Natural Resource perspectives

Number 60, September 2000

GMOs AND NGOs: BIOTECHNOLOGY, THE POLICY PROCESS, AND THE PRESENTATION OF EVIDENCE

Robert Tripp

Policy conclusions

- A pragmatic examination of the prospects and performance of specific agricultural technologies in specific economic and biological environments is to be preferred to the current label-laden debate over biotechnology and its alternatives. Decisions about any technology, including biotechnology, must come from democratic debate and markets and be located within adequate regulatory environments.
- NGO projects that support low-input and traditional agriculture require careful evaluation in order to test widely-made claims about their potential for replacing conventional agricultural technology.
- Any programme for delivering biotechnology to low-resource farmers must include attention to the adequacy of agricultural markets and information provision.
- Support for 'marginalised farmers', utilising whatever type of technology, needs to include a realistic assessment of production potential and consideration of alternatives for livelihood diversification.

Introduction

It is difficult to pick up a newspaper or listen to a news broadcast that does not include some mention of genetically modified organisms (GMOs). The application of genetic engineering to agriculture has raised considerable hopes for increased production and efficiency, but more notably it also has raised wide opposition. The controversy involves the future of biotechnology in both the North and the South. The lines of the controversy regarding the potential for the South are quite clearly drawn. Those who are optimistic about biotechnology argue for the need to increase food production and point to the possibility of addressing the problems of marginalised farmers. Opponents question the safety, relevance and equity of the new technology. This paper examines the arguments on both sides, but pays particular attention to the case made by a number of NGOs who have been effective in bringing the issues to public attention. Biotechnology is a product of globalisation, and its critics also utilise global links in promoting a synergy between NGOs interested in development with those whose focus is environmental issues in the North.

The purpose of this paper is not to arrive at conclusions about biotechnology's relevance for agricultural development, (see Nuffield Council on Bioethics, 1999 and Altieri and Rosset, 1999 for contrasting views), but rather to point out certain implications and weaknesses in the arguments on both sides. Although the presentation attempts to be even-handed, it must be acknowledged that the paper is motivated by unease over the nature of the NGO case. The paper begins by looking at some of the major arguments that motivate the debate on biotechnology. It then turns to examine how the debate is conducted in the North and the South. The paper concludes by drawing implications for NGOs engaged in agricultural development in the South.

The arguments

Environmental and food safety

The major opposition to biotechnology in the North centres on environmental and food safety. The critics are concerned by the potential environmental damage that might be caused by transgenic crops crossing with related species or by their effects on other parts of the ecosystem. Some also argue that transgenic crops have not been sufficiently screened for possible toxins or allergens that could be introduced to the diet. Supporters of biotechnology argue that the testing and regulatory processes applied to transgenic crops are capable of addressing these concerns. The battle over regulation is understandable, not only because regulatory failure has been at the heart of several recent food scares (e.g. BSE), but also because regulation is valuable political territory. The two sides line up behind what sound like comprehensive codes – 'science-based regulation' and 'the precautionary principle' – but it can be argued that these are simply formal expressions of subjective attitudes towards the regulatory process.

Despite the prominence of regulation in the debate, it is difficult to see contrasting perceptions of regulatory protocol as the primary force behind the controversy over biotechnology. For example, biotechnology's critics are selective in their regulatory concerns. In the past several decades, mutation breeding – exposing seeds to radiation or mutagenic chemicals – has produced many commercial crop varieties – including several popular malting barleys grown in the UK – but no alarm about food safety has been raised. Similarly, many of the properties of transgenic crops – such as disease resistance or even herbicide tolerance – have also been achieved by conventional plant breeding, but little attention is given to their possible environmental consequences. Such selectivity is typical of most risk perception: any society or group chooses what it wishes to identify as risks (Douglas and Wildavsky, 1983). The subjectivity is conditioned by various cultural, political and economic factors. Part may be explained by direct self-interest (e.g. a company denying that its products are potentially harmful), but risk perceptions are also related to broader world-views. This is certainly the case with agricultural technology and it is thus worthwhile turning to some of the other arguments surrounding biotechnology, particularly for the South.

