Food Security and Sustainable Development

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A Study of the EKD Advisory Commission on Development and Environment

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Foreword

The Protestant churches in Germany have dealt with the subject of structural change in agriculture on several occasions. In the present study *Food Security and Sustainable Development* the EKD Advisory Commission on Development and Environment takes up the current debate in the light of recent developments. The EKD Council has examined it carefully and welcomes its contents.

The future of food and nutrition does not just involve experts. Changes in the area of agriculture affect everyone of us. That particularly applies to the questions relating to global agricultural production and trade on the agenda of the World Trade Organisation (WTO). The relationship between opportunities and risks in the use of genetically modified (GM) seed in agriculture is a controversial matter. Worried farmers and consumers are asking about the long-term consequences. What does the patenting of GM methods mean for the production and global availability of crop varieties?

The study of the EKD Advisory Board for Development and Environment provides information about the current debate on global nutrition, and agricultural production and trade, pointing up the controversial character of political decisions for global food security as seen from the angle of sustainable development. The discussion about the ways and means of achieving this is marked by conflicts of values and interest. It is a complex discussion, in which the churches' option for the poor and disadvantaged provide them with specific assessment criteria and aids to decision-making.

This EKD study seeks to open up the issues and problems to a broad group of interested citizens, offering orientation in the minefield of competing goals and values. The Bible proclaims God as the creator and sustainer of the world, who created human beings in his own image and commissioned them to till the earth and safeguard creation. And it recalls God's siding for the weak and poor, and the commitments of generations to one another. The earth must therefore not be subjected to the short-term goals of a single generation or be the preserve of a privileged part of the world's population. That is why, from the Christian angle, sustainable development hinges on the solidarity of the generations alive today and their sense of fairness in giving future generations every opportunity to enjoy life on earth.

As we strive to make ethically responsible decisions we must beware of taking the wrong direction or ending in a cul de sac. For example, the forecasts about future threats to human life must not be played off against our present efforts to combat poverty and marginalisation – or vice versa.

The study shows threats to sustainability in agriculture through the loss of regionality and biological diversity, indicating possible negative consequences of using genetic engineering in agriculture. The EKD Advisory Board hopes that this study will make a critical contribution to the discussion in these particular areas. It seeks to stimulate necessary reforms and to draw attention to alternatives consonant with the three goals of sustainable development: protection of the environment, efficient economic activity and social justice. Only by avoiding one-sided emphasis on any of these three goals will sustainability be achieved.

Many thanks to all those involved in producing this study.

Hanover, 20 July 2000

Präses Manfred Kock
Chairman of the Council of the
Evangelical Church in Germany (EKD)

I. Preliminary remarks

1. The reason for this text – problem check

Agriculture is the most important economic activity of people although in developed countries it only makes up a fraction of economic value added. The production of food and the related use of the land and the labour of those working on it differ fundamentally from industrial activities and the service sector in two respects. They are directly linked with, and dependent on, nature and they satisfy a vital human need for food. No economic system can do without food security. The primary products of agriculture are plants and animals, and the basic resources are completely dependent on water, land and air. Whether available resources are exploited, even wasted, or preserved and renewed depends on a host of factors: the political order, the type of agricultural organisation and the ownership situation, the economic conditions, knowledge of natural processes and technological ability, and ultimately the attitude of humans towards nature. All these factors determine how people deal with the Creation that has been entrusted to them.

This study was written because we share the concern that neither the present agricultural system nor some of the most important trends are sustainable. A large share of the world's population has lost the resources and thereby the ability to supply their own needs. These people are dependent on an extremely unstable economic system, a system needing ever fewer people to reproduce itself. Every region in which the survival of its inhabitants depends on food having to be bought from outside the region has to export its own products and services year by year and expose itself for better or worse to the risks of extremely volatile world markets. The process of modernisation has increasingly led to a reduction in the farming population and the urbanisation of world society. Should this process continue, albeit with individual measures to reduce adjustment costs, or can fundamental alternatives be established? More attention must be paid in this discussion to the vision of sustainable development.

In view of current international negotiations on the global economy, agriculture and food the present paper seeks to contribute to a critical discussion and make suggestions for necessary reforms. This text concentrates on the global complex of food security and sustainable development; other questions like the current restructuring of agriculture in central and eastern European countries are not our topic.

The study comes to the conclusion that it is necessary to strengthen agriculture worldwide under the headings of sustainability and regionality, to reinforce a regional approach and to guarantee a livelihood for the farmers on their land. To this effect it makes more sense to consolidate experiences and traditional knowledge about varieties, farming methods and soil protection than to continue to promote agricultural methods predominant in industrialised countries.

For decades the Protestant churches in Germany have regularly taken up the issues raised in the present study.

- The EKD memorandum “Reorganisation and Agriculture” of 1965 was written in the context of the Federal Republic of Germany (West) and the European Economic Community (EEC). It still advocated the "businessman farmer" and a departure from a policy of subsidies, over-production and fierce competition. Environmental protection only got a mention as a side-effect of agriculture - to be remunerated as a service for the preservation of the landscape and not relevant to production. There was no reference to the broader international and development policy context, nor was the EEC a major agricultural exporter at the time.

- The EKD memorandum "Agriculture in a Field of Tension"[1] of 1984 was the consequence of the discussions on development policy, ecological and agrisocial consequences of the constantly rising agricultural imports and exports of the EEC. This had been sparked off by a strong publication by Brot für die Welt (Bread for the World), which had produced study materials in 1981 entitled "Hunger through Abundance – the cattle of the rich eat the bread of the poor". Under three headings the 1984 memorandum discusses three dimensions of "sustainable development", without actually using this concept: "Grow or go" raises social issues regarding the size of farms, "Ecology and economics" points to the tension between profitability and environmental protection, and "Hunger and abundance" raise development policy issues. The demands of the memorandum for a "social, inter-generational, ecological and international" agricultural policy come very close to present demands for sustainability.
- The Joint Conference on Church and Development and the German Farmers' Association issued a statement in January 1989. Under the heading "Reorganising agricultural policy as a social responsibility" they called for greater social, ecological, settlement-structure and development policy components of EEC agricultural policy. Further they advocated the reduction of agricultural subsidies, the granting of trade advantages for exports from developing countries and their protection from imports intended to benefit European farmers. Developing countries were also to have a fair say in the organisation of equitable world agricultural and trade relations.
- In November 1989 the EKD Committee for service in rural areas (ADL) presented an opinion on the "European Internal Market and the Conciliar Process for Justice, Peace and the Integrity of Creation". This called for qualitative instead of quantitative growth for the European Community, the integration of the goal of preserving creation into agricultural promotion programmes and agricultural policies, the abandoning of export orientation and the guarantee that each country can provide its own food supplies – e.g. through import tariffs – in face of the proclaimed goal of a deregulated global agricultural market.
- The same EKD committee, in a statement of 1993 on "Biotechnology and genetic engineering in agriculture" criticised the promise of genetic engineering to end hunger and poverty in the countries of the South, and named the dangers of a complete dependence on seed developers and seed owners through the patenting of genetically altered organisms. It warned against the dominance of capital-intensive agriculture.
- The Joint Statement of the EKD Council and the German Bishops Conference of 1997, entitled "For a Future Founded on Solidarity and Justice" (available in English), took up the demands for sustainable development. It expressly called for greater awareness of the connections between social, economic and ecological problems, a goal to remember as Christians shape the world. It called for greater ecological orientation of agriculture, the rejection of purely quantitative growth, greater emphasis on development policy and greater participation by poor countries in international economic bodies – all this in a spirit of responsibility for our "One World".

All EKD statements have been implicitly or explicitly accompanied by a preferential option for the more vulnerable and disadvantaged human beings, a commitment which the present study shares. In biblical witness God constantly takes the part of the poor, asking "is it not to share your bread with the hungry, and bring the homeless poor into your house; when you see the naked, to cover them, and not to hide yourself from your own kin?" (Isaiah 58:7). The option for the disadvantaged gives form to the

[1] *Landwirtschaft im Spannungsfeld zwischen Wachsen und Weichen, Ökologie und Ökonomie, Hunger und Überfluss* (1984). Eine Denkschrift der Kammer der Evangelischen Kirche in Deutschland für soziale Ordnung, in: Die Denkschriften der Evangelischen Kirche in Deutschland, vol. 2/3 Soziale Ordnung – Wirtschaft – Staat, Gütersloh 1992, 139-256, 156 (not available in English).

unity of loving God and our neighbour. It reminds us to take the part of people who live in the shadow of prosperity, unable to attract attention to themselves as a social group or constitute a lobby. It commits the prosperous to share and enter into effective alliances in a spirit of solidarity.

The above-mentioned EKD study of 1984 explains its rationale: churches and theology speak out in order to develop criteria for judgement and aids for decision on the basis of Christian faith and to clearly bring out the intentions of biblical witnesses. "The church can contribute to sharpening consciences, arousing a willingness to change direction and giving new impetus for action. They proclaim belief in God, the Creator and Sustainer of this world, who has commissioned human beings, made in God's image, to till and preserve the earth and not to use it solely for their own purposes....The Bible says: 'The Lord God took the man and put him in the garden of Eden to till it and keep it.' (Genesis 2:15). In our age of technological progress there is often too much stress on 'tilling' and too little on 'keeping'. This fosters a technological, economic dominance of nature that neglects the whole context. In our faith in God the Creator we must re-express the dual human responsibility that is given in that humankind is made in the image of God and is part of the created world. Responsibility before God also includes the willingness to participate in a global community based on solidarity." It is vital to examine in detail the extent to which faith in God, the creator, reconciler and liberator provides criteria for action. These will follow from our objectively analysing the problems while engaging with present goals and values, and with biblical criteria.

The memorandum names the following criteria, that also underlie this study.

- realising we are part of the created world;
- serving creation instead of exploiting nature and human beings;
- practising responsible stewardship;
- showing sympathy and solidarity among ourselves, with the coming generations and with other creatures;
- allowing free opportunities to develop, granting fair shares, and
- advocating for those who are socially vulnerable.

This also holds true even though few people in the industrialised world, particularly in Europe, are concerned about the development of agriculture. There is naturally a reason for that, as global agriculture has long been greatly to their advantage. Never were foodstuffs so cheap and plentiful. Yet a rising number of small farmers are suffering as a consequence: in the last few decades many have had to leave their farms – and this trend is not over. In other sectors of the economy people have, over the years and decades, had to devote fewer and fewer working hours to earning the money needed to buy basic food. In the industrialised countries there has been an increasing feeling that food shortages in developed countries are finally a thing of the past – after all, one of the greatest problems in the EU is how to deal with farm surpluses. So why should one give up such an advantageous situation – at least, if not forced to do so by external circumstances? However, the lifestyle connected with this mode of production cannot be transferred to the whole world.

It is hard to recognise that some structural features of the agriculture that has obviously produced this abundance are not sustainable. Yet these structures may collapse, both in the form of a sudden disaster or – more probably – as the sum of small, even tiny changes. We regard structures as threatened where – independently of the actual operating system – agriculture is organised on the model of industrial production, and its development characterised by the following elements:

- constant reduction in the number of farm hands;
- growth of capital investment, above all of external capital;
- growth of yield per resource and labour unit used;

– growth of the technical level of means of production;
– constant increase in division of tasks within the agricultural production chain and separation of the actual production, marketing and processing,
– concentrating on very few products, even on only one.

An important reason why such structures are incompatible with the criteria of sustainable development is the high energy consumption – energy needed for production, packaging and transportation of foodstuffs, but also for the production of animal protein, which requires seven times the energy needed for the corresponding production of plant foodstuffs. A second reason is the contamination of the soil and the (ground)water. The third, and perhaps most important reason is the growing uniformity of crops and the threat to biodiversity. That is leading to the loss of regionality in food security.

Finally, the elimination of jobs does not correspond to the principle of sustainable development as seen from a social perspective. Moreover, the continual production of surpluses goes against the sustainability criterion in economic terms since it can only be maintained by means of aggressive export strategies. Regional collapses have already occurred – in the age of globalisation capital follows even short-term comparative advantage.

A further important aspect of the problem constellation referred to in the present text is agricultural production in the "non-food" area. For business reasons, industrial primary materials or animal feed are often grown on good soils instead of food, even though the food supply of the region is not guaranteed by its own production. Here economic mechanisms conflict with the goal of sustainability. For some regions the non-food area is the only way of retaining agricultural production and thereby also its ecological functions and the guarantee of jobs in the primary sector.

There are, however, models for guaranteeing the sustainability of food security. This text argues that they should be constructively addressed. Yet what is at stake is no less than a fundamental correction of the political and economic control instruments in agriculture that, since the end of the 19th century, have been one-dimensionally geared to increasing production and productivity. "Sustainable development" and "food security" are mostly still discussed as separate problems. One of the aims of this study is to contribute to overcoming this separation and to showing that neither of these goals can be achieved without taking account of the other.

