



AgEcon SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

Subject III

Resource Use Efficiency, Particularly in Irrigated Areas

Rapporteur: Suresh Pal*

Agricultural growth in India during the post-green revolution period has intensified the use of natural resources (land and water) and external inputs like fertilisers, chemicals, etc. This resource-based growth has inflicted tremendous pressure on the natural resources and environmental sustainability. Farm income also declined because of substantial increase in the cost of production, particularly paid-out cost, and investment in new sources of growth (inputs, technology etc) became less attractive. In this context, resource use efficiency (RUE) assumes significance, particularly in irrigated regions. Both technical and allocative efficiency are important to achieve the overall economic efficiency in resource use. These and other related issues chosen for the conference received overwhelming response from the scholars. The contributed papers have covered most of the issues relating to the trends in RUE in different lands (including hill and problem soils), partial and total factor productivity, effects of technical change and price distortions, economic and environmental implications of RUE, etc. Some issues like methodological and institutional aspects of externalities in the use of natural resources, RUE under different sources (canal, tubewell, tank) and types (intensive, protective) of irrigation, and policy issues dealing with degradation and overexploitation of natural resources were addressed rather inadequately.

Trends in Resource Use Efficiency

The discussions focused on the issues raised in the keynote paper, Rapporteur's report, and brief presentations by the paper contributors highlighting their main research findings. The trends in level and efficiency of inputs and water resources were discussed in detail. It was mentioned that the response of critical inputs like fertilisers is decreasing and there is deceleration in the growth of total factor productivity of irrigated agriculture. The decrease in fertiliser response is because of inefficient management of soil moisture. However, the response is much better in tubewell irrigated areas due to better control on quality of irrigation. There is a need for assessing the optimal fertiliser response level under field conditions and possibility to enhance it by balanced use of plant nutrients and management of soil moisture. As regards efficiency of water use, although it has increased over time but still remains less than 40 percent, and the efficiency is much lower in the irrigated areas. Data are available on long-term fertiliser and irrigation experiments which should be made use of for generating information required to increase fertiliser and

*Principal Scientist, National Centre for Agricultural Economics and Policy Research, New Delhi- 110 012.

water use efficiency. Enhancing the efficiency of resource and input use is a must for reduction of cost of cultivation, and dissemination of information on better management practices is critical in this regard.

The Role of Price and Direct Interventions

The group spent considerable time on the role of incentives in the use of water resources in rice and wheat in the northern irrigated region. In the present price policy regime, there are strong incentives for growing rice and wheat and there is little possibility of large-scale diversification to other crops, which require less water and generate higher income. The group also felt that mere withdrawal of subsidy on electricity may not shift incentives in favour of diversification of the cropping system. This will require several other measures like effective direct control on the use of water, participation of farmer organisations in water management, and educating farmers about sustainable use of water resources. India can learn from the Australian experience where long-term farm planning based on suitability of land, pricing and control of water, and farmers' participation in water use, input supply and R&D are found to be very successful. This model however can be examined in terms of possibility and ways to mobilise a large number of small farmers and to control use of water by them. It was suggested that water control would be easy in canal irrigation, but for tubewell irrigation the possibility (economic and technical) of using some mechanical device, as practiced in some west Asian countries, should be explored. Direct control on use of canal water for certain crops was tried in south India but this failed because of poor governance and perverse incentive to grow the prohibited crops.

Management of water demand in the context of depletion of groundwater was discussed at length. It was mentioned that although the problem is widely documented, there is a need for construction of a national profile of groundwater use, well depth, water depletion rate, etc. to suggest location-specific responses and solutions. The data provided by the Central Groundwater Development Board are not adequate to meet this requirement. The challenge of enhancing water use efficiency should be addressed by using an appropriate mix of policy, institutional, and technological options. The current incentive regime of providing subsidy on electricity and minimum support price does not encourage efficient use of water resources, particularly groundwater, and diversification towards less water demanding crops. On the contrary, this has intensified the exploitation of groundwater and practices like advancement of rice transplanting are common and widespread in Punjab and Haryana. Change of this regime is extremely difficult because of politico-economic reasons, but essential for long-term sustainability of this most scarce resource. Corrective policy measures considered by the group are controlled supply of electricity, withdrawal of minimum support price (MSP) for early transplanted paddy, and pricing of water/electricity on working cost recovery basis. There could be an element of subsidy on water-saving irrigation investments

like drip and sprinkler irrigation, and the subsidy should be targeted to small farmers. The policy of rice and wheat export should also be revisited as this leads to virtual export of water. Export price of water-intensive crops like paddy should also reflect externalities associated with the use of water.

