Protecting local diversity in scenarios of modern food biotechnology, globalised trade and intellectual property rights

A.G. Haslberger[1], A. H. Gesche[2], M. Proyer[1], R. Paulesich[3], S. Gressler[4]

[1]*Dept. for Nutritional Sciences, Center for Ecology, Univ. of Vienna, Althanstrasse 14, A-1090 Vienna;* [2]*Applied Ethics and Human Rights Program, SHHS, Queensland University of Technology, GP Campus, X209, 2 George Street, Brisbane, Qld. 4001, Australia;* [3]*Dept. for Environmental Economics, Vienna University for Economics, Augasse 2, A- 1090 Vienna;* [4]*Forum Austrian Scientists for Nature Protection, Mariahilfer Straße 77-79, A-1060 Vienna, Austria*

Summary: Decreased global and local diversity and a homogenization of biota is seen as a major threat to ecological and socio economic resilience. Consequences of modern food production, such as global propagation of few high yielding elite lines, declining diversity of landraces or consequences from gene flow, interact with socioeconomic drivers such as trade and intellectual property regulations in accelerating the mostly irreversible and broadening impacts of loss of biodiversity. Especially the SPS agreement under WTO prohibits any approaches to restrict trade of foods because of other reasons than sanitary and phyto-sanitary measures. Already now the reports of the UN- Millennium Ecosystem Assessment reports alarmingly increasing homogenization of biota and distribution of exotic species by trade and trans- boundary movements. This development is considered to reduce local ecological and social resilience in food production significantly. In the light of these developments trade regulations need to be reconsidered. The use of new, ethically guided structured Matrixes or Codes for an integrated assessment of safety and societal consequences and a participatory priority setting including aspects of public goods, such as conservation, seems to be mandatory.

Key Words: Local Biodiversity, Homogenization, Resilience Trade, Intellectual Property Rights

Biotic homogenization and consequences for resilience

Diversity: Damages of many ecosystems and losses of biodiversity are discussed as a major concern worldwide. The Millennium Ecosystem Assessment (MA, 2005) launched by the UN summarizes that virtually all of Earth's ecosystems have now been dramatically transformed through human actions. Between 20% and 50% of 9 out of 14 global biomes have been transformed to croplands. Biodiversity change is caused by a range of drivers. Recent and topical trends in the development of biodiversity state that current rates of change and loss exceed those of the historical past by several orders of magnitude and show no indication of slowing.

One specific aspect of the destruction of diversity detected by the analysis under the MA is a steadily increasing homogenization of the surrounding environment described as homogenisation of biota. Large parts of earth's agricultural regions are already to be characterized as monucultural. Main drivers for these developments include the removal or introduction of organisms in ecosystems which disrupt biotic interactions or ecosystem processes. The spread of exotic species respectively Invasive Alien Species (IAS, see IUCN 2004) is promoted through worldwide trade and movement and increased global use of technologically improved high yielding races replacing local landraces. These dangerous developments are supported by socio economic drivers such as regulations for trade and intellectual property rights and are considered to be a major threat for ecological and social

resilience. Resilience is now seen as an important concept which enables adaptation mechanisms and policies to dangerous global changes such as climate change.

Resilience: Although the stability of an ecosystem depends to a large extent on the characteristics of the dominant species, less abundant species also contribute to the long-term preservation of ecosystem functioning (MA 2005). Often associated with aspects of disaster management, sustainability, vulnerability and risk (compare Manyena, 2006) the concept of (ecological) resilience could be summarized as buffer capacity or absorbing – ability of an organism when facing hazards or complications. Similarly social resilience is to be definied as the capability of a social community to face, withstand, cope with and recover from outward negative impacts of varied sources, intensity and outreach. This concept of economic resilience combines aspects of shock – recovery, shock avoidance and shock absorption of states or economic entities confronted with economic shocks (compare Sneddon 2000) and integrates data derived from specific vulnerability indices, information about risks of different countries facing problems through economically 'rough' times.

