

Ethical and Social Aspects of Biotechnology

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The globalisation of biotechnology brings not only new economic prospects but also new risks. According to cautionary principle, these risks could be avoided by implementing appropriate technology structuring. The following thoughts are not suggestions for complete solutions, but may open a new horizon of questions for joint interdisciplinary and intercultural project groups.

Structuring of Scientific-Technological Innovation

Cultural models criticise some technological alternatives as inhuman or ecologically harmful and focus on adapted or intelligent solutions. Ideas of naturalness or humanity have always been included in a path-dependent orientation of particular technological developments. The concrete paths of individual technology developments result from the interaction of various selected and limited conditions. With the dynamic of variation and construction within particular fields of technology development, routines of construction and paradigmatic solutions have been worked out. The routines of construction are established in the "State of Technology". In this respect a path-dependency of technological developments results from the practice of technology development. There is no central authority that would structure the entire development. So you must take various contexts of structuring into consideration, if you want to structure a particular frame of conditions

Technology does not arise from a single project but is developed out of a gradual process, and so it cannot be planned in advance. Likewise, neither technology assessment nor technology structuring can be done by a single project but also has to be taken as a gradual process of constitution and reflection. Nevertheless technological development does not have to be irrational.

Innovation in technological action always includes potential failure, unknown risks and non-intended effects. There are two ways to handle this: prohibition of every new technology to avoid any possible mistake (tutorism -- taking the safest way) or permission for new technological actions, provided that the acting parties are made responsible for their actions, in both positive and negative cases. This implies the demand for a technology assessment of effects in case of failure of the technological action, legal liability, and the obligation to research into the risk-potential of innovative actions, which means research on safety. Because no particular risk of genetic engineering in cultivation compared with conventional methods has been shown yet, tutorism in this field of technological action cannot be defended. The question of how to allocate responsibility for innovations is excluded from this. Here the question of structuring technological practise is pending.

The structuring of technological practise typically is done by institutions of technology, economic control and through juristic-administrative regulations. It can no longer be understood as a simple technological rationalisation. The old city-states used social production targets, e. g. the standardisation of bricks. The structuring of technology development is done by 1) institutionalisation 2) standardisation 3) juristic regulations 4) economic utilisation and 5) realisation of social needs and ideas of values (cultural dimension). Structuring first of all is

based upon the knowledge of technological dealing, orientated on the short-term success. The durability of technological developments results -- according to the thesis of knowledge of technological dealing -- not from the technological development itself, but from the present cultural frame. Yet one cultural prospect for technological development that would guarantee durability is the model, such as the model of sustainable development (Fritz 1995).

Whoever cannot show the harmlessness of a technology should expect preventive safety regulations. Yet the recombination of harmless agents has not resulted in any dangerous product. From the point of view of evolution uncertain risks and consequences are insufficient reason for not introducing a new technology. The obligation of precaution must be seen with different eyes. Because each quantifying weighing of risks and chances is connected with insecurity, especially in regard to the release of genetically transformed organisms, controversies cannot be excluded. Each decision includes arbitrary elements. The attempt of insuring against wrong decisions is done in society, for example, by law.

Law appears to be the right way to structure and organise technological actions so that they are legal yet also restricted. Laws mandate that technological action is done with responsibility. This way of structuring should be flexible considering the rapid developments in the field of genetic engineering. It would be desirable to research and compare the rights of genetic engineering in different countries as well as international regulations. It is apparent that national legal systems reach their limits in considering globalisation especially in the area of new technologies. So let us begin with listing the relevant fields of biotechnology development.

Biotechnology in Medicine

The contribution of biotechnology to the health situation of developing and take-off countries might be small in the near future. The main cause for diseases in tropical areas can be found in nutrition and substandard hygiene conditions especially amongst the poor population of developing countries. Methods of biotechnology and genetic engineering can be used to research and fight tropical diseases. Companies of poor developing countries or their governments are mostly unable to afford those innovations, which are essential for genetic research programs (Katz 1995, 44).

