eating infected meat. It is invariably fatal. Other diseases like foot and mouth disease also are equally fatal. These epidemics have raised serious apprehensions for animals themselves and applicability of animal use for the survival of human beings.

There is a basic need to change the attitude of human beings towards animals to avoid disease transmission not only to humans but also among other animal species. Technological revolution like xenotransplantations are breaking species boundaries, and such attempts of "humanizing" animals or oppositely "animalizing" humans pose a greater threat for cross species transfers as the things are dealt at gene level; although it is assured that all precautions being taken. Attempts at producing drugs and proteins in animals and later on using them for treatment also pose a threat for other infections. Another counter affect of misusing animals is in the livestock sector in use of antimicrobials to avoid bacterial infections for communicable diseases. There are fears that use of antimicrobials in animals has negative effects on human health making them bacterial resistant (WHO 2002). Change in the dietary patterns with a shift for a plant based diet, limited interference in natural discourse with limits on human play with animals is necessary for human beings own survival.

2.3.8.8 Hormones in animal feed

Fresh, wholesome and nutritious food was considered the most important criteria for good health and vigor of animals so that they can produce more, historically. Since the discovery of particular hormones responsible for the growth of animals; they have constantly been used for increasing the size, strength and disease resistant in the animals. Hormones are used by livestock producers primarily to increase the rate of weight gain and to improve the efficiency of feed use by the animal. As a result, livestock gain weight faster on less feed and can be slaughtered sooner, with lower production costs. In addition, hormones are known to reduce the amount of fat in meat, which could be an additional benefit for the consumers. Beginning in the mid-1950s, DES (diethylstilboestrol) and hexoestrol were administered to cattle increasingly in the US and the UK respectively, either as feed additives or as implants, and other types of substances also gradually became available. In general, such treatment has resulted in 10-15% increases in daily gains, similar improvements in feed conversion efficiency (FCE) and improvement of carcass quality (increased lean/fat ratio). Thus there has been a substantial reduction in the amount of energy required per unit weight of protein produced and the economic implications of this have been great (FAO 1982).

As the use of hormonally active substances rose, its opposition also increased because of the possibility that the residues in the animal meat would harm the health of the consumers. This has even led to the ban of hormones like DES to be used in many countries like USA. The speculated effects include growth of hair on body, change in voice, affect on foetus to change gender and many others. Codex, FDA and other food standards agencies have passed the list of certain growth promoting hormones that could be administered. Most naturally occurring hormones are considered to have no physiological side effects and that could be allowed. However there are limited tests done on the health of the animals. Although, some of the concerns have no evidence but a general feeling among people has been difficult to erase.

2.3.8.9 Religious views

The religious views of people have played an important role in genetic engineering debates on humans and animals because animals are vividly described in most of the religions of the world. In many religions for instance, in Hinduism, Islam and Judaism, people follow certain religious rulings in their approach towards treating some animals, either as domestic animals, or as food. In Hinduism, cow is a holy animal so religiously strict people do not eat beef and the Brahmins (uppermost caste) people live on vegetarian diet, but milk from cows is considered one of the purest things to be used. Islam prohibits use of pigs and eating pork; and the animals should be cut in a *Halal* way if it is meant for consumption. Similarly Judaism has described different ways of using cold blooded and warm -blooded animals. Genetic engineering allows transfer of genes across species and across kingdoms, and this has been a controversial issue in producing transgenic animals with genes from particular animals that are being worded in the religious texts of the world. Although, there is not yet a proven case of transgenic animals produced that hurt the religious sentiments of people, but its possibilities have attracted a significant attention. Another philosophical argument is that of "playing God", where nature is creation of God and human beings should not interfere with God's creation.

At present transgenic "pharm" animals are produced that carrying certain pharmaceuticals in them. For example, sheeps producing antibodies in their milk. Also transgenic animals are produced for xenotransplants carrying human genes to avoid immune rejection. There have also been reports of producing silk proteins in the milk.

Cloning of animals through nuclear transfer in commercial livestock production is also done at a regular basis. Such genetic engineering developments have so far been done with careful thinking of human benefit with ethical science. But religious fanaticism has been difficult to argue till today.

Governments of the world have been very cautious in implying regulations relating to transgenic animals. Codex released standards for Halal food in 1997, which is considered as a benchmark for United Nations considering religious concerns and sentiments of people. However there have not been any international standards set for the transgenic animals; if they offend the religious sentiments of some people.

2.3.9 Personnel issues

Although not directly related to the governance of food and agriculture, during the course of interviews the issues of employment, gender and behaviour were raised by those being interviewed. The issue of receiving personnel gifts during work was also raised. These issues are discussed in the results section.