Drivers of biotic homogenisation and food production

Mobility: Invasive Alien Species (IAS) are one of the most significant drivers of environmental change worldwide (IUCN 2004) such as habitat destruction. Of all almost 2000 imperiled species in the United States, 49% are endangered because of introduced species alone or because of their impact combined with other forces. The greatest impact is caused by introduced species that change an entire habitat, because many native species thrive only in a particular habitat. For example the zebra mussel, accidentally brought to the United States from southern Russia, transforms aquatic habitats by filtering prodigious amounts of water (thereby lowering densities of planktonic organisms) and settling in dense masses over vast areas. At least thirty freshwater mussel species are threatened with extinction by the zebra mussel. Some impacts of invaders are subtle but nonetheless destructive to native species. For example the rainbow trout introduced widely in the United States as game fish are hybridizing with five species listed under the Endangered Species Act, such as the Gila trout and Apache trout (D. Simberloff, 2000). Intentional and unintentional ('hitchhiking' of species or pathogens while transporting goods) contribute to the distribution of IAS where fast developments of globalised trading and globalised travelling significantly contributed to increased hazards.

Biotechnology enhanced breeding: In many cases products derived from modern breeding technologies resemble aspects of IAS. Modern methods of biotechnology enable the introduction of traits into recipient organisms which have not been a characteristic of the species before and which alter fitness parameters in the recipient environment. In addition few high yielding crop lines or fast growing animals derived from modern food production technologies are increasingly used in large areas worldwide competing with traditional local organisms, landraces or wild species. Gene flow between biotechnologically improved lines, conventional lines and wild organisms additionally endangers stability of ecosystems and diversity.

Trade: A biotechnologically improved organism is likely to be developed for use in large areas internationally and global trading as food and feed to endure returns of often considerable investments. Attempts become more likely that organisms are grown and traded in areas where characteristics of the product and agro-ecological characteristics do not indicate benefits, which may be existing in other areas. In consequence areas of development, production and consummation are getting more dispersed. Trade liberalization accelerates this dispersal. The SPS agreement under WTO prohibits any approaches to restrict trade of

foods because of other reasons than sanitary and phyto-sanitary measures. Current market dynamics press ahead with globalised trading of foods and crops where safety instruments for protection of local diversity such as the Cartagena Protocol on Biosafety are lagging behind. Developments also result in a dispersal of areas of benefits and possible disadvantages. Claimed advantages of market liberalization and reduced subsidies cannot be realized equally by all actors on the supply chain because producers and traders are neglecting regional economic differences as market structures or information channels.

IPR: Modern methods of biotechnology in breeding can enable only an improvement of a limited number of elite lines or organism, which then should be used globally to return considerable investments, protected by intellectual property rights. This endangers the propagation of traditional local races and knowledge. There are continuing concerns about market dominance in the agricultural sector by a few powerful companies. Also in the area of the implementation of intellectual property rights considerable resistance raised internationally. Critics urge restriction of patenting possibilities to genetic material in tight combination with specified methods and uses and even a recent report of WHO identifies inconsistencies in proposed regulations and recommends reconsideration and international discussion.