Food supply and population

Perhaps the most common defence of transgenic crops is the argument that population will soon outstrip world food supply and that new technology is required to meet the challenge. The trends are indeed worrying, but biotechnology's defenders tend to use them as a threat, implying that no other strategies can possibly avert a crisis. The argument about food supply and population has been a familiar one since the advent of the Green Revolution. The counter-argument is that there is

DFID Department for International Development

This series is published by ODI, an independent non-profit policy research institute, with financial support from the Department for International Development (formerly the Overseas Development Administration). Opinions expressed do not necessarily reflect the views of either ODI or DFID.

more than enough food in the world and that the challenge is distribution. This response draws attention to the role of inequality, rather than absolute production deficiencies, as a primary cause of hunger.

Despite the undeniable substance of this counter-argument, it embodies several inconsistencies that significantly weaken its force. In the first place, even if the agricultural production of some of the poorest countries were perfectly distributed, it would not provide adequate nutrition. In addition, the argument implies either massive population movements – far beyond what could be envisioned by any realistic opportunities for land reform; or expanding purchasing power for the poor, a more reasonable option, but one that includes the global food trade to which many NGOs object. Another problem with denying the need for production increases is that many of the NGOs making this case against biotechnology turn, often in the next breath, to promote their own agricultural production programmes, usually featuring low-input or traditional technology. Clarification requires attention to the types of farmers and the types of technology that appear in the debate.

Low-resource farmers

Some of biotechnology's strongest defenders claim that it offers the opportunity for public agricultural research to bring productive technology to the farmers in marginal environments that were excluded from the Green Revolution. Opponents say that the uneven distribution of benefits of the Green Revolution simply indicates what can be expected from biotechnology, and that emphasis should be given instead to other strategies that are more appropriate for marginalised farmers. Both sides tend to overlook some of the realities of the environments in which these farmers live. Differences in biological resources account for much of the differential impact of agricultural technology. Not surprisingly, good soils and adequate rainfall or irrigation are related to higher yields, and to the greater potential impact of agricultural technology of any kind. Part of the mandate of agricultural development programmes is to help level the playing field for marginalised farmers by overcoming these constraints, but there are limits. Whether transgenic varieties addressed at factors such as soil acidity or drought tolerance can address the inequality of agricultural assets remains to be seen – and many farmers in better environments could take advantage of such improvements as well. Alternative 'low-input' technology to overcome these constraints faces its own challenges, particularly if it demands increased labour. For instance, many labour-intensive soil conservation technologies are rejected because their returns are below what rural people can earn from other components of their livelihood strategies.

Box 1 The NGO case against biotechnology

NGO concerns about biotechnology cover a wide range of issues. Although there are differences between the stances of various NGOs, the following points represent some of the most widely-held views that are discussed in this paper.

- Biotechnology holds little promise for improving poor people's access to food; the major constraint is not food production but rather distribution of resources.
- Transgenic crops present significant environmental dangers and may also impose unacceptable health risks on consumers.
- The spread of transgenic crops will further increase the use of external chemical inputs, which are environmentally dangerous and inappropriate for resource-poor farmers.
- Transgenic crops will lead to dependence on seed companies, who will take advantage of farmers; emerging intellectual property regimes will limit farmers' ability to save their own seed.
- Transgenic crops represent a further step away from the traditional agricultural techniques and biodiversity that have served farmers well in the past.

Sources: Christian Aid (1999), ActionAid (1999), ActionAid (2000), Corner House (1998).

Another constraint to technology uptake in marginal environments is access to markets and information. Areas that benefited from the Green Revolution not only have good agronomic resources but they also have relatively good markets, roads and services. Extending this infrastructure to more remote areas could help marginalised farmers take advantage of whatever agricultural technology is on offer. Indeed, it may be argued that until adequate markets and better information provision are in place there is little likelihood that transgenic varieties will reach farmers in remote or marginal areas.