II. Clarifying terms

2. What is sustainable development?

This has become a political buzzword and in the abstract calls forth positive reactions. The Brundtland Commission's definition was: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[2] A related definition is to be found in Agenda 21, adopted in 1992 by over 170 states as a programme of action for the 21st century. Its Preamble begins: "Humanity stands at a defining moment in history. We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being. However, integration of environment and development concerns ... will

[2] The Report of the World Commission on Environment and Development (Brundtland Report), *Our Common Future*, 1987. See www.un.org/documents

lead to the fulfilment of basic needs..." In order to achieve this goal, the Preamble then calls for a "global partnership for sustainable development".

Yet this definition is very broad and general. The concept of sustainability contains at least the following ethical and normative aspects:

- The ecological dimension of sustainability designates the need for a global respect for the repercussions of economic and social developments on natural life support systems that have to be protected. Using resources sparingly, or not using them at all, are future-related aspects of sustainability and indicate the concern to ensure humane living conditions for future generations.
- Sustainability entails social justice and participation, and this includes ensuring that the basic needs of all people are supplied and they can all share in the goods of the earth.
- The political dimension of sustainability relates particularly to development policy. It means having an approach to the development of all nations and countries - with a bias towards developing countries - that is conducive to international and intercultural coexistence, justice and peace.

So the concept of sustainable development links up the ethical concerns of environmental protection and development policy. Social, economic and hence also agricultural structures are to be made sustainable in such a way as not to leave any mortgages for future generations to pay off which would impose heavy or irreversible burdens on their livelihoods. The concept of sustainability includes the idea of providing for the future, and endeavouring to allow following generations sufficient scope for action.

The disagreement begins with the attempt to fill the concept with substance. The reason is that in order to translate the ideal of sustainability into practical policies you have first to define and adopt sub-goals. Then you find that the term is supposed to apply to an extraordinary range of areas. A "narrow" understanding locates it exclusively in the field of ecology. At the other extreme, sustainability appears to be a comprehensive regulatory yardstick for all global and intrasocietal developments.

However, there is now a certain consensus that the principle of sustainability has to extend to at least the three focal dimensions of environmental protection, economic efficiency and social justice. Sustainable development – be it of a whole nation or of a smaller community – is only possible if there is no one-sided orientation to any of these three goals. However important it is to preserve our environment this must ultimately be in harmony with social and economic circumstances. Equally, the achieving of economic objectives must not be at the expense of ecological conditions and social balance.

Such a new consensus on the need to strive for sustainable development is all the more important since elements of the basic ethical consensus on which politics, business activity and society depend have been gradually eroded in the last few years. They need to be rediscovered under present social circumstances. Since the disappearance of systemic competition between eastern and western blocs, and with the advent of economic globalisation and new communication technologies, there has been a new discussion of the role of politics and the state, the importance of the economy and industry, the significance of work and, finally, the responsibility of individuals for the community. They all still need to be redefined. The relationship between poor and rich countries plays a key role here. The concept of sustainable development has a chance of becoming part of a new social consensus precisely because it offers room for interpretation and thereby a broad platform for many interest groups in society. At the same time the concept of sustainability can be introduced in such a way as to complement the ethical values generally accepted in politics and society.

Yet the term should imply a minimum of core content. In the field of the environment this means, first, the preservation of ecosystems and biodiversity. Renewable resources may only be used to the extent to which they reconstitute themselves and non-renewable resources only to the extent that these services, or the appropriate product, can be provided by renewable resources in the future. The waste absorption capacity of environmental media – water, soil, air – must not be exceeded. The timescales of human intervention must be adapted to those of nature. Dangers and risks to human health are to be avoided. Finally, there must be practical remediation for many forms of long-standing environmental harm.

"Sustainable development" must not be reduced to ecological objectives, as stated above. *Inter*generational and *intra*generational justice and solidarity are imperative. Without justice and solidarity there can be no sustainable development. The poverty of tomorrow and the threat posed by ecological degradation to human life with dignity in the future must not be pitted against the poverty and marginalisation of today, and vice versa. That also makes it clear that sustainable development is not just a matter of ecologically containing the damage. We should expect our society to reflect critically on consumption patterns and lifestyles. Might it not be better to again organise certain goods and services locally, or regionally, and not globally? What about the present global distribution of income and wealth, the geographical breakdown of the world into creditors and debtors? Agriculture could be sustainable if it were environmentally friendly, socially equitable, culturally appropriate, and holistic, i.e. understanding nature as an entity. Moreover, it would have to make a clear contribution to combating hunger in the world. In other words: "sustainable development" is about making far-reaching changes in politics, business and consumer patterns. And yet there has so far been little serious desire to do so. Therefore the idea of sustainable development really needs to be integrated into programmes of education and training.

Many of the questionable parameters for politics, business and culture have indeed brought about European prosperity, the virtual overcoming of poverty in the rich countries of the North and extensive social and legal security. Yet some of these achievements of western civilisation and certain economic paradigms of market and growth are now no longer necessarily compatible with the ethical postulate of global, intergenerational justice.

Calling for sustainability therefore seems like mission impossible. The three dimensions of this mission are mutually dependent. None of them can be pursued without considering the other two. So there will be more conflicts regarding aims and objectives – and precisely with regard to agriculture, quintessentially at the heart of conflicting interests.

3. What is food security?

Providing the growing world population with food, and above all satisfying the growing demand for food, was relatively easy in the past. Much of production growth took place by extending cultivation and irrigation areas, and spreading high-yield varieties with the appropriate technologies. Yet these possibilities are largely exhausted today.

– Further land reserves for cultivation are only available in individual cases; any remaining unused land is urgently required for nature protection.

– The easily accessible fresh water reserves have been fully developed; the further expansion of irrigation agriculture goes hand in hand with an almost exponential increase in investment costs

for water procurement. It is leading to a considerable damaging of resources owing to the tapping of ever deeper ground water levels.

– The potential of high-yield varieties is restricted due to self-induced diseases; these varieties have been largely cut back to a reasonable quantity by being crossed with more hardy local varieties. The growth rate of yield increases with staple crops has declined from decade to decade, particularly in developing countries. Even intensive fertilising and chemical plant protection often no longer lead to higher yields.

The concept of "food security" is as unclear as it is widespread and popular. As with sustainability, it is hard to define and allows anyone to use it to conceal their own interests. However, as soon as one tries to tease out the individual strands of this concept the differing ideas are quickly revealed. Some understand food security to mean national self-sufficiency with foodstuffs of all kinds and qualities, while others understand it in a global-market sense, where countries can compensate for a lack of national self-sufficiency by buying additional food on the world market with abundant foreign currency or trade surpluses. Others understand food security to be inciting unlimited growth of agricultural production; others prefer to see it as supplying certain threatened groups in society, linking it with an agricultural and food policy that is responsive to poverty and the needs of target groups. Others, again, pack in the idea of long-term resource security. For them food security is identical with environmental and resource protection. Finally, food security is often confused with the concept of food safety, that is exclusively concerned with the quality of foodstuffs, relating to their effects on health.

Food safety is often not guaranteed either, as shown by scandals in Europe – e.g. with "mad cow disease" (BSE) and dioxins in poultry products. In particular it has become clear through the BSE epidemic that the abandoning of natural feeding processes can lead to serious diseases. Here herbivores were fed bone meal. Such a misguided "cycle" is not unique, however. In the South of the United States cattle are fed nutritious poultry droppings while hens are fed bone meal from slaughtered cattle.

Politically speaking, the concept of food security has fallen into disrepute through the "protectionist agricultural states" (e.g. the EU and Japan) using the argument of increased food security to justify the production of their surpluses and protection of certain markets. That then meant having national food reserves in order to survive a certain period of crisis in the event of war or other calamities. It was EU policy to deliberately conquer other markets by subsidising farm exports to reduce its giant surpluses, thereby bringing the concept of food security into disrepute.

By contrast, the term has played a major role in the developing-country discussion. That is a matter of food security at both the individual and domestic levels, in terms of relations between different members of different ages and genders within the household, and also nationally and internationally. At the Food and Agricultural Organisation (FAO) there is a Special Programme for Food Security that gives the following definition: "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".[3] This approach assesses the vulnerability of access to food, distinguishing between chronic and temporary food insecurity.

The analysis and the food security policy following from such a view primarily engages sociologically with the different groups of poor people, their economic and social role in society and the distribution

[3] www.fao.org

of the physical production and financial resources. A comprehensive study of hunger and politics by Amartya Sen, Nobel prize-winner for economics in 1998, links the concept with the category of "entitlements".[4] These are defined as all the rights and opportunities of a person to use the different goods at their disposal in society. They relate to what a person can produce, sell or borrow, what they own or what societal and state rules allow them to do with all of this. From that angle there are basically four different entitlements to food:

1. trade-related entitlements, i.e. what food individuals can buy with the goods and cash they own;
2. product-related entitlements, i.e. the right to own what they produce with their own resources;
3. own work-related entitlements, i.e. those drawn from income from their own labour in order to be able to buy things on the market;
4. inherited or transferred entitlements, i.e. the right to own what is freely given through transfers, gifts or donations from others, including public spending on social security, food aid and pensions.

The strength of this definition of food security consists in the integration of the three food-related concepts: availability, access and stability of supply. Food security can therefore be understood as the ability to protect oneself from abrupt interruptions of normal entitlements to food. The definition has a macroeconomic dimension. As a cross-cutting task of all areas of policy it goes far beyond the question of appropriate agricultural development strategy or even rural development. The whole development model has to be seen from the question of the extent to which it serves to safeguard the poor from hunger. Economic growth is not rejected *per se*, nor is increasing world market integration. They must, however, justify themselves in terms of their distribution policy effect on the groups in society susceptible to hunger. A subsistence economy can be just as meaningful an option as commercialisation and export orientation as long as market development is officially overseen and its social policy effects are monitored. With this approach Amartya Sen has made a contribution to overcoming the neoclassical paradigms that have predominated thinking in this field for so many decades.

The problem about this approach is, however, that it omits the dimension of the environment and the question of appropriate technological development. The destruction of the fertility of soils or the natural balance between pests and useful insects can considerably shake the basis for nutrition and livelihoods of whole areas and large strata of the population. The same applies, however, to global technological developments, like the shift of the production of tropical raw materials, fruits and spices to the biofermenters of northern factories with their genetically modified micro-organisms. These developments of substitute products pose a very great threat to the world markets and the sales chances of the southern countries, particularly for employment and growth effects in the still very export-oriented agriculture of many developing countries. Here we see that the threat to food security is in some cases extremely dependent on global trends. It is not easy even for good governance or focused national policies to provide checks and balances.

Technologies have distribution effects in themselves that do not just consist in the employment effect. Different technologies are suited to different scales of operations and therefore benefit the different producer groups in different ways. High-yield seed may in itself be neutral regarding the scale factor, and even enhance employment, but it unfolds its full productivity only in connection with the complete package of accompanying measures, e.g. intensive use of fertilisers, irrigation, pesticides and placing large areas under cultivation. These costs vary but they mostly entail a capital cost for the purchase of inputs that has to be prefinanced, generally three months before harvest time. Bridging

[4] Drèze, Jean/Sen, Amartya (1989): *Hunger and Public Action*. Oxford, Oxfam.

this period, and the high vulnerability of high-yield varieties to inclement weather and pests, may mean that vulnerable social groups rapidly fall into unbreakable, livelihood-threatening debt cycles.

Small-holders in Asia, Africa and Latin America are therefore on the lookout for alternatives to the vulnerable high-yield varieties. These programmes are, e.g. in southern Africa, called "seed security". That does not just mean access to seed at the right time, plus the affordability and availability of other necessary inputs. Seed security is also about the appropriateness of the whole technology package incorporated in the seed, in the social and ecological conditions of the locality, and in the farming system and its forms of marketing.

It is also important to empower women in society. After all, they are often the ones to till the soil, bring in the harvest and select part of it for the next seed-time. Securing family food supply therefore is fundamentally dependent on the women's knowledge of resistant seed. Yet in many cultures women are not equitably represented in decision-making processes.

Particularly regarding the problematic trends towards genetically modified seed based on patents – and making re-planting subject to royalties paid to transnational corporations – developing their own seed base makes farmers feel more secure in view of all contingencies. A great step forward towards stability and food security can be made on the basis of improved old varieties and with the ability of the farmers to develop such time-honoured lines with the help of cultivators and scientific advisers. With luck they may produce hardy farm varieties that yield a reasonable amount and require little water and fertiliser.

Between 1960 and 1990 developing countries were able to extend their cereals production by 100 percent, mainly by using whole technology packages. This development was also accompanied by tendencies towards more one-sided cultivation structures. The improvement of yields by 100 percent meant in Asia an extension of the irrigation area by 60 percent and of synthetic fertilisers by 2000 percent. 33 percent of production growth may be attributed to the improved varieties and 66 percent to the use of inputs that modify the environment, i.e. intensified irrigation and the use of agricultural chemicals.

