

Pollution Effects on Urban and Peri-urban Agriculture in India, social and economic implications

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Any threat to agricultural production in India is a matter of great concern. Agriculture accounts for a little over one quarter of India's GDP, and nearly 80% of the population relies on agriculture as part of their livelihood. However, food security is still considered a luxury by many and 80% of the urban population spends 70% of their income on food (Mougeot 1994). Whilst attention tends to focus on rural areas, urban and peri-urban agriculture makes an important contribution to the growing urban food demand, particularly for supplies of perishable produce, and it is a major source of food security, income and employment for the poor.

This paper introduces a methodology for assessing the social and economic policy implications of pollution impacts on the yield, quality and safety of urban and peri-urban crops. It is based on ongoing interdisciplinary research by Imperial College since 1995, in partnership with a wide range of Indian organisations. The approach emphasises non-market valuation of agricultural produce and the inclusion of the poor, whilst developing strategies to link the micro- and macro-level policy perspectives to influence ongoing policy debates (Marshall, et al. 2000).

Pollution Impact

Field studies from Pakistan and elsewhere have shown that significant reductions in crop yields may be occurring as a result of air pollution (Ashmore & Marshall 1999, Marshall, et al. 1997). There is also limited evidence to suggest that the incidence of pest and disease damage may increase in polluted areas (Bell, et al. 1993) and that there may be a reduction in crop nutritional quality.

This interdisciplinary study was carried out by British researchers in partnership with local and national governmental bodies, non-governmental organisations, research institutions and local farming communities in India. There were three major strands to the research programme as indicated in [figure 1](#). Scientific data concerning the impacts of air pollution on crops of importance to the poor were linked with information on the significance of these impacts to livelihoods of farming communities, to other vulnerable stakeholders and to the city's economy. The policy and scientific research aspects of the work were carried out in parallel, with fora created to allow affected communities, researchers and policy-makers to exchange views whilst consumer groups, polluting industries and other interested parties were also consulted. In addition, a policy group was developed to assess how the emerging research findings could be most effectively utilised within the existing policy agenda.

[Figure 1 \(26MarshFig1.doc\)](#)

There are two key processes involved, which take place in parallel to the scientific investigation:

- 1) A holistic evaluation (using participatory methods) of the significance of urban and periurban agriculture, and air pollution as a constraint to it.
- 2) Linking with the existing policy agenda.

The holistic evaluation

The general nature and extent of urban and peri-urban agriculture were assessed using secondary data and were supported by field transect surveys. The results showed that UPA is an important, if little, recognised activity largely practiced by landless and small-scale farmers. Wheat and rice, grown for subsistence use, predominate the land area, whilst vegetables are often also grown for sale.

Marketing surveys were also undertaken to determine the proportion of the city's food supply that was sourced from urban and peri-urban areas, and the economic value thereof. In fact, the majority of highly perishable products, including many vegetables that are consumed in Indian cities, are produced in peri-urban areas

Data from the experimental studies were used to make preliminary assessments of the economic costs of air pollution damage. These were limited to an illustration based on current market value, because little is known about responses to yield and quality constraints (such as price fluctuation and crop substitution) in urban and peri-urban agricultural produce. This issue is being pursued in further studies, but it is important to note that many of the possible scenarios suggest that it is the poor who will suffer the most.

The analysis described above provides an indication of the monetary value of crop losses as a result of air pollution, but does not include any costs that are not represented in the traditional economy. In order to address this, a more detailed assessment of the nature of agriculture and its role in the livelihood strategies of both individuals and communities in selected case study villages was developed through an intensive programme of participatory research activities. The study provided evidence of the many ways in which reductions in crop yield can threaten livelihoods in these areas. Amongst small-scale farmers in the survey areas around Delhi and Varanasi, the majority of crops are for home consumption, and the crop residues maintain livestock and fuel supplies. Agriculture is also an important source of (seasonal) employment.

Whilst much of the participatory work focused on poor producers, complementary activities examined the potential impact of air pollution on other stakeholders in the production-consumption chain. Once again, the poor were seen to be the most vulnerable to constraints on production in polluted areas.

Policy Links

The second key process is based on the recognition that benefits of the participatory level methodologies are only fully realised by utilising the information gained from the analysis within the context of wider policies and programmes. Digesting micro- and macro-level analysis within an iterative framework enables researchers to focus on effective means to inform the relevant policy debates, influence the policy-making process and improve policy implementation.

The first stage was to identify target policy fields and actors. These included legislators for emission standards, pollution control measures, and land-use planning. There is a requirement for environmental impact assessments before new industrial installations are approved, but they do not currently include potential damage to agricultural crops. These are examples of where awareness of impacts on agriculture may help to support the case for more stringent emission controls.

Formal and informal channels for influencing environmental policy were then examined. The stakeholders involved included: central and state government departments for environment, agriculture, power/energy, industry, transport; pollution control boards; NGOs concerned with environment and public health; polluters and consumer groups. Policy influence may take place through direct actions such as lobbying senior government officials (the Ministry of Environment and Forests is a high priority) or indirectly through, intermediate institutions or systems such as the democratic, judicial and market systems. Some high profile institutions, through which direct interaction takes place, provide an excellent opportunity for policy influence. Other major players in India include an extremely active environmental movement led by non-governmental organisations and the judiciary who have been pivotal to many recent changes in environmental policy in India during the past decade.

Recognising that different stakeholder groups have unequal access to policy-makers and implementers, communication channels between those most affected by air pollution and the authorities charged with controlling it were explored. The objective was to consider how the concerns expressed by farming communities affected by pollution issues (as expressed through the participatory research) are currently and could potentially be addressed by the policy and regulatory frameworks.

Following this, the translation of environmental policy statements to specific strategies, instruments and initiatives were reviewed and successes and failures recorded with respect to their success in improving air quality particularly in urban and peri-urban areas. This included a review of problems that need to be overcome to support a higher level of achievement of policy objectives. For example, despite recommendations and justification for extensive use of economic, voluntary and social tools, command and control is still widely used for environmental pollution issues, but the financial penalties are often considered too low to act as a real deterrent, and whilst there is a strong rhetoric for greater involvement of NGOs and more widespread use of voluntary and social tools for pollution control, this is hindered by poor public access to information, which limits the accountability of responsible agencies towards the public and electorate at large.

Finally, specific links with ongoing initiatives to raise environmental awareness and improve the implementation of environmental policies were identified and facilitated. These included involvement in school-based environmental monitoring programmes and organisation of field-based farmer/scientist/government extension agent workshops.

Conclusion

The case study described above demonstrates that there can be considerable advantages in developing a scientific field research programme in parallel with community-based research and in maintaining a policy dialogue at all levels. In addition, the focus on specific stakeholder groups (in addition to the local or national economy) provides data to target further scientific research into the effects of air pollution on crops and forests to focus on commodities and field studies that are appropriate to a particular priority group.

The aim is to carry forward elements of this research methodology into future programmes concerning urban and peri-urban agriculture. One of the priorities will be to analyse and document the institutional lessons that have been learnt.

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