Both sides of the controversy need to make some difficult choices about agricultural development resources. The high prevalence of poverty in marginal rural areas demands attention from governments, donors and NGOs. But the degree to which this kind of poverty is most effectively and realistically addressed by agricultural technology – of any kind – must be decided on a case-by-case basis. Investment in appropriate agricultural technology can make a difference to farmers in difficult environments, but promotion of unrealistic strategies – either high- or low-tech – simply wastes people's time and diverts attention from strengthening skills and resources for non-agricultural opportunities.

External inputs

There is considerable concern about the marriage between the chemical and biotechnology industries. Many of biotechnology's critics urge the reduction or elimination of agricultural chemicals. On the other hand, biotechnology proponents emphasise the potential for pest or disease resistant varieties to lower dependence on chemical inputs. The relation between agricultural chemicals and biotechnology deserves a brief review.

Insecticides have attracted particular attention in critiques of modern agriculture. Until recently insecticide use was expanding rapidly, and dangerous, broad-spectrum insecticides have been responsible for many cases of illness or death. In addition, their indiscriminate application often has altered ecologies and made pest control more difficult. In some cases – such as in Green Revolution rice areas – the growth in pesticide use was caused at least as much by policies that subsidised these products as by biological need. The imperative to reduce and rationalise insecticide use has led to various types of integrated pest management (IPM) that include biological control methods and farmer training. Conventional plant breeding invests significant resources in pest and disease resistance; one of the reasons for the recent decline in pesticide use on rice is the improved resistance of many of the new varieties. Discussions of biotechnology's possible contributions to insect control centre on the somewhat controversial use of genes from the soil bacterium *Bacillus thuringiensis* (Bt), but there is a wide range of other genes controlling the production of toxins, enzymes and enzyme inhibitors that are also the subject of research. The challenge is to understand the degree to which such innovations can contribute to sustainable pest control strategies.

Approximately 80% of the transgenic crops currently grown incorporate herbicide tolerance, reflecting the importance of chemical weed control in the North's commercial agriculture. Few people foresee a prominent role for this trait in the South in the near future, although it must be acknowledged that herbicide use plays a larger role in small-farm agriculture than is often imagined. Discussion of potential herbicide use

should consider several factors. First, herbicide is a labour-saving technology; in certain areas its adoption could have adverse equity effects by reducing demand for rural labour, while in labour-scarce areas it can make significant – and equitable – improvements in productivity. Second, in some hillside areas – particularly in Latin America – herbicide use is an integral part of soil conservation strategies for many smallholders. Finally, herbicides present many of the problems of other pesticides; some of them are quite toxic, and over-dependence on herbicides can lead to the emergence of resistant weeds. The degree to which herbicides are an appropriate choice for smallholders in the South – and whether relevant transgenic varieties might be useful – is a question for location-specific research.

The most important external input is chemical fertiliser. The essence of the Green Revolution was the development of short-statured crop varieties that could respond to higher levels of fertiliser. The expanded utilisation of chemical fertiliser has been one of the major factors in the growth of world food production. This has not been achieved without a cost; inappropriate fertiliser use can cause groundwater pollution and deterioration in soil quality. Critics of modern technology are uncomfortable with farmers' growing reliance on purchased fertiliser and strive to develop low-input alternatives. Unfortunately, the realities of nitrogen metabolism bring sobering news for both sides in the biotechnology debate. Although it is possible to imagine productive agriculture without the use of chemical pesticides, synthetic nitrogen is an absolute necessity for maintaining world food supply. By the 1980s China's national annual per hectare protein output was more than double that achieved in areas of traditional intensive organic farming in the 1950s; this is due to a use of synthetic nitrogen almost four times that of the US (Smil, 1991). On the other side, any hopes that biotechnology will find an efficient shortcut to biological nitrogen fixation remain a distant dream. No matter what type of technology is developed for resource-poor farmers in the foreseeable future, most of them will need access to chemical fertiliser.