The extension of monocultures, the use of agricultural chemicals and the intensification of irrigation has led to enormous ecological side-effects, e.g. eutrophication and the contamination of fresh water and the seas, soil erosion and the reduction in agrobiodiversity. A comparison between the energy efficiency in the cereals production of agricultural systems with intensive external inputs and with extensive operating systems in Bangladesh, Columbia, China, Philippines, the United States and Britain clearly show that on average extensive agricultural systems have five times more energy efficiency (1.34 kg/MJ) than input-intensive operating systems (0.28 kg/MJ). In the Philippines it has been calculated that the transition from traditional systems of rice production to modern cultivation requires an energy cost increase of 3000 percent, contrasting with an additional yield of 116 percent.[5]

Over 15 years ago it was shown that all the known resources of fossil energy in the world would hardly suffice to feed the existing population with the same energy cost as required by the nutrition systems of industrialised states.[6] It is clear that developments towards an ever more intensive use of inputs cannot go on like this. The future of world food supply cannot be guaranteed this way.

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5 Data from International Rice Research Institute.

6 Pimentel, David (ed.) (1984): *Food and energy resources*. Orlando, Academic Press.

In the last few decades, with the structural adjustment programmes (SAPs) of the World Bank and International Monetary Fund (IMF), there has been considerable pressure on the governments of developing countries to reduce their interventions in business activities, even in the areas where there is a great risk of market failure or where there has been a basic need for state intervention. In the argument about who is more efficient, the market or the government, the decision has come down strongly in favour of market economy solutions. The mistrust of governments is great, because their market interventions have often strongly distorted the incentive structures and prices, from which the most vulnerable social groups have often benefited least. Recently the treaties of the World Trade Organisation (WTO), the liberalisation of the capital and product markets, the reduction in agricultural support and world market integration have made it more and more difficult for governments to represent the interests of threatened, disadvantaged groups.

Even the role of the state as a defender of property rights and guarantor of a stable environment for production and exchange has been threatened by the constraints of deregulation in many developing countries. If efficient conditions based on the rule of law are lacking, the question of whether anyone can satisfy their food needs often becomes a question of the distribution of power, both within households and within the community, the region and the nation. So in times of global liberalisation food security increasingly becomes a politically sensitive concept, which can be used to oppose any further erosion of the role of governments. As a "non-trade-related concern" food security will be pushed by many developing countries in future WTO agricultural negotiations. They want to prevent important programmes beneficial to poverty-oriented rural development and food supplies for the poor falling under the "non-market-compliant" or "protectionist" measures which, according to WTO rules, are to be abolished. They also want to prevent the subsidies that flow into these programmes conflicting with the WTO's commitment to cut back on support payments.

III. Threats to sustainability in agriculture

Agriculture is always governed by dynamic development. Different breeding methods used over the millennia have adapted plants and animals to constantly changing requirements. As plants and animals change, so do methods of cultivation and animal husbandry. In the past, yields were greatly increased through livestock breeding and the refinement of production equipment and inputs such as fertilisers and pesticides. At the same time, the following well-known ecological problems appeared as an adverse side effect of this development: soil degradation and erosion, salinisation, the pollution of waters with chemicals and a rise in the emission of climate-relevant gases such as methane and carbon dioxide.

Today we are realising that these problems cannot be solved through end-of-pipe technologies, ie through technical clean-up when the damage has been done. Rather, it is vital that the precautionary principle be applied to cropping, and to animal husbandry and breeding methods, in order to try to prevent these problems from occurring.

In this section, we will deal with three problems that have a significant bearing on food security: the loss of regionality, the threat to biodiversity, and genetic engineering in agriculture. All examples are taken from the field of cultivation. In many instances, however, there are parallels with the issues of livestock breeding and animal husbandry.[7]

[7] See e.g. Chivers, Keith (1998): *History with a Future*. London, J.A. Allan.

4. The loss of regionality

Ever since humans became sedentary and began to modify their environment according to their desires, intact nature has had to give way to a cultural landscape with great regional differences depending on environmental circumstances, climate conditions and different lifestyles. One thing that all people working and living in rural areas have in common is that their occupation and activities are still strongly linked to agricultural production. In countries with large-scale farming methods characterised by industrial production, this link has become weaker.

Due to cultural diversity, ways of life can differ considerably in rural areas worldwide: people prefer different foods leading to the breeding of different livestock and plants to satisfy their needs. This is how regional foodstuffs and medicinal herbs were discovered, cultivated and modified through breeding, while being unknown to other regions where they would not flourish. Nurturing this cultural heritage is still of great importance to the well-being of the rural populations of the South because a balanced and wholesome nutrition and the treatment of diseases are based on the knowledge of the different species of plants.

This direct link between food security and cultural landscape has, to a great extent, disappeared in the Northern hemisphere. In those countries, food security is a supraregional issue and medicine is supplied by the pharmaceutical industry. More and more animals and plants are farmed for the world market and not for a single region. The larger the area of cultivation, the more monotonous the appearance of the landscape. Cultivation, livestock farming and further processing often do not take place within one region and in some cases involve long-distance transportation.

In Europe, the value of the cultural landscape is primarily seen from an ecological and aesthetic point of view. A landscape rich in structure, biodiversity and typical environmental features contributes to the conservation of biological diversity. It is also of a high recreational value.

The increasing focus of agriculture on the world market has changed the social structures of the rural areas: the size of farms is increasing, there are fewer and fewer full-time farmers and an increasing number of those farming on the side. Nowadays, living and working are often spatially separated. Those who live in the countryside commute long distances from their domicile to their place of work. Due to its attractiveness, more and more people who do not work in agriculture or rural industry want to live in rural areas. This is leading to new structures in local communities.

Today we are seeing a rediscovery of the regionality of food, a fact which is giving fresh impetus to agriculture and leading to a stronger identification of the population with its regional surroundings. Food scandals and the discussion about genetically modified foods have resulted in consumer confidence in the wholesomeness of food being connected to confidence in regional production. More and more people are understanding the significance of agriculture for society, i.e. the connection between caring for the cultural landscape, protecting the diversity of nature and growing food.

A seed initiative in Eichstetten[a]

Eichstetten is a rural community in the Kaiserstuhl, a region in southwest Germany. The seed initiative, established in May 1998 in the municipality of Eichstetten, aims at establishing a project for the conservation of plant stock, for the cultivating of regional varieties and for the scientific development of plant-breeding methods. The initiative is supported by the council, farmers, gardeners,

and wine growers of the region. Farmers of all cultivation methods – conventional, organic and integrated – are participating in the project. Scientific monitoring is assured through various national and international contacts.

The initiative focuses on fruit- and wine-growing and on the development of a conservation garden for plant breeding as well as the construction of a nature trail that informs visitors about cultivable plant varieties. It is also planned to carry out large-scale cultivation of regional strains on the farms. Since the growing of vegetables is the most important element of the Eichstetten seed initiative, the project aims at reproduction, conservation and selection as well as the marketing of seed and end-products.

This project is a very important step towards the conservation of the diversity of cultivable plants. It can strengthen regional structures and protect small-scale farming methods. The objectives of the Eichstetten seed initiative, such as new income-generating possibilities in agriculture, tourism, the hospitality business and processing activities as well as the protection of the local genetic diversity will in the long run be to the benefit of the whole population of Eichstetten. The project also helps to counteract the present trend – owing to European integration and globalisation – to reduce the importance and influence of local communities.

a Cf. Homlicher, Anette/Hees, Wolfgang (2000): "Ein Dorf für den Erhalt der Kulturpflanzenvielfalt", in: Ökologie und Landbau, No. 113, January 2000, 44.

We often find a converse development in the countries of the South: through the cultivation of plants for commercial purposes, the farming of regional food crops is being neglected or even given up and diversified nutrition in local communities is on the decrease. When farmers buy high-yield seed they depend on sufficient irrigation and additional inputs, which results in higher costs and more hazards to human health and the environment. Crop failures or falling prices on the world market lead to less proceeds from sales and hence make it more difficult for the families to provide for their daily diet.

5. Threats to biological diversity

Unfortunately, most people disregard the reasons why our global food system is not at all sustainable. Many environmental hazards – from nuclear power to acid rain, from the ozone hole to soil contamination from toxic waste – are well known to most of us; only a few, however, see the threat to the genetic diversity of our natural environment and understand that our global food system could collapse as a consequence – something which would have unpredictable political repercussions. Strengthening regional, community-oriented agricultural systems can at least help to defuse this crisis. In order to do so, it is important to protect genetic diversity of our plant and livestock *in situ*, i.e. on a local level and in line with the specific ecosystems and social structures.

Rice diversity in Asia

Over 90 per cent of the world's rice production is cultivated in Asia on an area of almost 150 million hectares. Rice accounts for 50 per cent of agricultural income in Asia and supplies almost 80 per cent of the region's nutrition. Due to the great significance of this crop for agriculture and food security, Asian farmers have developed a vast variety of rice strains over thousands of years. Scientists estimate

that more than 140,000 rice varieties have been developed in Asia. 80,000 varieties can be found in the world's largest gene bank for rice, the International Rice Research Institute (IRRI)[a] located in the Philippines.

During the past 30 years, however, this diversity of cultivation has vanished. Through the promotion of high-yield varieties by the IRRI and government agencies in the course of the Green Revolution, yields were increased considerably on some heavily irrigated, fertile locations but, at the same time, the danger of crop failures from pests and diseases became more imminent. The introduction of corporate agribusiness led to a greater dependence of the rural population on cost-intensive means of production. The soil became less fertile and biodiversity decreased. Now, only a few varieties of rice are still being cultivated: in Thailand and Burma five varieties are cultivated on 40 per cent of all arable land, in Pakistan, five varieties are grown on 80 per cent of all land used for rice cultivation and in Cambodia only one variety is planted during the dry season on 84 per cent of the whole cultivation area.[b] Because of these intensive-farming methods, fewer nutritional herbs can grow on the fields, even though they constitute very important complementary nutrition for the poorer rural population. In order to make a living with rice cultivation, farmers neglect the growing of other plants typical of the region. This results in a loss of important side incomes and may cause nutritional deficiencies. Rice may be rich in carbohydrates, but it does not contain many other nutrients.

In India, the governmental food programme shifted the daily diet to subsidised rice distributions and as a consequence, food crops were no longer cultivated to a sufficient degree in areas with less productive soil. Unbalanced nutrition causing deficiency diseases was the consequence, and a further loss of fertile soils since the less productive soils were left to lie fallow.

In the future, this situation will become more dramatic because multinational corporations are launching patented rice strains on the market. Patents on Indian Basmati rice and Thai Jasmine rice triggered heavy protests in their countries of origin, since these aromatic rice varieties were developed in Asia. The countries of this region consider genetic modifications carried out and claimed as a patent by the US corporation RiceTec to be of minor importance compared to the breeding of rice varieties which Asian peasants have been practising for hundreds of years.

There are already 160 patents on rice worldwide and most of them are held in the US or in Japan. Most of them are issued on herbicide- or insect-resistant plants. Additionally, more and more conventionally produced hybrid strains are sold on the market, forcing farmers to buy new seed every year even though it is vital for the poorer rural population to save part of the harvest from year to year for replanting. This explains why the Terminator Patent is so strongly opposed in Asia. This patent refers to a genetic modification of plants rendering their seeds sterile so that they will not germinate on harvest.

Industry has brought forth another questionable development described by its makers as being very promising: rice that produces vitamin A. This new variety is designed to fight deficiency diseases caused by the extensive consumption of polished rice. The question here is whether it wouldn't make more sense to recover traditional and balanced food customs which have been altered through the intensive use of herbicides on the fields of the Green Revolution. This could be achieved through focused support on the local level and could lead to an improvement in the families' livelihood and health.

Along these lines, there is a noteworthy project of the Deccan Development Society (DDS) in India whose members are women of the lowest social group, the Dalits. They are creating a self-sufficient regional system consisting of traditional foodstuff which aims at replacing the official central

programme of rice supply. Not only is this project strengthening the local social structures of the poor and offering a certain economic autonomy for the families, it also preserves soil fertility and biodiversity.[c]

a GRAIN, Biopiracy, TRIPs and the Patenting of Asia's Rice Bowl, A collective NGO situationer on IPRs on rice, May 1998.

b IRRI's Social Sciences Division data sets and IRRI hotline April 1998.

c Sateesh,P.V./Pimbert, M. (1999): "Woman Sanghams of the Deccan Development Service", in: Seedling, vol. 16, June 1999.

The Green Revolution has shown that natural plant tolerances cannot be completely replaced by the use of chemicals. Without the greatest possible diversity of plant stock, it will be impossible to guarantee food security for the long term. The transition to a sustainable, locally appropriate form of agriculture can only be successful if traditional seed – enabling cultivation in the past without the use of chemical pesticides – can be preserved. The same can be said of all species of livestock.

There are more interactions that need to be taken into account if we want to achieve sustainability in our agricultural system: the greater the climate change during the 21st century, the faster the regional agricultural systems will have to react and the greater their dependence on biodiversity will be.