Vaccines for diseases such as AIDS, hepatitis and malaria are relevant for developing countries (Katz 1995, 47). Tropical medical care programs of the World Bank and various worldwide organisations must be supported. In addition, industry shows an increasing interest in the market of take-off countries. Its target is the local development of pharmaceuticals. Due to the high costs of genetic engineering, cooperation with industry will be necessary. To make this possible for developing countries themselves, exceptions in patent and sort preservation are being suggested. There also is a demand for technology assessment on the effects of on-site technology that considers traditional organisations and the social integration of technology. The betterment of the economic and social situation and the creation of a functioning health system will probably not be realized by genetic engineering procedures due to low funds. There is a legitimate hope that new vaccines and diagnostic methods for diseases will be developed. Because of high investigation costs, the prospect for an economical use for companies that work on the development is only evident in some take-off countries. Diseases of the poor are especially to be fought in a socio-economic way.

Biotechnology in Agriculture

To feed the increasing world population food production must be doubled within the next 15 years, yet agricultural floorspace cannot be extended. Cell- and tissue-technology, which produces virus-free hybrids, can offer a contribution of 15-30 percent. Analytical methods to simplify the diagnosis of plant diseases are of importance. The number of plants that have successfully been genetically transformed has exploded during the last few years and already includes the majority of food- and export-plants that are relevant for developing countries. But there is still a long way to go for research to translate laboratory and greenhouse results into development of transgenic types to be used in agriculture.

Most of the plant qualities that are worth being improved such as yield, vegetation, duration or fertility, are determined multigenetic. The basic technologies within the field of cell- and tissue-technology of southern plants are already perfected for practise and are routinely being used. Therefore in international agriculture research centres the focus of the work is on illness- and pest-resistance and also on stress-tolerance for improving the combination of substances (Katz 1995, 27). Problems of technology transfer into the third world arise due to the high state of privatisation of genetic engineering (Katz 1995, 28).

Genetic engineering works best in countries with good infrastructure. For example, the use-protection-concept tries to establish permanent protection of tropical rain forests with their cautious and sustainable usage (Katz 1995, 85). Another possibility for funding of biodiversity could be to connect it with an offer of processed samples to the chemical-pharmaceutical industry (Katz 1995, 86). Costa Rica. Mexico. Indonesia and Kenia [Kenya] already have exemplarv

structures for protection and marketing of genetic resources (Katz 1995, 8). Through this the position of at least some developing countries as mere raw material producer was affirmed rather than disproved (Katz 1995, 87). The potential use of large-scale genetic procedures for developing countries is rather low at present. But other biotechnology procedures are already of importance (Katz 1995, 2). In the near future, relatively expensive raw materials like cocoa butter, peanut- and coco-oil could be replaced through biotechnological transformation into cheaper fatty acids, i. e. rape-, soy- and palm-oil. The present local advantages of particular developing countries, e. g. climate and cheaper manpower, could slowly lose their importance. Nevertheless, the introduction of this technology is a question of profitability. As long as these raw materials are cheap, the procedure of genetic engineering will not be accepted.

Foodstuffs often have a high cultural meaning in developing countries, so that in many cases innovations are rejected. In developing countries genetic engineering and biotechnology offer enzymes, plant-cultures, micro-algae-cultures, bioconservation and procedures for testing the safety and quality of food. Since the beginning of the 20th century 75 percent of genetic diversity of useful plants has been lost (Katz 1995, 60). Biotechnology research can protect genetic resources. The interests of developing countries should be taken into consideration and the sustainable usage in each country of their own national plant resources should be intensified. Also customer protection in trade with genetic food in non-industrialized countries should be introduced (Katz 1995, 61). Questions of production safety and the effects on customers will have to be clarified. Only the Netherlands, Great Britain and the US have specific regulations for products that have been produced with genetically transformed organisms, which are unable to reproduce. Here questions must be clarified concerning the unexpected emergence of new substances or the impairment of