This examination of external input use concludes that farming in the South will depend on the use of a wide range of biological and chemical inputs – combined with an increasing capacity in farm management. Labelling such inputs as 'natural' (e.g. a virus introduced as part of an IPM programme) or 'external' (e.g. synthetic nitrogen to supplement that available in the soil) does little to help make the pragmatic choices necessary for increasing production, lowering costs, and safeguarding health and the environment.

Box 2 Biotechnology and genetic engineering

Agricultural biotechnology encompasses three areas: *diagnostic techniques* that use an understanding of molecular biology to make conventional plant breeding more efficient; *multiplication techniques* such as tissue culture that can rapidly reproduce planting material or help eliminate viruses and other disease-causing organisms; and *genetic engineering*, which involves the transfer of genes from a wide range of sources. Most of the controversy about biotechnology centres on genetic engineering and its products, transgenic varieties.

Gene sources. The genes may come from any source. The more spectacular – and controversial – cases involve wide transfers, such as the introduction of a gene from a flounder to a potato – for cold tolerance. Many other examples involve less distance (e.g. a nematode resistance gene from rice transferred to potatoes), and a significant number of cases involve movement of genes within the same species (but with more precision than conventional plant breeding allows).

The ownership of the technology. The majority of the techniques for gene transfer, and many of the most widely used genes in current transgenic varieties, are owned by private firms, mostly the few large multinationals that dominate the field. All of the transgenic varieties currently grown on a commercial scale – with the exception of some in China – are privately owned. Nevertheless, there is also significant investment in public biotechnology research. Public research organisations in the North and South are developing transgenic varieties, using techniques and genes licensed or donated by the private sector as well as sources and methods in the public domain.

Markets

An important element in the opposition to external input use in small-farm agriculture is a concern about farmers' dependence on input markets. These fears are compounded by the advent of transgenic varieties; even when they embody public technology, private seed companies will most likely deliver them. In the North, the commercial seed industry is well established, and although there are legitimate concerns about its recent concentration – spurred by investments in biotechnology – there is little discussion of the alternatives to commercial seed supply – even, for instance, in the conduct of organic agriculture.

For the South, however, a predominant assumption is that the commercial seed industry will take advantage of farmers. This assumption has complex origins. One element is quite reasonably rooted in the weakness of markets in remote areas. Another element is the image of peasants' seed saving and the fear that commercial seed will erode their self-sufficiency. Farmers the world over – including the North – save seed if they are able to do so. Commercial seed has become predominant where it offers advantages in quality and convenience. Is it reasonable to deny this option to farmers in the South?

A further part of the argument concerns intellectual property rights (IPRs), particularly related to the establishment of the World Trade Organisation (WTO). Although systems of plant variety protection have been available for many years, the advent of biotechnology certainly provides added incentives for companies to push for stronger IPRs. There is considerable controversy over the breadth and types of IPRs that should be allowed. The notion that IPR regimes will deny farmers the right to save seed of even their local varieties is alarmist. It is important that a balance be established so that IPRs provide sufficient incentives for research but that mechanisms are in place to allow small farmers to save seed of protected varieties. The situation is further complicated by instances of exceptionally broad patenting – particularly for some biotechnology – private annexation of public germplasm, and biopiracy. The challenge is to identify and control the excesses while at the same time supporting the emergence of a commercial seed industry that can serve smallholders.

A final element in the argument is the assumption that although commercial seed companies in the North are acceptable, those in the South will behave irresponsibly. The history of the seed industry in the North has been characterised by many small firms and considerable competition. Despite the concentration of ownership of biotechnology in a few large firms in the US, for instance, hundreds of different transgenic varieties are available, offered by dozens of seed companies, many of them serving only a local market. The licensing of the technology allows it to be delivered by seed companies that have developed locally preferred varieties and have loyal customer bases. It will admittedly be a long time before biotechnology can be delivered to farmers in many developing countries in this fashion, but efforts towards diverse and responsive national commercial seed sectors certainly deserve support.