The system of industrial agriculture is confronted with a never-ending race between plant breeders on the one hand, and pests and plant diseases on the other. If the plant breeders were to lose, the impact on an agricultural system based on single-crop farming or the cultivation of only a few varieties would be completely unpredictable.

– The rising demand of planters to sow seed of varietal purity has also increased pest problems. The adverse effects on human health resulting from the more intensive use of herbicides will be pointed out only briefly here. On a field planted with a landrace or local variety – a natural mixture of seeds which are well adjusted to the local conditions – insect pests which find a plant they do not like move to another which they prefer. There is no need for them to adapt to new conditions because these fields offer a moderate, but permanent food supply. Yet if thousands of hectares are cultivated with plants of varietal purity, insect pests and disease-causing agents have to adapt to the new circumstances in order to survive and have to overcome the different tolerances which the uniform seeds might present. This change is taking place at a remarkable speed.
– In order to breed new varieties whose pest and disease resistance stems from original genetic material, cultivators have to fall back on landraces, local varieties and wild plants because they are the source of all cultivated food crops. Unfortunately, only a few landraces and local varieties are still being cultivated – and in very remote areas. This is for the following reasons: first, the global triumphal march of agribusiness, second, the success of international seed companies which are selling their varieties all over the world and third, the decline of many traditional forms of agriculture.
– The conservation of genetic diversity of food crops through gene banks is highly problematic and will always represent a "second-best solution", albeit at present a vital recourse. "No one strategy could hope to preserve and protect what it took so many human cultures, farming systems and environments so long to produce. Diversity, like music or a dialect, is part of the community that produced it. (…) Communities must save their agricultural diversity in order to retain their own

options for development and self-reliance."[8] Furthermore, diversity cannot be preserved if no real use is made of it. It is only through cultivation that diversity can develop further under natural conditions. The need for diversity is never-ending. Therefore, our efforts to preserve this diversity can never cease. No technology can assume responsibility in our stead, to safeguard the genetic diversity of our plants for us and for the generations to come.

It is becoming more and more difficult to protect the natural diversity of food crops because our efforts have come to represent a dramatic race against time– not least due to the policies of the European Union. Already these policies can be held responsible for the irreversible loss of thousands of varieties. The underlying reason is the introduction of the EU Common Catalogue and the procedures bound up with it, protecting the interests of the big seed companies which have formed the Union for the Protection of New Varieties in Plants (UPOV) (see box).

The Common Catalogue of the European Union

According to the present legislation, it is prohibited in Europe to pass on or sell seeds not listed in, and hence protected through the EU Common Catalogue. Usually, seed catalogues consist *only* of such varieties for which royalties are paid to the patentee. It certainly presents a problem that seed companies "take over" a newly and cost-intensively cultivated variety of another company and sell it under a different name.

To be registered with the EU Common Catalogue, a seed variety has to undergo a certain test procedure in order to verify whether the variety meets the standard of distinctness, i.e. it must differ in important characteristics from all other existing varieties, and whether its genetic structure offers a minimum level of uniformity and stability (DUS test). In 1976, the test cost about DM360 (about €184), in 1995, this amount had risen to DM2,400 (€1227).[a] When the new variety is found to meet the standards, it can be registered with the national varieties list – fee: €322 – and can remain there on payment of a further annual levy of €191. Furthermore, the seed company holding the title to the variety can be required to carry out trials on a standardised field, so that genetic uniformity can be tested continuously.

These regulations apply to old as well as to new varieties and have resulted in a crisis for many small seed companies. These enterprises do not have enough financial resources to carry out intensive breeding programmes and so they often specialise in traditional varieties. Many of their breeds had no chance to be listed in the EU Common Catalogue because landraces and all other varieties with a certain genetic variability did not meet the stability criterion and were thus automatically excluded from the tests. Since July 1980, all varieties offered for trade have had to be registered with these lists and therefore many smaller enterprises have had to give up their business or sell out to bigger competitors. Owing to these developments, Rank Hovis McDougall was able to buy up 83 smaller seed companies within a single week.[b]

Companies would certainly not pay the fees for the test, for the registration and for remaining on the varieties list if prospects of selling great amounts of a certain variety were poor. Since the sales to commercial agriculturists and horticulturists account for nine tenths of the turnover of an average seed company, it is generally the case that only those varieties are registered that meet with the approval of

[8] Fowler, Cary/Mooney, Pat (1990): *Shattering – Food, Politics, and the Loss of Genetic Diversity*. Tuscon, University of Arizona Press, 168.

commercial farmers and gardeners. This poses a problem in that private gardeners, cultivators of allotment gardens and organic farms need other seed varieties than conventional operations using "industrialised" cultivation methods. A commercial farm would demand characteristics such as high yield, uniformity and good capabilities for further processing, whereas the "amateur" prefers a fruit with a particularly good taste.

If we look at peas, for example, a commercial farmer prefers a variety with a plant that does not have to be tied to canes, with fruits that ripen simultaneously in order to be harvested at the right time for the deep-freeze market and a variety that has few leaves and wooden stems because they could block up the harvest equipment. Conversely, hobby gardeners and organic farmers want plants which grow tall so that their backs don't ache when harvesting. They prefer the shells to ripen consecutively over the longest possible period of time and the taste should be best when the peas have just been harvested – characteristics after deep-freeze processing are not of great importance to them. Even though the problems and threats have been known for a long time, dozens of tall-growing pea varieties and thousands of other old food crops have been disappearing slowly from the varieties lists.

The procedure to register on the Common Catalogue also resulted in the loss of genetic material because only one specific variety of a traditional plant was admitted on the lists. Other varieties of the seed companies were simply classified as being identical, even though it was very clear in some cases that they were not. The transitions are always seamless – some varieties, selected over the years in different climatic regions, have changed in the course of time and often can no longer be compared with the original varieties that bear the same name.[c] In the seventies, for example, the onion "Bedfordshire Champion" was one of the favourite varieties of small-scale gardeners in England and variants were registered in the most diverse catalogues under names such as "Bedfordshire Champion Hurst Reselected", "Golden Globe", "Nuttings Golden Ball", "Cambridge No. 10", "Sutton Globe" or "Up-to-Date". But after July 1980, they all had to be sold under the name of Bedfordshire Champion, regardless of the fact that some had become very distinct from the original variety because they had been cultivated and propagated in very different regions. It was even immaterial that some new varieties had developed a resistance against a certain type of mildew, a characteristic that the original variety does not have.

When an application is made to register a traditional variety with the EU Common Catalogue or a national varieties list, this does not mean that it is permanently safe. It will only stay on the list as long as the company which undertook the registration pays the annual fee. Since the companies want to economise, however, hundreds of vegetable varieties have been taken off the list, which means that it is no longer legal to sell them. An infringement would result in lawsuits and fines. Assuming that one of these varieties had survived, anybody who wanted to sell it legally would have to pay the full amount of money required for a fresh series of tests and renewed registration.

The European Union has several cases pending, which aim at relaxing the regulations on the sale of smaller amounts of seed to gardeners who want them for their personal use. In the recent past, some progress has been made. However, it still seems that legislation is threatening the protection of traditional varieties instead of facilitating it.[d]

a Personal information from the Plant Variety Rights Office in Cambridge, May 1995.

b Fennell, Kay (1987): *The Seed Scandal*. Sevenoaks: Socialist Countryside Group.

c Fennell, Kay (1987): *The Seed Scandal*. Sevenoaks: Socialist Countryside Group.

d The problem can obviously be found in the impossibility to classify seeds into one group destined for commercial cultivation and another intended for use in allotment gardens; see here e.g. Arche Noah (ed.) (2000): *Sortenhandbuch 2000*. Schloß Schliltern, Austria: Selbstverlag.

6. Genetic engineering in agriculture

The threat to biological diversity in the agricultural sector will be intensified if the global spread of genetically modified plants continues to increase.[9] Up until January 2000, there was no international agreement guaranteeing worldwide biological safety. It is true that the Conference of the Parties held in 1995 in Jakarta had a mandate to negotiate a Biosafety Protocol to the Convention on Biological Diversity, one of the decisive conventions of the Earth Summit in 1992 in Rio, but this Protocol failed in 1999 in Cartagena (Colombia) due to the resistance of the Miami Group. This is a group of agricultural export countries, namely the United States, Canada, Australia, Argentina, Chile and Uruguay, which have vested interests. This opposition resulted in a lack of regulations concerning the safety of transnational trade with genetically modified organisms and presents a strong contrast to the extensive WTO rules on the structure of world trade. The WTO regime is putting the developing countries under pressure, demanding the adoption of patent laws for "biological material" in line with the Trade Related Intellectual Property Rights (TRIPs). The far-reaching patent protection in the US and now in Europe as well, with the introduction of the EU directive on the legal protection of biotechnological inventions which allows patents on micro-organisms, plants and animals and, with restrictions, on parts of the human body, is set to become operative worldwide.

The rights of exclusion which result from the patent protection, and mainly concern the use of transgenic organisms, would be of most benefit to the Northern countries, whereas the only way for the source countries of the genetic material – mostly those of the South – to profit from their own biological diversity would be by paying royalties. In the field of genetic engineering, the WTO does not offer an instrument of regulatory or antitrust law able to check on monopolistic tendencies: Thus, neither biological safety nor the control of monopolistic tendencies in the seed sector and in the field of biological diversity can be guaranteed. More and more transnational corporations are dominating the seed-production sector and are protecting their varieties with patents. And the TRIPs Agreement is supporting this development instead of preventing it.

It remains ethically and socially questionable whether this development can be brought into line with the objectives of sustainable food security. The fact that a few multinationals can claim possession of the seeds they have at their disposal not only encourages the dependence of farmers but, in the end, of all people. This is why plants and animals as well as living modified organisms (LMOs) should be exempt from compulsory patenting. The TRIPs Agreement should at least protect the farmer's rights and those of the local, indigenous community, so that centuries-old, informal possessory claims and practices such as the exchange of seed can be preserved.[10]

Genetic engineering is already widespread in agriculture. Up to 1998, about 25,000 field trials had been carried out in about 45 countries with almost all important food crops, above all soy beans, maize, rapeseed, cotton and potatoes. About 150 test releases took place in developing countries. In

[9] UNEP (ed.) (1996): Convention on Biological Diversity. Buenos Aires, UNEP/CBD/COP/3/L.12.

[10] See also CIDSE (2000): Biopatenting and the Threat to Food Security – A Christian and Development Perspective. www.cidse.org/pubs/tg1ppcon.htm

1998, transgenic varieties were being cultivated in the US during the growing season on 11 per cent of all the arable land, i.e. 20 out of 180 million hectares.[11]

The transgenic plant varieties now ready to be launched on the market have been modified mainly in their agronomic characteristics. 77 per cent of transgenic plants cultivated in 1998 were herbicide resistant and 22 per cent proved to be resistant to insects. In the future, we may see plants with a different composition of substances, fruits with a delayed ripening period and varieties that are resistant to viral and fungal invasion. What is being criticised is that this concept mainly focuses on the needs of a fully industrialised and export-oriented agricultural sector such as the one prevailing in the industrialised countries. The majority of farmers in the developing world do not have the necessary means to cultivate these varieties at a profit. This is why genetic research is not meeting their needs. Therefore, transgenic varieties developed up to now do not fulfil the prerequisite often mentioned, which is that hunger in the world can be eliminated by means of genetic engineering. Results of scientific studies are now indicating that the cultivation of transgenic plants may be to the detriment of biodiversity and ecosystems. And these results do not yet show to what extent damage is done through large-scale and long-term cultivation of these plants.

Herbicide-resistant varieties are spliced with genes that protect them from the damaging effect of non-selective herbicides. As a consequence, farmers can use these herbicides during the growth season since it is only weeds and not the food crops that will die. This is exactly where scientists fear adverse effects on biodiversity because using such herbicides on a large-scale basis disturbs the food chain of the field's ecosystem. Another phenomenon could be the appearance of super-weeds, i.e. weeds which receive their resistance through transfer from the food crop. According to the producers, the advantage can be found in the use of smaller amounts of herbicide but, in practice, the higher costs for the seeds compensate for the reduction in the use of herbicides. Frequently there is no such reduction, however. This is why herbicide-resistant plants may result in a win-win situation for the producers by supplying the farmers with herbicides and seed at the same time, and they may lead to a strong monopolisation of the agricultural market.