Regulations

The World Trade Organization (WTO) is the only international body that sets and oversees global rules associated with trade between nations. At the core of the WTO are agreements negotiated by the majority of the world's trading nations and ratified by their governments. One of them is the Sanitary (human and animal safety) and Phytosanitary (plant safety) Agreement (SPS Agreement), overseen by the WTO. The purpose of the WTO-SPS agreement is two-fold, i) to promote free trade and ii) to protect nations against bioinvasion of unwanted pests, weeds and diseases carried by plants, animals and similar. Developing countries, which lack the capacity to implement internationally-agreed standards for food safety and animal and plant health, are supported by the Standards and Trade Development Facility (STDF) through grants, information sharing and technical cooperation. The STDF also helps developing countries 'gain and maintain market access' (STDF Secretariat, 2006). Another international body important with regards to modern food biotechnology and trade, is the Codex Alimentarius Committee. It was established jointly in 1962 by the United Nations' Food and Agricultural Organization (FAO) and the World Health Organization (WHO). Its major function is to set international food standards. The Committee is currently working on revised ‘Working Principles for Risk Analysis for Food Safety for Governments.’ The Committee already established ‘a framework for undertaking [scientific] risk analysis on the safety and nutritional aspects of foods derived from modern biotechnology’(FAO/WHO, 2003) earlier, intended to protect human and environmental health. Although the principles have no binding effect on national legislation, they can be used in case of trade disputes. International trade in food is further guided by a code of conduct, namely the 'Code of Ethics for International Trade in Food'. Its two major aims are to protect the health of consumers and to protect consumers from "unfair trade practices" (Article 4). There are no comments made in the Code which specify more closely unfair trade practices. The 'Code of Ethics' has been in existence since December 1979, was amended in 1985, and is currently under review once more by the Codex Committee on General Principles (CCGP; Joint FAO/WHO Food Standards Program, 2007). The aforementioned documents and guidelines are but a small proportion of international guidelines that impact on the global food market. All of these documents are directed mainly to the market. Even the 'Code of Ethics for International Trade in Food' does not address any environmental, ethical or social aspects as they relate to the production and marketing of GM foods. Even attempts to discuss a broadening of SPS criteria

for an involvement of environmental or socio-economic criteria showed massive resistance. The use of international standards for traded food, focusing on food safety such as the STDF (Standards in Trade and Development Facility), a joint effort recently established between the WHO, the FAO, the World Trade Organization, the World Animal Health Organization and the World Bank will, hopefully, also focus on environmental issues in the future.

In light of the current concerns of many nations about global warming and the protection and conservation of biodiversity and the environment, we make the following recommendations with regards to a revised version of the Proposed Draft *Code of Ethics for International Trade in Foods*:

1. Reference should be made to sustainable development and the conservation of biodiversity;
2. If biodiversity is threatened to an unacceptable level, local communities and national bodies should be given the choice and be provided with the authority to protect their resources, even if this contravenes current world trade provisions. Any decisions taken should be based on an integrated risk assessment which includes scientific and normative impact assessments and is conducted by independent authorities with the mandate to invite stakeholder input and to initiate processes that ensure proper representation;
3. At the local, national, and international level, the current provision of benefit sharing should be expanded by also providing for sharing the burden of retaining biodiversity in a fair and equitable manner;
4. Reference to ethical principles should be included in order to provide an equitable and just environment within which to make decisions about trade and biodiversity.

Sustainable development and conservation of biodiversity

The Convention on Biological Biodiversity (CBD), recognised by more than 180 nations, regards the conservation of biological diversity as ‘a common concern of humankind’ (Article 15(1)). It also states that the collection of resources requires prior informed consent. Biodiversity is especially prevalent in the megadiverse tropical and subtropical areas of the South, where ‘biodiscovery’ (bioprospecting) activities have become points of conflict between local interests and trade interests, including intellectual property interests, which are heavily skewed towards the North. The term 'biodiscovery', first used in the 'Code of Ethics for Modern Biotechnology in Queensland' (2001) replaces the term ‘bioprospecting’ and refers to accessing and taking of biological resources. Providers can be the government or a government agency, but also individual indigenous land owners, local communities and similar. Access to these resources is required by mainly international or transnational companies, seeking valuable compounds by screening and analysing the genetic material from plants, fungi, and other biological resources in search for patentable products, such as novel pharmaceuticals, for commercial gain. These scenarios are played out on a regular basis and highlight the tension between the generally capacity poorer provider and the capacity strong producer. An ethical approach to reduce the tension and the potential disadvantage of the weaker party would be to commit stakeholders to share benefits and burdens equitably and fairly by following a process of negotiation that is situated within a framework of ethical practice and decision-making.