Traditional agriculture

Past opposition to the Green Revolution and current concerns about biotechnology are partly related to the external input and commercialisation issues discussed above, but they also draw on sentiments about the value of traditional agriculture. A Christian Aid document portrays the tragic suicides of indebted cotton farmers in India as a harbinger of biotechnology's potential impact and laments that these farmers had abandoned their traditional crops for cotton. The image is a powerful one, but is quite misleading.

The recourse to traditional agriculture may be an expression of vague romanticism or it may be part of a carefully crafted presentation. An outstanding example of the latter is Vandana Shiva (e.g. 1993), who has developed a considerable following through cleverly designed contrasts between an idealised traditional agriculture – diverse, feminine, self-sufficient – and the deficiencies of new technology. A comparison of this ideal with India's pre-Independence history, in which the majority of the peasantry was subject to a succession of empires, landlords and colonial rule, raises grave doubts about the supposition of an ecologically balanced, egalitarian rural society rent asunder by the imposition of foreign agricultural technology.

Supporters of traditional agriculture are concerned about the loss of biodiversity. The issue is of undeniable importance, but it is too often used to cover a vague defence of 'traditional' varieties rather than an examination of the dynamics and the trade-offs in diversity's contribution to agricultural production (Wood and Lenné, 1999). In addition, the emphasis on traditional agriculture promotes a paternalistic view of unchanging local customs and overlooks the dynamic and adaptive qualities of virtually all agricultural systems. The origins of Green Revolution technology – fertiliser-responsive varieties – are to be found in 19th century Japan – where they were a response to land shortage – and not in the 20th century US – which is still behind countries like India or Nepal in its adoption of semi-dwarf wheat varieties).

The opposite tendency, of course, is to paint an overly optimistic picture of technological change in agriculture. The Green Revolution was responsible for a remarkable increase in food production that significantly lowered food prices. But its poverty impact is less straightforward. A comprehensive review of the literature concludes that the technology was responsible for 'massive rises in the yields of staple food crops eaten, grown, and worked mainly by poor people. There have been positive effects on employment and on the availability, cheapness, and security of food. Yet there have been only delayed, scanty, and sometimes faltering and imperceptible improvements in the lot of the poor' (Lipton et al., 1989). The new technology helped stem the growth of poverty, but it was not sufficient to reverse the trend. Instances of Green Revolution technology improving the production and incomes of the poorest farmers tend to be found where there is greater equity of access to resources. The results confirm propositions held by both sides in the biotechnology debate: new technology can help alleviate poverty, but it is not a sufficient response.

The nature of agriculture makes it difficult to take decisions about technology that are based solely on efficiency criteria. More than almost any other enterprise, agriculture is both a productive activity and a way of life. Policies that affect agriculture in the South have an impact on the livelihoods of the majority of the rural population. Agricultural technology must be able to increase food production, but it must also provide employment opportunities and food security until economies grow and diversify. The equity considerations are less starkly drawn in the North, where agriculture provides employment for a tiny fraction of the population, but the choices are no less complex. For instance, concerns about preserving family farms and 'traditional ways of life' are important determinants of agricultural policy. We now turn to examine how policies related to agricultural technology are formed. We look first at the example of the biotechnology debate in the North and then draw implications for the South.

How the debate is managed

The North

In a country like the UK, the debate over biotechnology has achieved a very high profile. The opposition focuses on environmental and food safety issues and pushes for strict regulation or moratoria. Its principal emphasis is the changes to the countryside that could be caused by the introduction of exotic genes. Biotechnology's defence tends to be more vague; it can only express faith in the potential of new technology and confidence in the regulatory system. Economic arguments are difficult to establish. Farmers may be curious about transgenic varieties, but without the opportunity to test them they can hardly be expected to lobby forcefully in their support. Even the most optimistic scenario for the utilisation of cost-saving biotechnology would be unlikely to lower food prices enough in the short-run to attract the attention of consumers.

