Letters

Emission Standards: Costs and Benefits

It is reported by Constance Holden (News and Comment, 27 Sept., p. 1142) that the National Academy of Sciences (NAS) has okayed auto emission standards. Indeed, the recent NAS study (*1*) prepared for the Senate Public Works Committee endorses the numerical emission standards set out in the 1970 Clean Air Act and sees "no substantial basis for changing the standards." It claims that the standards are justifiable in cost-benefit terms. It reaches this conclusion by finding "that the benefits in monetary terms . . . are commensurate with the expected cost" of about $5 billion to $8 billion per year.

Unfortunately this conclusion is not justified: the optimum point of operation is not one at which the dollar benefits are equal to the dollar costs, but one at which the *marginal* (or incremental) benefits are equal to the *marginal* costs (Fig. 1). This optimum point generally occurs where the costs are much lower than the benefits. At the optimum, a $1 increase in cost would buy an additional $1 of benefits; at the point where costs equal benefits (which is well past the optimum), it would buy substantially less. The summary report only hints at this possibility. But the detailed results of the study itself can be used directly to support the following contrary conclusion: Relaxing the emission standards, or reducing their geographic coverage to cities with serious pollution problems, or delaying the implementation of the standards would lower the costs drastically without an important reduction in benefits.

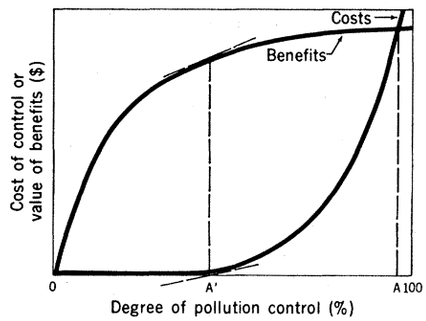

Fig. 1. Schematic diagram of costs and benefits versus degree of pollution control (*2*, p. 949). The optimum level of pollution is not at point *A*, where costs equal benefits, but at point *A'*, where the marginal quantities (slopes) are equal.

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References

1. Coordinating Committee on Air Quality Studies, National Academy of Sciences–National Academy of Engineering, *Air Quality and Automobile Emission Control*, vol. 1, *Summary Report* (Government Printing Office, Washington, D.C., 1974).
2. Modified from S. F. Singer, *Eos (Trans. Am. Geophys. Union)* **55**, 948 (1974).

Agricultural Development

I commend Eugene Brams and James Kirkwood (Letters, 23 Aug., p. 649) for trying new methods to improve international agricultural education. I am not sure, however, if such programs will bear fruit.

Most instructional modules, including those described by Brams and Kirkwood, are based on the conditions in the developed countries. But are these modules applicable to conditions in countries such as India, where the social structure is altogether different from that in the United States? Success in producing more food grains in the Third World has been achieved, as is evidenced by the so-called Green Revolution. But the development of agriculture in India involves many departments of the government other than the agriculture department. In the Punjab state, considered the granary of India, continuous problems with agricultural development arise because of the lack of coordination among the various governmental departments, not because of the lack of technical know-how or the skill to communicate (*2*). And this probably holds true in many other developing countries.

Another reason why the United States has often failed to give effective assistance to the developing countries may be because they have not always sent competent advisers to those countries, although there have been some excellent men on such assignments. In this connection, Singh states, "In my social contacts with these foreign experts I have found them more knowledgeable on tiger-hunting in India than on the country's agriculture" (*3*).

The answer to the question of whether the United States, after 25 years, $150 billion, and the dedicated efforts of thousands of experts, has learned how to carry out an effective development project in a developing nation is given in the title of a book by Paddock and Paddock (*4*). Let us hope, wait, and see if Prairie View's new methods succeed.

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References

1. J. M. Brewster, in *Agricultural Development and Economic Growth*, H. M. Southworth and B. F. Johnston, Eds. (Cornell Univ. Press, Ithaca, N.Y., 1967).
2. A. S. Kahlon, A. C. Sharma, P. C. Deb, in *Serving the Small Farmer: Policy Choices in Indian Agriculture*, G. Hunter and A. F. Bottral, Eds. (Croom Helm, London, 1974).
3. S. Singh, *Ceres (FAO Rev.)* **4**, 33 (1971).
4. W. Paddock and E. Paddock, *We Don't Know How* (Iowa State Univ. Press, Ames, 1973).

Ultrasonic Holographic Instrument

There is an error in the Research News article by Jean Marx (18 Oct., p. 247) on "Diagnostic medicine: The coming ultrasonic boom." I estimated that it will take 2 or 3 years before the feasibility of an ultrasonic holographic instrument can be demonstrated at the RCA Laboratories, rather than that we are 2 to 3 years away from marketing such a device. Further, an additional period of several years would be required to test a diagnostic machine in a clinical environment.

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Scientific Manpower Survey

The article by Deborah Shapley (News and Comment, 31 May, p. 967) on the 1973 survey (*1*) by the National Research Council (NRC) of doctoral scientists and engineers overlooks a fundamental difference between that survey and others with similar purposes. The population base from which a representative sample was drawn in