bio-availability of a foodstuff, which could imply the change of the general potentials of a product (Katz 1995, 133). There is a real risk of uncontrolled export of inferior products from industrial countries into developing countries. On the other hand, there is the risk of import of products from developing countries that do not agree with Western safety standards (Katz 1995, 134). The GATT-agreement expressly demands a scientifically approved reason for speculation on safety risks (Katz 1995, 135). Labelling for genetically produced food would be seen as a trade obstacle (Katz 1995, 136). Developing countries could be misused as unloading points for products and technologies that are dangerous and unhealthy.

Third world countries will solve their problems only if they implement research (Katz 1995, 145). Therefore access to biotechnological innovations would be helpful. Nevertheless, research and technology as well as the entire development should consider national and regional needs (Katz 1995, 147). The task is to fit technology into economic, cultural and political frames and capacities of each of the countries. Regarding technology transfer it is advisable to provide only technologies in those areas in which the receiving country could not be economically competitive. Patent- and sort-protection rights should include exceptions for developing countries (Katz 1995, 163) to make technology transfer easier. Technology assessment must be established as a complementary method for valuing developing programs. A problem-orientated examination perspective should be taken, which also includes the development of both technological and social alternative solutions (Katz 1995, 165).

International centres for agriculture research play an important role in the establishment of biotechnology and genetic engineering, e. g. the Rice Research Institute in Manila, established 1962, the Corn and Wheat Institute in Mexico City (set up 1966). the Tropic Agriculture Research in Kali (Columbia 1967)

and the Institute for Technology Assessment in Ibadam (Nigeria 1967). Each of these has relative low funding (Katz 1995, 41). They also practise strategies of defensive patenting. This is essential because of the GATT agreement for protection of mental property. Protection by patent should have a positive influence on development of biotechnology and technology transfer. There must always be a protection by patent for microorganisms and procedures of biotechnology or genetic engineering, according to these regulations. For plant sorts a protection by patent or any other working protection system or a combination of both should be introduced. The farmer privilege and the breeder privilege within sort protection are still missing. Very broad patents are not useful; therefore their durability is in question. The supporting effect of protection by patent on development of biotechnology in developing countries is especially doubtful within trade restricted practices. Developing countries should work out a system differing from the patent one and make use of the scope given in the agreement (Katz 1995, 73). It is not reasonable for many developing countries and their farmers to pay licence fees for plants that have been improved on the base of their own breeding work, without considering this contribution. Recognition of such advance concessions of indigenous communities is not planned yet in the agreement for protection of mental property (Katz 1995, 74).

In theory stress-tolerant plants have, particularly for developing countries, a massive change potential in agriculture science. But this results in a move from overused floorspace to untouched areas, which is an ecological disadvantage. An improvement of dryness- and salt-tolerance transfer from useful plants to their natural relatives is not improbable (Katz 1995, 92). Biological safeness in developing countries does not always agree with standards. The risk of release of genetically transformed plants in the third world is usually higher than in industrial countries. Before doing release experiments, scientists must consider

the special characteristics of a developing country. In addition the safety research on release is insufficient in spite of the extensive efforts, especially in China (Katz 1995, 102). On the other hand, the problem of spoon-feeding countries according to questions of safety for the protection of their own population should be cleared up and answered positively (Katz 1995, 103).

As Latin American countries, in particular, move towards US-American safety regulations (Katz 1995, 103) so they inherit a safety problem. From experiences with experiments on small fields they conclude harmlessness or danger of the release on large fields. This is in the least an insecure practice. The substitutes of the synergetic concept demand a case-to-case check up. The Agenda 21 of the Rio agreement includes an agreement about biological diversity. According to bio-safety records the safety regulations will have to be unified. The development of international bio-safety guidelines is essential. Developing countries should be supported with establishment of their own safety-guidelines.

References

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