The debate takes place in the media and in local political forums. The democratic process is necessarily imperfect, and decision-makers are subjected to pressures from corporate lobbyists and ecowarriors, but there is a good chance that a majority viewpoint will be heard. Because of a lack of immediate economic impact, popular opinion is largely influenced by competing images of the countryside and technology. If the opponents' case continues to have appeal it will result in strict labelling and segregation of transgenic produce, or even its outright prohibition. To illustrate how economic factors might come into play in the future, it is possible to imagine a scenario in which other countries benefit from the efficiency advantages of biotechnology – and evidence of environmental dangers fails to materialise – and the UK begins to find that its own agriculture is less competitive. These market effects could lead to pressure from UK farmers – as well as consumers – to rescind many of the restrictions that had been imposed on transgenic crops.

Another possible scenario – related more to the image of the countryside than to economics – involves the current tendency to see the debate as one between biotechnology and organic farming. The demand for organic produce is growing sharply, despite its higher cost. In the UK this demand is currently met in large part by imports; it receives increasing attention from large supermarket chains and is becoming part of the marketing strategy of industrialised agriculture – organic farming is not necessarily small-scale; the rotation legume for organic rice production in California is sown by aeroplane. Future concerns about the fate of the countryside could turn towards the small family farm that wants to preserve its independence from the large marketing chains. Consumer support could develop for purchasing the – not necessarily organic, and perhaps even transgenic – produce of the small independent farm rather than the commercial products whose organic label is decreasingly redolent of traditional farming.

The point of these hypothetical scenarios is not to predict the fate of transgenic crops in the UK but to show how public opinion, open political debate and responsive markets will determine policies on biotechnology in the North. We now turn to ask how these decisions are managed in the South.

The South

How adequate are markets and political systems in the South for making democratic decisions about the future of transgenic crops? In the first place, attention must be given to regulatory mechanisms, in particular biosafety procedures. Even if the vast majority of transgenic varieties turn out to be environmentally benign, countries need access to adequate and impartial regulatory protocols to screen the range of biotechnology products that may be on offer. These mechanisms are in place in only a few countries in the South and their establishment is a priority. But there are several other elements that affect the biotechnology debate in the South.

Various sectors have an interest in biotechnology. A number of countries in the South, especially those with well developed public research systems, are investing in biotechnology research. There is considerable sentiment among national agricultural researchers that transgenic varieties offer prospects for improving local agricultural production. In addition, local and multinational seed companies are eager to introduce transgenic varieties because they can see opportunities for increased sales. On the other side, a small but growing number of middle-class consumers in the South have begun to hear about the food safety debate, and some of them have adopted the scepticism of their Northern counterparts.

Although farmers constitute a significant proportion of the population, their political voice is often not heard. Only a relatively few farmers who have good connections to public research may have an idea of the potential of biotechnology. Biotechnology may also become a highly visible rallying call for farmer organisations. In recent years, a number of farmer movements in India have been successful in calling attention to the declining profitability of agriculture and the political domination of the urban middle class. Some of these movements have found it effective to link their protests to the debate over India's liberalised trade policy. Most – but not all – of these groups are opposed to liberalisation; one well-known incident involved the occupation of a multinational seed company facility. More recently, several farmers' groups have protested against trials of transgenic cotton; one of the justifications was the – erroneous – rumour that the varieties incorporated the 'terminator gene'. Most of the Indian farmers involved in these movements regularly buy inputs (including seed). One can only speculate how these farmers might respond if a productive transgenic variety became available, offered by a local private or public seed company.

In some cases local NGOs are also active in the debate, most often in opposition to biotechnology. Their concerns and alliances are similar to those of international NGOs, emphasising environmental protection, self-sufficiency, and traditional agriculture. In cases such as The Philippines, NGOs' scepticism about transgenic varieties is consistent with their long-standing opposition to Green Revolution technology, which was promoted by the Marcos regime without concomitant political or land reform.