Sharing the benefits and the burden

The term 'benefit-sharing’ was coined at the Convention on Biological Diversity (CBD) at the Earth Summit in Rio de Janeiro, Brasil in June 1992 - the first global agreement to not only conserve and sustain the biological diversity of our planet, but also to ask for the sharing of benefits that arise from the commercial or other utilization of existing genetic resources in a fair and equitable manner. The CBD obliges nations to enter into benefit-sharing agreements

with the access providers of the genetic resources. This includes the valuing of knowledge within indigenous communities. These measures are a sign of how much in recent years the notion of biodiversity has shifted from a ‘common heritage of mankind’ to a ‘resource under the sovereignty of nation states’ and considerations of intellectual property rights. From a justice point of view, developing countries are increasingly asking for compensation for their assistance in providing companies with the original cultivars and their associated knowledge, which the companies then use to commercialize their research and products (Gepts, 2004). These demands have led to a number of disputes in the past. Recently, the so-called 'Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising Out of Their Utilization' provide guidance about how to deal with access and benefit sharing issues (CBD Conference, The Hague, 2002). In addition, several megadiverse countries, Australia included, have devised their own guidelines to minimise disputes. Where access is sought to biological resources on indigenous peoples' land, in Australia, prior informed consent is to be obtained from access providers. While such guidelines address the commodification of resources, they do not address the other value of biodiversity, that is, the role local people play in providing healthy ecosystems, which, in turn, are vital for food security. As biodiversity declines, mainly through deliberate human interactions, and food security stressors become more prevalent, new ways must be found to encourage local communities in biodiverse areas to become guardians of that diversity or to restore past diversity. It might mean that the international community has to compensate these countries for their role in forfeiting monetary benefits in return for biodiversity protection/restauration. One such example comes from Australia, where in April 2007, a 'Global Initiative on Forests and Climate' was announced aimed at protecting the world's forests. The first beneficiary is Australia's closest neighbour, Indonesia. It will receive US $160 million to counteract illegal logging, plant new trees and find alternative income sources for people involved in the timber industry. Australia's initiative could set an example for related purposes (BBC, 29 March 2007).

Extending the current 'Code of Ethics for International Trade in Food' by including a normative framework of practice

The current 'Code of Ethics for International Trade in Food' does not pay any attention to social and ethical aspects with regards to the commercialization and trading aspects of biological resources. The question is whether it should and could be further amended to i) allow for changes in societal expectations with regards to trade plus ii) respond to recent findings regarding the relationship between biodiversity and food security. For example, if the title of the current code could be amended to ‘Code of Ethics for International Trade in Food and General Principles’, normative issues as mentioned above could be considered alongside trade standards. Which principles should be selected awaits further discussion. We propose a framework of ethical principles adapted from those suggested by Beauchamp and Childress (1971, 2001), which are widely used in the biomedical field. We offer the following principles for further discussions:

- Respecting persons and their communities and considering the living environment and biosphere on which life depends.
- Avoiding harm, being cautious and maximising benefits to persons, communities and the environment. This includes the sharing of benefits and burdens to maintain or restore ecosystems on which food security and trade depend.
- In trade, acting justly and equitably towards others, including other nations and future generations.
- Reducing activities that harm the biosphere and ecosystems. Taking actions that are sustainable.

- Acting with integrity in trade and development, declaring conflict of interest, and following relevant national and international guidelines and legislation designed to support both, trade and the well-being of nations and their ecosystems.
- Supporting participatory engagement and decision making, including allowing for choice and effective self-determination.

An ethical matrix (Mepham 2000; Kaiser 2001), based on the same principles, could further facilitate stakeholder deliberation when strong trade interests intersect with local, regional, or national interests, often in capacity poor regions of the globe. The suggested changes to the 'Code of Ethics for International Trade in Foods' might require a review of current trade rules, intellectual property rules and other practices to make the sharing of benefits and burdens a reality. They could set the scene for a more socially embedded and sustainable governance of international trade in modern foods that acknowledges the close relationship between food production methods, food security and the need for biodiversity conservation.

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