Insect-resistant plants carry a gene from the *Bacillus thuringiensis* (Bt), a soil bacterium that produces a toxin which harms insect larvae. The Bt toxin is already being used successfully as a spray in agriculture to fight heavy insect infestation. It is also allowed in organic farming. Transgenic food crops carry genes that permanently produce the toxin within the plant. Consequently, the plants are protected from destructive insects and, theoretically, there is no need to use insecticides to kill the larvae. However, it is already becoming evident in the cultivation areas of the US that the exclusive cultivation of Bt plants will lead to a rapid development of resistance in insects due to mutations that are taking place. Thus, a regulation on "refuge management" was introduced, i.e. requiring that up to 50 per cent of cultivated land be planted with conventional varieties and then partly treated with insecticides. Even this was ineffective, however, because it soon resulted in a dominance of resistant insects.[12] Advocates of this variety therefore only expect a short-term cultivation advantage as could be seen a few years ago with the planting of Bt maize to fight infestation with the European corn borer. According to several scientific studies, insect-resistant varieties can detract from biodiversity because they indirectly harm beneficial insects when these insects carry out their natural tasks within the ecosystem, which is to feed on pests from the plants. Caterpillars are threatened directly when they take in toxin-containing pollen that is dusted onto the leaves of fodder plants. The interaction of different ecological consequences can be very complex (see box) and a great deal of further clarification is required.

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[11] KWS (ed.) (1998): Annual Report 1997-98.

[12] According to a study by F. Haung et al. in: Science (7.5.99).

Threat to the Food Chain

Green lacewings are beneficial insects because they eat great amounts of aphids and thus represent a very important element within the pest-management system. In a study carried out in 1998, Hilbeck was able to show that larvae of the green lacewing are threatened indirectly when Bt maize enters into the food chain: if caterpillars are fed with Bt maize and are then eaten by larvae of the green lacewing, the mortality rate of these larvae is twice as high as that of other test larvae.[a] This caused the assumption that plants containing toxin are also harming beneficial insects. In the US, a study is being carried out to find out whether caterpillars will suffer damage when feeding on maize pollen that contains the Bt toxin.

A publication showing an adverse effect on the beautiful Monarch butterfly in laboratory tests, attracted public attention.[b] The significance of this study is still to be tested in a field trial. If the results were to be confirmed, the Bt toxin would have severe repercussions on insect diversity: The World Wide Fund for Nature (WWF) Switzerland, presented a study according to which many local butterfly varieties are in the caterpillar stage when corn is blossoming.[c] These butterflies could be affected by the Bt toxin – like the Monarch butterfly in the US – when they take in pollen from Bt maize.

Moreover, the toxin is released into the soil through the roots of the corn and there it remains active for several months.[d] It is not yet clear which effects the toxin can have on soil organisms. There is another concept of insect-resistant varieties which had been criticised even before the genetically modified plant was cultivated: potatoes were spliced with lectin genes from the snowdrop plant.[e] Aphids feeding on the plant and absorbing the toxin were harmful to those ladybirds eating the aphids. The ladybirds laid 30 per cent fewer eggs and died after only half of their regular life. This can be seen as another example of severe damage to the food chain.

a Hilbeck et.al. (1998), in: Environmental Entomology, vol. 27, 480 - 487.

b Losey, J. et. al (1999), in: *Nature*, No. 399, p.214; cf. also Hartzler, B. (1999), in: *Science*, No. 283, 171.

c Villiger, Mathias (1999): *Effekte transgener insektenresistenter Bt-Kulturpflanzen auf Nichtzielorganismen am Beispiel der Schmetterlinge*. Zurich: WWF Switzerland.

d Saxena, D. et. al (1999), in: *Nature*, No. 402, 480.

e In: Nature Biotechnology (1997).

All these results call for a new evaluation of the concept of insect-resistant plants. In 1997, the governments of Austria and Luxembourg announced a ban on a Bt-maize variety (Novartis) which is herbicide resistant and has an additional gene carrying a resistance to antibiotics. Ever since then they have opposed an Europe-wide permit for this plant. The reservations of these countries are now being reinforceded by an approval prohibition of respective varieties announced by the German federal ministry of public health.

The damage resulting from the cultivation of these varieties can be expected to be more serious in the developing world than in the industrialised countries. This is due to the fact that most centres of biodiversity – the origins of our cultivable plants – can be found in the southern hemisphere. In these countries, outcrossings might occur more often and would have more dramatic repercussions on the existing gene pool, modifying those plant genetic resources which are of utmost importance to modern

breeding. If transgenic crops were to become widespread in these regions, more local varieties would be displaced resulting in a loss of breeding diversity. In comparison to modern high-yielding varieties with their high requirements, local varieties offer yields that can guarantee food security to the population even under the cultivation conditions of local subsistence agriculture. Since there is an absence of a legal framework concerning genetic engineering in numerous countries of the South, they often find themselves in the situation of their authorities not being able to monitor releases of genetically modified organisms (GMOs) of transnational corporations and their local partners.

At the end of January 2000, the negotiations of Cartagena were taken up again and the difficult process that had lasted several years was concluded. The Cartagena Protocol on Biosafety is the first comprehensive international agreement of the new century. 140 states agreed on international regulations concerning intergovernmental questions of transboundary movements of GMOs.[13] This new regulatory framework is being hailed by the governments of the developing world and many industrialised countries as well as by NGOs as a great historic step forward in environmental and consumer protection. Finally, there was a successful point of departure to subject new technologies in due time to regulations protecting humans and the environment. This success can be attributed to the increasing public awareness – especially in the US – concerning safety matters of biotechnology and genetic engineering and to the presence of more than thirty ministers from the EU and developing countries.

The following are the main points of the Protocol:

1. It is guaranteed that this multilateral agreement for the protection of human health and the environment is not subordinate to multilateral trade agreements.
2. The precautionary principle is enshrined in the Protocol as the main guidance and basis for all individual decisions, i.e. bans on GMOs can be announced on the grounds of a justifiable suspicion.
3. The principle that the perpetrator of the damage pays will be introduced after the devising of rules and procedures in the field of liability.
4. In principle, GMOs can only be transferred from one country to another if the country of import gives its consent, basing its decision on comprehensive information about the organism and its potential impact on existing local ecosystems.
5. This principle also applies in general to unsaleable agricultural mass products intended for the use as food or feed, or for processing. Thus, food aid and development programmes will be able to distinguish real relief programmes from export-dumping that mainly serves the exporter's interests.
6. The labelling regulations enshrined in the Protocol can be seen as a contribution to ensure consumer information and their freedom to take a decision.

The Cartagena Protocol on Biosafety will enter into force on ratification by 50 states.

[13] The full text of the Cartagena Protocol can be found on the internet under www.biodiv.org/biosafe/index.html; on the Convention on Biological Diversity see www.unep.ch/bio/conv-e.html

IV. General policies and alternative models

7. World food policies and conditions for sustainability strategies

The basis of industrialised agriculture can be found in the introduction of a credit-supported focus of farms on few products or even on only one, with the aim of producing maximum yields. In times of crises, these products were subsidised by public authorities. In the 1930s and 1940s this production pattern became common practice in the US, particularly when the demand for agricultural products grew during the Second World War. Agricultural production in the EC caught up only slowly and it was not until the sixties and seventies that industrialised agriculture became common in Europe. The entry of EC farm surpluses on the world market and the competition with the US led to the globalisation of agricultural production and competition for global markets of agricultural products. At present, more or less all countries in the world are competing for these markets.

At first, the developing countries, still under the influence of colonial tradition, were still primarily exporting raw materials in order to meet the increasing demand of the populations for consumer goods. A fall in commodity prices led to a change of strategy: cash crops were now cultivated for export on good land while basic food crops for the population were displaced to marginal areas, causing a heavy decrease in yields. It became necessary to import food.

The principle of "locally appropriate farming"

Meeting world food demand in the future will call for new and comprehensive approaches. One can no longer take the simple paths of growth as in the past, which involved extending irrigated areas, further farming new land, increasing acreage cultivated with high-yielding varieties and external inputs. But what can be the substance of a possible new approach?

Agenda 21 mentions three different paths for development in agriculture:

1. The "New Green Revolution" is conventional intensive farming with completely new, genetically modified seed promising yield increases and the protection of resources and the environment at the same time.
2. "Integrated farming" aims at reducing the use of external input, or at least tries to achieve their highest possible efficiency. It aims at using a broad range of all possible measures related to cultivation.
3. "Alternative agricultural production" is a term not precisely defined in Agenda 21. It is mentioned it for the first time in an intergovernmental document and Agenda 21 stipulates that it be studied, documented and possibly promoted.

Agenda 21 dedicates a whole chapter to genetic engineering and expects it to produce great solutions. No distinction is made between paths 1 and 2. In fact, Agenda 21 considers these paths for development to be complementary and to merge into one another.

In European agriculture, however, great differences can be found between the three paths because of the "alternative agricultural production" outlined legally by means of the EU regulation on organic farming. According to the definition, "alternative agricultural production" implies that agriculture must refrain from any use of chemical pesticides, synthetic fertilisers and genetic engineering. In the

agricultural sector of the South, the distinctions between these three paths for development are more blurred.[14]

Apart from the small niches of an urban, middle-class market and the limited amount of organic products permitted by the EU for export, "organic farming" hardly exists as a well-defined structure in most developing countries. Due to the high flexibility of allowed inputs and methods, it would be more suitable to use the term "locally appropriate farming", as do most non-governmental organisations working in the field of development.[15] "Locally appropriate farming" is as distinct from genetic engineering as is "organic farming". However, concerning the use of chemical pesticides and synthetic fertilisers, "locally appropriate farming" in some respects shows more willingness to compromise.

Integrated Pest Management and Participation: The Model behind Agenda 21[a]

Agenda 21, chapter 14 declares "integrated pest management and/or farming" (IPM) to be the guiding principle of sustainable agriculture. In order to understand what this means, one has to know the background since there is a great difference between IPM in the tropics and IPM in Europe. Behind this model is the experience with a large-scale programme in Indonesia. In the context of the FAO's "Inter-Country Programme South East Asia", Indonesia decided to establish IPM as an official programme in rice cultivation because of a prevalence of pest-management problems. Nationwide, all promotion of pesticides through subsidies, credits and special advice were dropped. 57 pesticides were prohibited or their use reduced to a minimum through the introduction of a law on pest management. A comprehensive programme for training, research and the development of alternatives was launched. 200,000 farmers were trained and then asked to train other farmers. Research was decentralised and combined with training and extension services. Advisers, scientists and politicians had to undergo training seminars on the significance of IPM. The reduction of chemical pesticides became the criterion for success. Owing to its high degree of mobilisation, the programme reduced the use of chemical pesticides in rice growing by 40 per cent without yield losses. On average, trained farmers had higher yields and lower costs for chemical pesticides.

The following criteria led to the successful implementation of the programme in Indonesia:
- a strong political will and consistent policies,
- mobilisation and training of farmers through real participation on a broad level, the integration of local practical knowledge and the empowerment of agricultural workers,
- monitoring of the market and consistent risk minimisation,
- no vague definition of IPM but the considering of chemical pesticides as a "last resort".

The success of this programme was, however, called into question through structural adjustment programmes, which had the following consequences:
- the sale of agricultural products was privatised;

[14] See Robinson, Nicholas A. (ed.) (1993): *Agenda 21:* Earth's *action plan annotated*. New York, Oceana.

[15] See e.g. Brot für die Welt (ed.) (1997): Nachhaltige Landwirtschaft – Orientierungsrahmen für eine sozial und umweltverträgliche Landwirtschaft aus Sicht der kirchlichen Entwicklungszusammenarbeit, Stuttgart; cf. also: Misereor, Fachreferat für ländliche Entwicklung (1993): Nachhaltigkeit und standortgerechte Landnutzung – ein Konzept der ländlichen Entwicklung, Aachen: Selbstverlag.

– extension services, training and research were reduced and privatised through deregulation and compulsory savings;
– further promotion of alternative development was carried out by foreign development aid-workers only;
– the official monitoring system on the sale and use of chemical pesticides also had to be funded by development aid.

a See footnote 14.

"Integrated farming" can be distinguished from other farming methods in terms of the use of chemicals. The German law on pest management defines the relation between integrated pest management and chemicals as being that chemical pesticides are to be reduced to the "minimum necessary degree". The FAO definition goes further by stating that chemical pesticides shall only represent the "last resort" after all other methods have failed. In Germany, "integrated farming" has become a guiding principle which does not diverge much from the required standard of "good farming practices". Yet it seems very much open to interpretation. After all, the belief in "integrated pest management" has hardly led to any reduction in the use of chemical pesticides or synthetic fertilisers. There is, however, a certain form of "locally appropriate agriculture" which fully explores all possibilities of chemicals reduction and, at the same time, integrates comprehensive changes of cultivation structure, techniques of soil tillage, the definition of a limit value for harmful substances, crop rotation, seed selection and plant nutrition.

A transition to locally appropriate agriculture does not only imply that communities and regions contribute to their food security by cultivating regional varieties; here as well, the essential point consists in reducing the dependence on external inputs to the greatest possible extent. This does not simply mean a return to traditional forms of land tillage since it is not at all the case that locally appropriate agriculture is hostile towards technology or deliberately falling behind – in comparison to global agribusiness, it is just that other criteria are used for taking decisions on the use of certain technological means in the production of goods and services. The same can be said about the "third path" of Agenda 21: alternative or organic farming methods.

The following outline gives a picture of the whole range of different aspects which have to be considered for a transition to another path for development in agriculture. The list of criteria presents an *ideal* description. It has to be modified according to the different economic, ecological and social conditions of the respective regions.