Our main interest, however, is the role of international NGOs. We have seen that many of them have launched a highly visible campaign against the possible use of biotechnology in the South. We need to examine the contribution of NGOs to ensuring that the circle of the debate is closed, so that interests and consequences are apparent in political forums and market performance, as they are in the North. To what extent do the arguments they present allow the concerns of citizens in the South – which may differ from those of the Northern debate – to be the ones that matter? Do the activities of NGOs in the South strengthen people's capacities to make their voices heard? A recent initiative in 'citizens' juries' in India (ActionAid, 2000) attempts to move in that direction, by allowing small groups of farmers to participate in a debate about biotechnology with leading proponents and critics. But this is a long way from developing farmers' independent capacities to interact with public agricultural services and to have more control over markets.

Many NGO strategies are distinguished by their antipathy to markets. Several NGOs use the example of the cotton farmer suicides in India. The tenor of the argument is that it would be preferable for farmers to return to their traditional crops and practices so that they could be protected from the capitalist system that lured them into cotton farming. There is little attempt to examine the complex conditions that led to the tragedy: the power of local moneylenders, the lack of adequate extension, the actions of unscrupulous merchants, and the failings of regulatory agencies. And there is little evidence in this case of any interest in helping make local markets work in favour of marginalised farmers: establishing credit facilities, strengthening farmers' technical capacities, or providing consumer education and organisation.

It is easier for NGOs to make an example of such tragedies and then wrap themselves in a cloak of innocence, 'promoting mixed, low chemical-use farming which favours naturally improved and locally adapted plants' (Christian Aid, 1999). It is difficult to object to such attractive proposals, as long as they provide an acceptable living for farmers. The problem comes when we begin to search for evidence regarding the outcomes of these alternatives.

This is not the place to examine the low-input agriculture movement, but many of its basic premises are correct. Excessive input use is responsible for environmental damage and inefficient farming; there is a wide range of possibilities for improving the productivity and safety of farming and these deserve careful testing and evaluation. There is a growing literature on alternative farming methods, and the management-intensive, small-scale nature of the technology makes it appropriate for NGO participation and support. But anyone looking for data on the impact of this type of NGO activity will be disappointed. NGOs are particularly derelict in following up and evaluating the results of their agricultural projects. The deficiency is easy to understand. The vast majority of the public that contributes funds to these efforts is satisfied with an occasional brochure with pictures of smiling farmers, and the donors who provide funding are irresponsibly lax in organising assessments that go beyond their own bureaucratic reporting requirements.

Many of low-input agriculture's most articulate supporters admit that there is relatively little solid evidence on the adoption and impact of the alternative production strategies that attract NGOs. This does not imply that the alternatives are inadequate but rather that much more effort is required for evaluation and adjustment. In the cases where follow-up is done on NGO activities, visiting communities several years after project investment has been completed, the results may be disappointing (Cramb et al., 2000). This is to be expected, as surely the majority of all agricultural projects fail to achieve their objectives. But it is ironic that the ability of NGOs and others to discuss and dissect the impact of the Green Revolution is due to the immense amount of data that is available about the adoption and effects of those technologies. Similar follow-ups of NGO work are in order.

A related issue is NGOs' role in agricultural technology generation. Despite the frequent tirades against the Green Revolution in NGO literature, it is not uncommon to find that their work in the South includes the introduction of 'new varieties' that are the products of the same public agricultural research system responsible for the Green Revolution. One may ask if NGOs see themselves as 'reluctant partners' (Farrington and Bebbington, 1993) of public research, or rather

as competitors for a decreasing volume of donor funding dedicated to agriculture. Do NGOs propose to contribute to building public research and extension systems that are more responsive to farmers' needs? The image of agricultural technology presented by NGOs has a significant influence on the nature and direction of donor support to agricultural development. In addition, if NGO positions are perceived as extreme or unrealistic they thwart potential alliances with supporters of public agricultural research who are also alarmed by the growing power of the 'Life Science' industry.

Conclusions

There is little reason for most NGOs to become directly involved with biotechnology. The technology itself is not within most NGOs' purview; their comparative advantage lies more with building local organisations and capacities. So there is no reason to expect any significant NGO commitment to biotechnology, even if transgenic varieties were shown to be safe and beneficial for small-scale farmers. In present circumstances, of course, the incentives are strongly in the opposite direction. By demonstrating opposition to a technology that makes many Northern consumers uneasy, NGOs can garner additional support for their own agricultural programmes.

