The biotechnology revolution has almost overwhelmingly been a private sector phenomenon. This alarms many who, aside from other concerns, fear the consolidation of the agri-food industry in the hands of a few multinationals. Two scenarios for the developing world are often imagined: either genetically modified crops will intensify the industrialisation of agriculture in a way that is particularly harmful for poor farmers, with corporations getting the benefits while processes of marginalisation intensify. Or, they will be largely an irrelevance, with transgenic product portfolios way out of the price range of the world’s poorest farmers, beyond a few high-profile goodwill projects. China’s experience with biotechnology has been very different from other countries. Critically, the state has determined the objectives and led the process. Does this Chinese ‘developmental state’ model suggest that alternative more pro-poor biotechnology futures are possible?

In China, biotechnology research and development has been the preserve of the public sector. This is not unusual in itself, as private sector research is small in many developing countries. What is significant in the Chinese case is the scale and intensity of state commitment. This means that the profile of biotechnology products emerging from research is very different from most other developed and developing country settings (see box).

China has not so far, for example, concentrated on the herbicide-resistant crops that have been a priority of multinational corporations. The emphasis has been more on producing new seeds that lower input costs for farmers, rather than tie them into particular proprietary chemicals. In the case of Bt cotton some farmers have already made significant savings (see Briefing 10). Also, there has been more emphasis on non-transgenic techniques of less interest to the private sector, because they are less likely to result in patentable products: marker-assisted selection, for example. Meanwhile, crops are being developed with a ‘pro-poor focus’, including stress tolerant crops suited for dry, low-fertility or saline settings.

Despite the achievements there are dilemmas when the Chinese example is used to either present biotechnology as problem-free for poor farmers, or as an example of an alternative model for the GM revolution. Key questions that need to be thought about include:

- do the huge state investments in research lead to pressure to commercialise new crops and override biosafety concerns, as some Chinese ecologists would claim in relation to Bt cotton?
- what are the opportunity costs in relation to other non-transgenic forms of agricultural research? The vast resources committed to biotechnology laboratories inevitably mean a diversion from conventional research programmes, some of which might offer more to poor farmers and might be more ecologically appropriate.
- over the longer-term will state research institutes and their spin-off companies increasingly behave like corporations and focus on creating income-earning products, rather than technologies for marginalised farmers?
are farmers really able to influence types of new GM technologies being developed on their behalf?

- do farmers and consumers have enough information to be aware of the risks associated with transgenics?

### COMPETING PRESSURES ON CHINESE POLICY-MAKERS

**Trade and livelihood concerns**

A decision to commercialise transgenic varieties of major food crops could have implications for exports to EU markets (see Briefing 5). It might also restrict scope for excluding imports of more competitive US GM soya beans and maize, following entry into the WTO. This could have implications for the livelihoods of farmers in China's economically troubled north-eastern provinces.

**Don’t get left behind**

China has invested heavily in biotechnology. Starting with Deng Xiaoping, senior leaders have viewed biotechnology as a key area of the knowledge economy, one where China must not be left behind. However, some policymakers complain that they are now under pressure from influential scientists who argue that China must not be over-cautious, and should begin to capture the returns from its substantial investments in GM crop research.

**Biosafety management**

Officials are also aware that, with China's diverse smallholder farming systems, implementing biosafety regimes is very difficult. This is an argument against the commercialisation of Bt maize in the Chinese north-east, for example. Non-Bt maize is a key refuge crop in China's Bt cotton growing areas. Policymakers fear that, if maize were commercialised in north-eastern provinces, seed would quickly travel south and be used in the cotton zones. Further to this, for crops where China is a centre of origin – rice and soya beans, for example – biodiversity concerns cannot be taken lightly.

**Sceptical Chinese consumers**

The growing Chinese urban middle-class is increasingly informed about food safety issues. Some recent opinion polls suggest that substantial opposition to genetically modified foods is a real possibility.

The Chinese developmental state can, it seems, promote a different type of biotechnology. However, there are dilemmas associated with the Chinese model of biotechnology development. Chinese policy-makers are now more circumspect about GM crops than popular media images often suggest. No new GM crops have been commercialised for several years.

In the face of a set of competing pressures and interests pulling them in different directions, Chinese officials appear to be taking a ‘wait and see’ position (see box).

Under some circumstances, a ‘developmental state’ can challenge the major biotechnology multinationals, as the Chinese case suggests. This could mean that technology is more relevant to a greater range of farmers, with less emphasis on proprietary products, where profits can be captured for corporations, and with greater emphasis on exploration of a range of non-transgenic biotechnology tools. However, questions still need to be asked. One dilemma for the developmental state is that rapidly developing technological capacity may not always allow sufficient space for careful deliberation of the risks associated with new innovations, or what forms of development are most appropriate for poor farmers. Added to this, China is clearly different from many other states in terms of its size, its political and organisational culture, and the scale of resources it can put behind its biotechnology programme. Not all developing countries can guide the path of technology development in quite this way.