Criteria for a new path for development in agriculture

– Solar energy and other forms of renewable energies present the main energy sources in alternative agricultural production. Different forms of fossil fuels which are used in large amounts in industrial agriculture are avoided as far as possible.
– Ecologically oriented farms even produce part of the energy themselves.
– Alternative agricultural production is characterised by the use of rainwater and small-scale irrigation systems. Large dams, long-distance distribution of fresh water and deeply drilled wells for water supply – presenting developments of the industrial system – are only used in real emergency situations.

- Alternative agricultural production uses organic fertilisers exclusively. Plant-disease and pest control is carried out through mixed cropping and mechanical and organic procedures. Only when there is an imminent danger of a total yield loss do farmers resort to inorganic fertilisers, pesticides and herbicides.
- Alternative agricultural production focuses on mostly local traditional seed varieties; another method is the planting of a mixture of different seeds. Under no circumstances must seed of varietal purity, above all hybrid strains, be cultivated on the majority of fields.
- No single-crop farming is practised, unlike with industrial agriculture. Instead, there are many different varieties with a carefully thought-out crop-rotation method.
- Alternative agricultural production is much more labour-intensive than industrial agriculture, which employs more machinery; consequently, traditional forms of cultivation and family-operated farms can once again make a living.
- The funds of ecologically-oriented farms are raised by their owners through new local credit systems whereas farms of the industrial system obtain loans from the conventional banking system, leading to an aggravation of the prevalent trend towards concentration.
- Products of alternative farming are mainly marketed via regional distribution structures whereas industrial agriculture produces for the anonymous (global) market.[a]

a Concerning this list, cf. the comprehensive work of Pretty, Jules (1995): *Regenerating Agriculture*. London, Earthscan.

The transition from industrial to alternative agriculture will take several years during which farmers will suffer yield losses; during this time of transition assistance and bridging loans are needed – measures which can absolutely be in the interest of a regionally-oriented economy because, in the long run, the community or region as a whole will benefit from this development. Moreover, it often turns out that the transition is less difficult than expected because many farming expenditures only occur within the industrial system. It is, for example, almost indispensable to use pesticides when fields are treated with fertilisers containing nitrogen. This is due to the fact that these fertilisers not only stimulate the growth of plants but also make them more susceptible to pests, bacteria and fungal invasion. If chemical fertilisers are dispensed with, however, pesticides will often be superfluous. Another reason for heavier pest infestation may be found in the large size of fields not confined by hedges or field copses, which farmers removed in order to employ ever bigger agricultural machinery.

In the tropics, all three paths for development have one thing in common: they aim at providing access to new technology packages for all different sizes of farms in order to prevent additional processes of structural change and the consequent displacement of small-holders, tenant farmers and labour-intensive employment. It is, however, difficult to put these good intentions into practice because external inputs can only be purchased if the necessary amount of cash is available. The unbalanced access to funds and/or preliminary financing of variable inputs results in the appearance of social selection criteria which indirectly lead again to structural change and to labour-saving mechanisation.

Due to price ratios in industrialised countries, where labour is expensive and capital cheap, mechanisation has advanced considerably – even in organic farming. The developing world, by contrast, has to maintain labour-intensive methods because they are affordable and external capital is expensive. Consequently, mechanisation in the South can only be carried out in a very selective manner: it should only imply an increase of the capacities and/or the productivity of labour and should

not result in a displacement of farm-workers. A mechanisation of land tillage and the production of a seedbed at the beginning of the rainy season in Africa could, for example, greatly increase the acreage cultivable per worker, provided that enough land is available.

The fundamental principle of "locally appropriate farming" consists in the skilled and efficient use of the local conditions of an agricultural enterprise. Apart from managing a stable small-scale local balance between beneficial and destructive insects, locally appropriate farming also implies an optimum adaptation of crops and plant varieties to the different forms of soil, the local climate and water availability during the cultivation season. Another important element is the optimisation of interactions on a farm – i.e. interactions between crops, livestock and humans.

"Locally appropriate farming" means continually seeking and learning new methods of adaptation and optimisation based on carefully observing nature and drawing on all its possibilities.
This path for development is especially suited to overcoming the three great shortcomings of the Green Revolution:

1. by using the diversity of the different genotypes of a crop, to overcome the neglect of the whole range of plant genetic resources;
2. by using all the productivity-generating capacities of marginal cultivation areas which are not suitable for intensive-irrigation cultivation and whose types of crop and specific seed needs were neglected;
3. by extending entrepreneurship to marginal land as well, where the stakeholders - subsistence or semi-subsistence farmers, tenant farmers or part-time farmers - were excluded from technological progress because they did not have the necessary funds to buy modern means of production.

It can be said with certainty that sustainability in world food supply will depend less on major financial investments in agriculture than on a transition to a knowledge-intensive process of "locally appropriate farming". In this kind of agriculture, the producer him/herself is the main holder of the knowledge that aims at creating a balance between the yield increase in plants and animals and the ecological, social and economic needs. Consequently, research and development cannot be relegated to the laboratories of universities and industry – they have to be integrated into the socio-economic conditions of local farmers.

In the past, not much importance was attached to the role and skill of farmers. They were merely the recipients of messages of modernisation which had been developed elsewhere. The idea was that innovations producing higher yields would convince the farmers. However, they often accepted far less than was expected and the use of new methods of cultivation were far from producing the results achieved in field trials. When investigating why modern technology packages were not fully used or not even accepted by the farmers, social scientists always discovered very rational reasons. Under the real socio-economic conditions of small-scale farming many obstacles make it inadvisable to aim for maximum productivity.

There is no doubt that practical knowledge of farmers concerning the respective ecological, social and economic conditions of production is the most important element for the path of locally appropriate agriculture. However, farmers should not be left to their own devices. We need a new approach to research and advice which can assist the farmers in using their endogenous capacities for production in an optimum manner. This includes the development of participatory forms of research and advice through dialogue. Scientists must no longer withdraw into their ivory towers, they must optimise agriculture in cooperation with the farmers. They have to understand traditional knowledge and the intuitions of farmers as being a potential strength and address them seriously. Research objectives and entry points are to be defined together. There will not be any delays between the acquisition of

research results and their application; the findings of science have to prove themselves within the existing socio-economic conditions. Farmers will learn from researchers, so that they can gradually combine their traditional practical knowledge and empirical methods with research results. Their human resources will be strengthened, and their self-esteem and self-reliance fostered, so that they can answer the next questions of optimisation by themselves.

Participatory research: What does this mean?
An example taken from practical experience[a]

For several years, Dr Eva Weltzien-Rattunde, scientist and plant breeder at the international Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Hyderabad and Kirsten vom Brocke from the University of Hohenheim have been carrying out participatory research in a very difficult, arid region of the State of Rajasthan. Their aim is to improve millet cultivation of local farmers. They are cultivating traditional as well as modern varieties of millet. With a systematic approach and by means of a specific method called "participatory rural appraisal", the scientists documented the knowledge of farmers concerning characteristics and properties of their cultivated varieties. They covered, above all, the whole process of seed management, i.e. the nurturing, selection and refinement of seed from traditional varieties as well as the exchange of seeds between individual families or even within a whole region, and the way farmers handle modern breeds. When the farmers were asked to evaluate the seed, it was striking that, on the one hand, they had a profound knowledge of varieties they had planted themselves. On the other, it became clear that their assessment of the advantages of single varieties was very different, depending on caste membership, gender, size and location of the farm, the distribution of fields and other criteria. Nor could they provide the scientists with further information on the whole range of existing seed.

Consequently, the farmers were motivated to carry out trial cultivation of varieties unknown to them, employing their traditional methods of production. They were supported by advisers. When evaluating their field trials, the farmers individually introduced a great range of classifications: growth and productivity, quality of grains and of forage straw, adaptation to environmental conditions etc. Before the harvest took place, all fields were inspected and, in groups, the farmers compared the results with the traditionally cultivated varieties. Through discussions, they decided which selection should be propagated within their respective locations. The choices were not the same since social and ecological conditions differed from group to group and from village to village. During this research, the farmers identified with the cross-breeding that was done and with the proposals for improvement made by the breeders. They were very keen to learn how systematic cross-breeding, selection and evaluation is carried out.

When the scientists evaluated the project, they stated that the inclusion of farmers was a highly effective way to adapt plant-breeding to social and ecological conditions. Without their help, the scientists would not have been able to understand the value and significance of certain old landraces and local varieties to the farmers.

a See Weltzien-Rattunde, Eva/Whitaker, M.L./Anders, M.M. (1996): "Farmers' Participation in Pearl Millet Breeding for Marginal Environments", in: "Die Saat dieser Erde", epd-Entwicklungspolitik, Materialien I/96; Christinck, Anja/vom Brocke, Kirsten: Evaluating Pearl Millet Cultivars for Farmers, unpublished manuscript of the Institut für Agrarberatung at the University of Hohenheim, c/o Prof. Dr Volker Hoffmann.

In order to overcome potential conflicts between the objective of production growth and that of preserving natural resources, it will also be necessary to overcome the conventional perception of farmers as producers of goods. Their behaviour as land users within a specific ecosystem, and within individual social conditions that have a bearing on their behaviour, has to be integrated into research and extension methods. In doing so, it may become necessary to call society's ideas of progress into question.

In locally appropriate farming, the relationship between optimising the biological efficiency of external inputs – with a high safety standard – and the maximum efficient use of endogenous processes through biological and ecological measures will not be defined in advance. There will not be an *a priori* rejection of chemical pesticides and synthetic fertilisers. However, there is a hierarchy; only after having exhausted endogenous capacities will farmers resort to external inputs in order to solve remaining problems. If the market for foods free of chemicals continues to develop in a favourable way, the full transition to organic farming will present a natural and lucrative reaction of many farms.

The knowledge-intensive agriculture of the tropics calls for a thoughtful, careful approach, above all in difficult semi-arid regions affected by fluctuations in precipitation and other climatic variables. Farmers who lack resources are very vulnerable to yield losses or crop failures. Under these conditions, a comprehensive variety of different cropping techniques is the safest approach. These include methods such as the selection of extremely arid-resistant varieties or crops, an intensive and deliberate fragmentation of fields, delayed and heterogeneous seeding and techniques of cultivation or a strong dispersion of mixed cropping. When farmers compare their yields, it often becomes clear that it may be distressing to cultivate without optimum results during good years – because of the planting of more hardy, traditional varieties. However, the strategy of securing a minimum harvest under adverse weather conditions still produces higher yields over an average period of ten years than the cultivation of more sensitive high-yield varieties. In this case, farmers risk total crop failure during bad years – not to mention the social question of how families will be able to survive when a crop fails.

Without production incentives, there can be no efforts on the part of the farmers to improve their methods of production. A balanced development of the rural economy is mainly based on an increasing exchange between provincial towns and rural areas and on the development of local and regional markets and reciprocal relations. The exchange of information on market developments, demand and on possibilities of placing products on the market is as vital to farmers as information on product technology. The diversification of production has to go hand in hand with the establishment of marketing opportunities for diversified products. These aspects also have to be taken into consideration by those engaged in research and extension services.

Apart from improving marketing opportunity, it is also paramount that farmers can have an influence on the markets through their organisations and their knowledge. They should also be enabled to exert pressure on national policies through democratic participation and their political representative bodies. The farmers' self-esteem and their social standing in society are crucial to the future of hundreds of millions of small farms worldwide because they are the ones who will decide on the future of world food supply. This, too, is a knowledge-intensive process that greatly depends on their general level of education and their access to modern channels of information.

Obstacles on the way to "ocally appropriate farming"

This model is above all threatened by the interests of agribusiness, which has seized control of agricultural processes through genetic engineering in the seed sector. On the grounds that much of agricultural development is anticipated in the genetic codes of seed, controlling the seed sector also implies controlling future paths for development. The most effective instrument of control appears to be patent law because it guarantees sovereign powers by means of exclusion rights and it can dictate the conditions under which patented innovations may be applied. Thus, the struggle concerning the question of patents on lifeforms – triggered by the US and introduced not long ago in Europe through the WTO TRIPs Agreement and the EU directive on the legal protection of biotechnological inventions – shows that this is where the real power lies when it comes to vital options concerning future paths for development in agriculture and the food sector.

Alternative seed is marketable – a lobbying campaign is bearing fruit

According to the German Seed Trade Act, only seed that bears the genetic characteristics of uniformity, stability and distinctness can be marketed. This is a very narrow interpretation made by the Federal Office of Plant Varieties (BSA) and, as a result, only highly-bred cultivars can be found on the market. The law stipulates that local varieties, landraces and wild strains which were grown by organic methods by the farmers must not be passed on. Having been introduced with a view to serving consumer protection and preventing farmers from being misled on the grounds that the quality of seed is not recognisable, the legislation now contradicts the requirement of diversity. In the past, the issue of high yields was in the forefront, but now it is the conservation of plant genetic resources and agri-biodiversity that are vital.