Regardless of the strengths of various arguments or the ultimate fate of biotechnology, the current campaign raises a question about NGO strategy, which is related to larger concerns about globalisation. It is perfectly appropriate for NGOs to take advantage of their wide links to stimulate debate about a technology which is global in character. But we need to know where NGOs stand in response to globalisation, and in particular whether they choose to 'engage or de-link' (Edwards et al., 1999).

In the case of agriculture, de-linking involves concentration on self-sufficient communities relying on 'traditional' production methods, isolated from larger markets or political processes that are judged to be inimical to the interests of marginalised farmers. This would not appear to be a realistic alternative, but if it is the path that is chosen, the Northern public and donors that support this action deserve detailed reports on progress achieved. The opposite course, engagement, would seem to offer many more opportunities. It makes no assumptions about the type of technology that is utilised. It may involve 'traditional' or 'modern' technology. It may develop methods that outperform anything that biotechnology has to offer, or it may complement or accelerate the use of biotechnology. The quality that distinguishes engagement is a clear commitment to ensuring that marginalised farmers have a voice in agricultural markets and that they are better represented in public activities such as agricultural research, extension and regulation.

This type of engagement sees civil society not as a 'countervailing force' to expanding markets and disintegrating states (Edwards et.al., 1999) but rather as the vital element that makes markets and governments perform for their citizens. NGOs need to contribute to strengthening states and markets in the South so that people can debate and come to decisions about biotechnology as they do in the North.

References

ActionAid (1999) *AstraZeneca and its genetic research. Feeding the world or fuelling hunger?* London: ActionAid.

ActionAid (2000) *ActionAid citizens' jury initiative.* London: ActionAid.

Altieri, M. and Rosset, P. (1999) 'Ten reasons why biotechnology will not help the developing world'. *AgBioForum* 2 (3&4). www.agbioforum.missouri.edu/.

Christian Aid (1999) *Selling Suicide. Farming, false promises and genetic engineering in developing countries.* London: Christian Aid.

Corner House (1998) *Food? Health? Hope? Genetic Engineering and World Hunger.* Sturminster Newton: The Corner House.

Cramb, R., Garcia, J., Gerrits, R. and Saguiguit, G. (2000) 'Conservation farming projects in the Philippine uplands: Rhetoric and reality' *World Development* 28, pp 911-27.

Douglas, M. and Wildavsky, A. (1983) *Risk and Culture.* Berkeley, CA: U. California Press.

Edwards, M., Hulme, D. and Wallace, T. (1999) 'NGOs in a global future: marrying local delivery to worldwide leverage', *Public Administration and Development* 19: pp 117-36.

Farrington, J. and Bebbington, A. (1993) *Reluctant Partners? Non-Governmental Organizations, the State and Sustainable Agricultural Development.* London: Routledge.

Lipton, M. and Longhurst, R. (1989) *New Seeds and Poor People.* London: Unwin Hyman.

Nuffield Council on Bioethics (1999) *Genetically Modified Crops: The Ethical and Social Issues.* London: Nuffield Council on Bioethics.

Shiva, V. (1993) *Monocultures of the Mind.* London: Zed Books.

Smil, V. (1991) 'Population growth and nitrogen: An exploration of a critical existential link', *Population and Development Review* 17: pp 569-601.

Wood, D. and Lenné, J. (eds.) (1999) *Agrobiodiversity: Characterization, Utilization, Management.* Wallingford: CABI Publishing.

Robert Tripp is a Research Fellow at ODI, 111 Westminster Bridge Road, London SE1 7JD, UK. *Email*: r.tripp@odi.org.uk *Tel*: +44 (0) 20 7922 0336 *Fax*: +44 (0) 20 7922 0399

ISSN: 1356–9228

See *www.odi.org.uk/nrp/* for papers in this series.