At the FAO International Conference on Plant Genetic Resources for Food and Agriculture, convened on the invitation of the German Federal Government in 1996 in Leipzig, where a Global Plan of Action was drafted, NGOs called the regulations of the Seed Trade Act into question. This criticism is even voiced in the Global Plan itself, albeit cautiously.

In a campaign organised by German NGOs and initiated by the German Protestant churches' organisation for development education in rural areas the issue was raised through the case of Mr. Josef Albrecht. A farmer from Bavaria using organic methods, he was indicted on the grounds of passing on organic seed which he had cultivated. Small bags with seed were distributed to the population in Leipzig and they were asked to file a suit against themselves with the Federal Office of Plant Varieties because they had violated the Seed Trade Act. Several thousand such self-denunciations were submitted to the Federal Office.

When the German government held the final press conference at the FAO conference, the permanent secretary of the Federal Ministry of Agriculture had to admit – after having been questioned persistently by the journalists – that this section of the Seed Trade Act would have to be revised as a consequence of Leipzig. Following this event, the Federal Office, commissioned by the Federal Ministry of Agriculture, put forward a comprehensive proposal, suggesting that seed which cannot fulfil the strict requirements in order to be put into circulation may be marketed in limited amounts. This decision was also based on a revision of the EU directive on the marketing of seed (98/95/EC), which provides for a simplified regulation on the passing on of "conservation seed": this term defines landraces and varieties which have been adapted to local and regional environmental conditions and which are threatened by genetic erosion. The directive envisages a specific admission procedure for

these varieties and includes a non-official test at EU level. They are to be listed in the EU Common Catalogue of Varieties, but under the name of "conservation variety".

The proposal made by the Federal Office diverged strongly from the EU draft directive in that it went even further and was more in line with what NGOs had expected. The Federal Office wanted a clear distinction to be made between varieties which were to remain registered as high-yield varieties and "other seed", which does not have to undergo a test and admission procedure and would not be listed with the Common Catalogue. This "other seed" is termed "seed of origin" in the Federal Office's proposal. It can be put into circulation to a restricted extent, provided that it is classified with a specific label and meets further criteria.

The whole issue does not only revolve around the questions: Is genetic engineering in agriculture good or bad? Do seed companies use and transfer their knowledge in the right way so that tropical agriculture and the farmers there benefit from it? Is this knowledge employed to support hunger and poverty relief and consequently, sustainable development? There is much more to it than that. With their power to use modern biotechnology and genetic engineering, the corporations of the North are the ones to determine whether and how agricultural production can be shifted from fields to factory biofermenters, located anywhere. Comparative advantages of southern countries in the production of tropical spices, stimulants, foodstuffs and raw materials might easily disappear overnight and the developing countries could lose their locational advantage. Moreover, a large share of rural employment and income is based on the production of these goods. Global markets for raw materials could be replaced to a large extent and agriculture could partly lose its function within the world trade system:

The threat posed to sugar-cane cultivation by isoglucose was, for example, a first step; the second will follow when the many research companies manage to isolate the gene of the sweetener thaumatin, which is 2000 times more intensive than sugar, and to transfer it to other plants or micro-organisms. If this becomes reality, 50 million jobs in the sugar industry of the South will suddenly be jeopardised. Other goods traditionally exported from the South, such as spices and flavourings, will also be affected - as the first patents to be granted indicate.

There is also another very drastic influence exerted by the instruments of patent law on the different options of future paths for development in agriculture: they are preventing the protection and marketing of alternative varieties and cultivation methods, and placing genetic resources under private control.

8. Global conditions for agricultural development

The globalisation of agricultural trade is a great challenge to future world food security. It can have positive as well as negative effects. One advantage of international trade is that it can overcome regional bottlenecks. Furthermore, overused small-scale farming systems can be restructured to cultivate labour-intensive products with a more efficient use of available production factors. This supports the protection of resources and the environment and can lead to an increase in the amount and diversity of total food supply. However, the great threats that globalisation presents can be found in the additional dependence of the developing world on the rich countries. Not only does this mean that a country is dependent on international commodity futures markets, financial markets, exchange-rate fluctuations and political programmes of other countries, it also implies an increasing dependence on a

small number of international trading corporations. Globalisation is strengthening powerful agricultural states and is undermining the scope of action of the weaker ones. Global liberalisation of agricultural trade entails the danger of an increasing concentration of global food production on a few areas favourable for cultivation while in vast regions, for example in Africa, self-sufficiency is more and more replaced by the need to import food. It can also cause a downward spiral in the competition of different locations for investment capital to raise ecological and social standards. After all, globalisation has an adverse effect on the environment because large-scale international trade in food is generally linked to high expenditure for transportation.

Due to the increase in agricultural production, grain prices have fallen worldwide by 150 per cent during the past two decades. And the result is ambivalent: cheaper prices for basic foodstuffs led to a reduction in hunger and poverty, and provided food for the poorest populations. However, the other side of the coin was a decline in production incentives and a deterioration in the agricultural and rural economy. Today, the main poverty areas of Africa, Asia and Latin America are rural. A study of the World Bank revealed the full extent of impoverishment of farmers in the South caused by negative protectionism, distorted exchange rate parities and unequal taxation.[16] High subsidies for agriculture in the North are intensifying this trend since the dumping of US and EU surpluses on the world markets has pushed prices well below the level of production costs even of many southern countries. The farmers have been doubly disadvantaged: first, through the economic policy of their own governments, which have often neglected agriculture and promoted the industrial sector instead and, second, through the agricultural policies of the North. Much of the food-production disaster of Africa is due to these factors.

During the past three decades, the real terms of trade for agricultural products have been continually deteriorating worldwide and, if this trend is not reversed, there can be no guarantee of sustainable agricultural development and world food security for the long term. WTO negotiations are half-hearted on this issue. Agreements do not ban dumping activities sufficiently and the plundering of agriculture in developing countries is not even mentioned. However, IMF structural adjustment programmes have done something towards correcting discrimination against agriculture in the South.

At present, many poor developing countries import more food than they export. And their dependence on the global agricultural markets will increase. In Sub-Saharan Africa alone, import demands in grain are estimated to rise from currently 9.3 million tons to 27 million within one decade.[17] As a result, the poor countries, and above all the poorest population groups, are growing rapidly more vulnerable to an increase in world market prices for grain.

World market integration should therefore be flanked by a global food-security system to prevent disasters such as that of 1995-96 when world grain prices suddenly increased by 50 percent and about 20 million tons of grain were no longer available to supply poor countries. The Uruguay Round of the General Agreement on Tariffs and Trade (GATT) was concluded in Marrakesh and led to the foundation of the WTO. The decisions taken there concerning Net Food-Importing Developing Countries present the necessary structural elements of such a global food-security network: it has to be a combination of structural development aid for agriculture, of additional financing facilities for food imports in times of rising world-market prices, of greater availability of international food aid, and of credits to finance exports.

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[16] Schiff, Maurice/Valdés, Alberto (1992): *The* Plundering *of Agriculture in Developing Countries*. Washington, World Bank.

[17] Deutsche Welthungerhilfe (ed.) (2000): Jahrbuch Welternährung. Frankfurt: Fischer.

The 1996 World Food Summit in Rome adopted a Global Plan of Action. It demands that "each nation must adopt a strategy consistent with its resources and capacities to achieve its individual goals and, at the same time, cooperate regionally and internationally in order to organise collective solutions to global issues of food security".[18] Furthermore, it states that "agricultural trade and overall trade policies shall be conducive to fostering food security for all through a fair and market-oriented world trade system". There is a great danger that international negotiations which focus on expanding trade liberalisation do not take these objectives of fairness sufficiently into account. Therefore, follow-up negotiations of the WTO Agreement on Agriculture have to be geared towards this aim, for example, by granting developing countries specific possibilities of exemption from general liberalisation commitments which then could contribute to food security. Here, India has set an important example by presenting clear proposals.

V. Policy frameworks and instruments

9. The international arena for Agriculture and sustainable development

The conclusion of the GATT Uruguay Round leading to the foundation of the WTO on January 1st 1995 marked the adoption of the first binding international Agreement on Agriculture. Its provisions are in line with the objectives of the WTO, i.e. promoting world-market integration and thus contributing to world-economic growth. International agricultural trade is to be promoted by means of the following measures: the conversion of all restrictions on market access into fixed tariffs, then to be gradually reduced; the continuing reduction of export subsidies and the level of agricultural support, and the increasing international harmonisation of food standards. The arbitration-tribunal procedure of the WTO and potential sanction mechanisms in the case of an infringement give the Agreement teeth.[19]

Article 20 of the Agreement on Agriculture provides for negotiations for extension to be initiated one year before the end of the five-year implementation period, i.e. starting in 1999. The mandate for these negotiations comprises the phased continuation of the trade-liberalisation measures adopted in Marrakesh while taking into account the experience gained in implementing the Agreement of 1995 and with "non-trade-related concerns". According to the logic of GATT and the WTO, questions of sustainability come under non-trade-related concerns and are to be decided accordingly. Otherwise, Art. XX of GATT has to be consulted for interpretation. In Art. XX/b the WTO tolerates a clause protecting contracting parties from international trade if human, animal or plant life or health is threatened. Consequently, environmental protection is at least indirectly included in the Agreement.

Sustainability is not an explicit subject of WTO agreements. It is only mentioned as a principle in their preambles. This corresponds to the implicit and frequent assumption that economic growth and sustainability almost always complement each other. However, the agreements do not expressly state how to weigh up the benefits of trade liberalisation and sustainability in the case of conflicting goals. Since the arbitration procedure in dispute settlement does not provide appropriate mechanisms for weighing up the benefits and the agreements do not set any real limits to sustainability, it is to be feared that the WTO will find it easy to push through the objective of trade liberalisation at the expense of other objectives.

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[18] http://www.fao.org/docrep/003/w3613e/w3613e00htm

[19] See Chapter 10.

"Non-trade-related concerns" in the field of agriculture appear in the WTO Agreement on Agriculture through the exemption clause regarding commitments to reduce domestic support measures. The Agreement distinguishes between trade-distorting subsidies which have to be dropped or changed, subsidies which are to be cut, and those forms of subsidy which at most cause minimal distortion and can thus be tolerated in international agricultural trade relations. Sustainability objectives such as environmental and resource protection, food security, balanced regional development and the promotion of rural development are laid down – for exceptional cases – in the last category of the Agreement, the Green Box. They are, however, subject to certain criteria.

Moreover, the issue of developing-countries is featured in the WTO Agreement on Agriculture. It is raised under measures in favour of least developed countries and stipulates that they receive "special and differential" treatment. A point of criticism concerning implementation as set out in the Agreement is, however, that the measures do not go far enough in sustainably promoting the development path of locally appropriate farming. The special and differential treatment is mainly limited to granting least-developed countries additional time for transition and fewer commitments to cutting subsidies. Concerning international agricultural relations, however, the WTO should take into account the completely different character of agriculture in developing countries and its particular social role and standing in the developing world. If this were done, completely different regulations would be adopted. Permanent subsidies for small-scale producers employing ecologically appropriate systems of production would then be allowed in order to compensate for higher costs in comparison to conventional farming methods. One regulation providing for special treatment and often discussed in this context is the Food Security Box. Like the Green Box concerning ecological measures in the Agreement on Agriculture, it allows developing countries, by way of exception, to enhance their food security through certain subsidies and support measures. These measures could be implemented in Art. XX of GATT if it were amended to state that exemption regulations – apart from serving the "protection of life and health" – may be justified by the objective of food security.[20]

Looking at recent agricultural negotiations, we see that WTO members have divided into three camps which may be characterised roughly as follows:

- The Cairns Group is a coalition of 18 agricultural exporting countries which, under the leadership of the US, Australia and Canada, are pressing for further liberalisation in the agricultural sector.
- The "multifunctional agriculture" group comprises, above all, the EU, Switzerland, Norway, South Korea and Japan. These countries see agriculture as a special sector fulfilling other economic, ecological, social and cultural functions apart from the production of foodstuffs. As a consequence, they call for special regulations diverging from non-differentiated liberalisation.
- Then there is the group of net food-importing developing countries for which food security is a matter of life and death. Accordingly, they call for special regulations on food security.

It seems probable that the proponents of multifunctional agriculture and the group of developing countries will form a negotiating alliance. If this happened they could constitute a political counterweight to the Cairns Group.

At an international level, the conflict between economics and ecology in agriculture can only be met by well-functioning multilateral environmental agreements (MEAs) which can create an international consensus and set limits to free trade. The WTO would most likely submit to such agricultural MEAs. To date, however, there are no international environmental standards for agriculture. All attempts to

[20] Also demanded by the Forum Umwelt und Entwicklung – AK Landwirtschaft (2000): Positionspapier für CSD 8. Bonn, Selbstverlag.

initiate relevant negotiations, for example within the FAO, have failed. The lack of agreement between the governments on the question of "sound agriculture" is so significant that the provision of environmental standards for the protection of soil, animals, the climate, plants or water appears to be an almost utopian ideal. Agenda 21 or the Biodiversity Convention are of little help. Up to the present, international agreements have only been concluded on partial aspects, e.g. trade in pesticides or the exchange of plant genetic resources.

Consequently, the only way of allowing for individual action by countries is to strengthen and valorise cases of exemption within the WTO Agreement on Agriculture. The disadvantage here is that such initiatives would render less competitive those countries claiming such exemptions and effectively implementing environmentally friendly agriculture. Furthermore, there are precise limits to Green Box measures which might prove too constraining if the existing consensus in Europe on massive agricultural support through fiscal resources were to waver. The Green Box allows only support measures through publicly funded governmental programmes but no intervention in the market which could result in the national consumer paying higher prices in support of the environment. The WTO Agreement on Agriculture also sets clear limits to the amount of money made available in the context of environmental programmes. Only payments compensating for income losses through environmental protection are exempted from reduction commitments. Not even national incentives to use environmentally friendly methods are in compliance with WTO regulations. It is true that the WTO Agreement on Agriculture greatly restricts positive measures to promote locally appropriate farming. However, the reduction of direct and indirect subsidies stipulated in the Agreement may lead to specialised, high-yield agriculture in its conventional form becoming less profitable due to greater risks. Then more farms will have to go back to spreading their risks and minimising costs through diversification of crops and less input-intensive methods.

The Agreement on Sanitary and Phytosanitary Measures is having an increasingly restricting effect. In principle, it grants international specialised organisations – such as the Codex Alimentarius Commission, which establishes international standards for food security – the right to the binding stipulation of *maximum levels of protection* in the field of food standards. The conflict between the US and the EU about the legitimacy of the ban on growth hormones in animal husbandry presents a clear example of the problem regarding the Agreement: the WTO has asked the EU to either pay high amounts of compensation to the United States for loss of trade or to lift the ban on growth hormones if scientific studies cannot prove harmfulness according to WTO criteria and within a certain period of time. Further conflicts are likely to break out. One contentious issue is the labelling of genetically modified foodstuffs. The US has denounced the Novel Food Regulation of the EU as being a trade barrier – with the declared intention of having it found to be invalid. However, the US is completely isolated at this point.

In general, essential sustainability principles contradict WTO principles, e.g.:

- The United Nations Conference on Environment and Development (UNCED), held in 1992 in Rio de Janeiro, called for the precautionary principle: the WTO Agreement on Agriculture requires scientific evidence of adverse effects.
- UNCED asked for incentive systems for environmentally friendly measures: the WTO wants to restrict matters to financial compensation.
- Rio favoured internalising external costs: the WTO prefers a delinkage of all support programmes from prices or markets.
- Rio wanted to implement the polluter-pays principle: the WTO wants all similar products be accorded the same treatment.

– Agenda 21 calls for huge investments in agricultural sustainability: the WTO wants cuts in support levels.

– Rio postulated the priority of the protection of biodiversity over patent protection and the sharing of patent benefits between the population and the companies: the WTO wants to implement intellectual property rights with respect to biotechnological inventions without any such restrictions.

There is still no international authority able to resolve contradictions between conflicting international agreements or organisations. It remains to be seen whether it will be possible to create an international institution with the formal authority to take final decisions, or whether a solution has to be found within the WTO's system of panels.

Since the failure of the WTO Conference in Seattle[21] in December 1999 more attention has been paid to other trade rounds which will also be of importance to agriculture.

– The successful negotiation of the Biosafety Protocol in January 2000 in Montreal has shown that developing countries can establish individual negotiation positions; it is vital that the protocol be ratified as soon as possible.[22]

– The 10th session of the United Nations Conference on Trade and Development (UNCTAD X) could make a significant contribution to strengthening coherence between trade policy and environmental and development policies. In order to do so, UNCTAD would need to extend its remit beyond the current tasks of research and analysis, and technical support and policy advice for developing countries. Its activities should include the analysis of the repercussions of international trade on the above objectives and on non-economic interests such as compliance with human rights. In addition UNCTAD should also develop rules whereby international trade can be brought to promote these goals.[23]

– The eighth session of the Commission on Sustainable Development (CSD 8) also dealt with the issue of agriculture. Here, too, the CSD should be pressed to endeavour to implement the agricultural objectives of Agenda 21 by promoting their inclusion in the appropriate international framework treaties.

10. Dispute settlement in the WTO

When the WTO was founded, the most important goal was the promotion of the legal foundation for international trade in order to come closer to the model of efficient markets and to create fair conditions for competition. A legal system also includes the dispensation of justice in case of disputes. Other multilateral agreements do not have such an instrument at their disposal. With the introduction of a new procedure for the settlement of trade disputes between WTO members, the 1994 WTO Agreement set new standards.

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[21] See "Keine Festlegung einer umfassenden Welthandelsrunde", in: Umwelt [ed. Federal Ministry for the Environment, Nature Conservation and Reactor Safety], issue 1, 2000. 6f.

[22] A motion to debate the protocol was submitted to the German upper house of parliament (Bundesrat) by the parliamentary group of the German Green Party (Bündnis ‘90/Die Grünen) and the German Social-Democratic Party SPD; cf. BT-Drucksache 14/2520 of January 18th 2000.

[23] See also Reichert, Tobias (2000): "UNCTAD X – ein neuer Impuls für entwicklungs- und umweltverträglicheren Handel oder business as usual?", in: BUKO Agrar Info, No. 89, January 2000, 1-3.

In comparison with the old procedure, the new system was in many instances an improvement. The new agreement has given a stronger position to small countries. They can now expect to be treated in a neutral manner by multilateral bodies and regulations, and thereby protected from bigger and more powerful national economies.

The improvements set limits to the scope of action of the big trading powers. The convening of panels can no longer be blocked by individual states because the procedural steps are taken almost automatically when a measure against which a complaint was filed proves to be of significance for trade. Likewise, decisions can no longer be blocked but only challenged; the decision of the appellate instance is final and absolute. The Dispute Settlement Body (DSB) is no longer obliged to reach a consensus in order to take decisions, which now makes decisions on conflicts possible. The setting of deadlines for each step of the procedure prevents the postponement of decisions.

Furthermore, it is important to note that the mere contempt of decisions of the appellate instance can lead to trade sanctions. Consequently, even big trading nations can no longer disregard trade-policy decisions taken within the WTO because they know that the legitimacy of further trade liberalisation is strongly linked to a continuous improvement of legal certainty.

The large number of dispute-settlement proceedings initiated and concluded since 1994 shows the high degree of acceptance of this procedure as well as its efficiency. It also indicates that there is great interest on the part of the US, the EU and Japan, and also of the smaller developing countries in using this procedure to explore the new scope of national sovereignty within the WTO.

Decisions of WTO panels concerning trade measures on environmental grounds

With respect to sustainable development, the question is whether – apart from improving the legal basis – dispute settlement can also contribute to solving substantive conflicts. Many disputes have involved the US, which has imposed unilateral trade-related obligations on its trading partners, allegedly in the interests of environmental protection. They include the purity requirement for gasoline and an import prohibition for shrimps not caught in nets leaving turtles unharmed. In both cases, the appellate instance of the WTO found for the appellants, who had appealed against this encroachment on free trade by the US. In both cases the panel had ruled that the measures against which a complaint was filed were not sufficiently covered by the article of exemption XX/GATT, which allows for trade measures in favour of the protection of endangered species and the environment. This decision was explicitly revoked by the appellate instance, referring, among other things, to the preamble of the WTO, which stipulates that in all trade measures and decisions, the need to protect the environment and to promote sustainable development has to be taken into account. Due to their decreasing stock, the appellate instance even went so far as to define turtles as an exhaustible resource meriting protection. Yet a more thorough analysis of its reasoning shows that it was not the environmental grounds that were decisive but the fact that the principle of equal treatment of all trade partners was violated.

In both cases, the United States had grossly infringed the rules of equal treatment or non-discrimination. The purity requirement for gasoline was only applied to importers and not to domestic refineries because high adjustment expenditures would have impaired its competitive strength. As regards the fulfilment of obligations for shrimp fishing, the US set Asian countries a very short time limit while Latin-American countries were offered support for transitional measures.

The analysis of the decisions taken by the WTO panel and appellate instance reveals that, up to now, the dispute-settlement system has been employed to stop discrimination disguised as environmental policy, but not to use trade policy arguments to counter measures protecting the environment. It can be said that states which appear to be using environmental arguments to put up trade barriers for some trading partners are doing environmental protection a great disservice.

The greatest deficiency of the dispute-settlement procedure can be found in the qualification of the panel. Its members have to be jurists politicians who are specialists in issues of trade. Problems at the interface of trade and environment could more easily be solved if experts in environmental law were integrated more intensively into the negotiations. However, even an improved system cannot completely eliminate the power divide between bigger and smaller trading nations.

VI. Conclusion

11. The need to defend and regain scope for decision and action

Agriculture is the area of human economic activity where people's roots in the natural environment are most clearly experienced and perceived as undeniable. The global problems of agriculture and their special impact on the poor have to be given more attention from a sense of responsibility for the whole of creation. How agriculture is organised plays a key role in the implementation of sustainable development.

Strategies to develop agriculture based on maximum, short-term profit are not sustainable. This has led worldwide to the over-use, degradation and erosion of soils, and the contamination of air and water. The task of global food security has thereby been considerably hampered, since sealing, damage and erosion lead to more soil being lost than can be compensated by developing new areas of fertile soil. Hence the goal of agriculture worldwide can no longer be primarily to increase yields. Rather there has to be an optimum yield, through appropriate management, with a maintenance of soil fertility and avoidance of erosion. This will only be possible by regaining a regional perspective and strengthening local producers by promoting locally appropriate farming. Therefore it is necessary to highlight policies aiming to regionalise and decentralise agricultural activity.

International political action is required here, to reinforce these policies. Some instruments have already been mentioned. Regarding the WTO, there should be exemption regulations for developing countries allowing food security programmes, with a Food Security Box. Existing exceptions in the Green Box should be checked to see whether they offer sufficient scope for environmental protection programmes. In this context more importance should be ascribed to social and ecological aspects of manufacturing so that a production method committed to the principles of sustainability does not entail the risk of competitive disadvantage. After all, the TRIPs agreement exempted living matter from patenting, and recognised at least the rights of farmers and local, indigenous communities. In addition, decision-makers should be careful to ensure that the provisions of multinational environmental agreements to strengthen regionality are not *de facto* counteracted by the WTO.

Marginal locations, particularly in countries of the South, should be brought into use – on a sustainable basis – even if they do not quite suffice to feed the regional population. A certain degree of self-sufficiency reinforces social structures and a varied diet prevents deficiencies and diseases. In addition, such farming is a way of maintaining regional flora and fauna and reducing soil degradation and erosion.

In all, it is crucial to preserve the knowledge, experience and seed varieties of the rural population in the world's regions, using them to safeguard food supplies in a sustainable way. This requires a protection of this knowledge by the existing "farmers' rights", in order to create a counterweight to the protection of varieties, patent protection and globalisation of the seed market. Indigenous and regional know-how has mostly been developed and preserved in communities. Therefore multinational companies should not be allowed to market this knowledge. In an economy committed to sustainability society should not offload its toxic substances onto agriculture nor, conversely, should negative external effects emanate from agriculture.

Having said that, there is a considerable need for reform in terms of international agricultural relations. Instead of advancing large-scale reforms in this field there is now an opportunity of fundamental reform of the WTO, following the failure of the negotiations in Seattle at the end of 1999. Strengthening the position of developing countries in the world trade system, setting up a global nonprofit network to improve food security and strengthening "non-trade concerns" in the North and South are fundamental elements of such a reform.

Multilateral environmental agreements – e.g. the UN Convention on Biological Diversity, the Convention to Combat Desertification, the Convention on Climate Change; or environmentally relevant parts of Agenda 21 – should also constitute a framework binding on the WTO. The goal should be to draw as fully as possible on existing international instruments.

The above text is intended to give impetus to the discussion. We have listed a number of topics which appear most important to us if the 21st century is to make a sustainable start. The future development of agriculture is a bone of contention at present. The conflict patterns appear to give a choice – between an input-intensive agriculture and one that is locally appropriate and ecological, or between a small-holder agriculture and one dominated by agribusiness. Differing national interests are reflected in international negotiating positions; lobbying interests become clear in demands made on agricultural policy-making; economic interests influence the development of technology and the political debate about patenting.

Organising sustainable agriculture will mean taking note of these disagreements. The next step will be to call on the parties to step back a bit from their political routine and discuss what needs to be done in a long term perspective. Everyday political demands need to be carefully examined in the light of fundamental criteria to assess their potential impact on agriculture.

The present text is also a call to participate. The questions around the connection between food security and sustainable development are complex and not easy to fully grasp. It is of the utmost importance, however, that as many people as possible take the trouble to become informed and examine the issues more closely. These should not be left to the experts! Only then will all the stakeholders be able to (re)discover their own potential for action.

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