The Role of Institutions and Technologies

The second important issue relating to efficient and sustainable use of water resources is to strengthen the institutional mechanism to manage and use irrigation water. For canal irrigation, which is a major source of inefficiency in water use, there is a need for improving the governance of irrigation system and ensuring people's participation in water distribution and collection of irrigation charges. The success in this aspect has been partial and sporadic because participatory irrigation management models were not tuned to location-specific problems. The same is true for the Integrated Watershed Development Programme (IWDP) being implemented with substantial government funding. There are problems relating to the planning, people's participation and monitoring of the plan implementation. People's participation can significantly improve micro-planning and its implementation, but mobilisation of heterogeneous group requires development of social capital and civil society organisations can play an important role in this direction. These institutional developments should be backed by appropriate technological interventions for making IWDP a success. For groundwater, legal institutional mechanism (act and its enforcement mechanism) could prove to be more effective.

Technological options are equally effective to increase water use efficiency. The possible options include system diversification through increasing profitability of less water-intensive crops, development of water-efficient crop establishment and management practices, and irrigation methods for higher water use efficiency. System of rice intensification, zero tillage, bed planting, and direct seeding of paddy are some recent examples of water-saving technologies. Large-scale adoption of such technologies requires (a) monetary incentives like cost saving or yield increasing, besides saving irrigation water, and (b) a perfect match between research and extension systems for their dissemination.

Methodological and Other Issues

The neo-classical economics alone does not incorporate adequately externalities in the use of natural resources like groundwater, and the gap is widening between the social and private costs of resource use. There are methods like contingent valuation method to evaluate the externalities, but these have limited role in terms of controlling unsustainable resource use. The neo-classical economics along with the institutional economics provide a much better framework to analyse the incentives and institutional arrangements to promote efficient, equitable and sustainable use of natural resources. These mechanisms should be used in combination of appropriate technologies and facilitating government policies.

Finally, the group was of the opinion that the problems associated with RUE in irrigated agriculture were recognised by researchers quite early. The complexity and severity of the problem have been growing over time, and understanding of the ways to address the problem has been rather incremental. The initiatives to increase water use efficiency are weak and success at regional and micro level is sporadic. How can we address this problem? The most critical step in this direction is to create greater social awareness about the cost of depletion of water resources. The examples of health (nutrition and HIV/AIDS) and population control have shown that empowerment of people by provision of information is extremely useful in addressing the major developmental problems. The information should comprise of social costs associated with inefficient use of water, as well the alternatives available to enhance utilisation efficiency. The primary responsibility of dissemination of this information lies with the public extension system which should be strengthened and to undertake this and other similar tasks.

Research Issues

The following are the research issues that emerged during the discussion:

- Advancement of analytical methods for incorporating environmental externalities and their applications in the analysis of RUE and cost of production.
- Assessment of relative importance of technical efficiency in irrigation system and crop production in the promotion of overall water use efficiency in the traditional and newly irrigated areas and in different river basins and agro-climatic situations.
- Assessment of relative effectiveness of price (resource and product), technological and institutional factors in promoting crop diversification in intensively irrigated areas and its impact on RUE.
- Effect of withdrawal of subsidies on profitability and efficiency in production and resource use, and their impacts on environmental externalities.
- Study to increase fertiliser response and irrigation efficiency under field conditions using long-term experimental data.

Policy Issues

Information for empowerment of people: The government should launch a mass campaign to inform people about severity of the depletion of natural resources, its social cost and possible action required at their level to promote RUE.

Reforms in power sector: The state governments should regulate electricity supply to control over-exploitation of groundwater. Also, subsidy on electricity should be rationalised and the tariff rate should recover the working cost. However,

subsidy can be provided on water-saving investment like drip and sprinkler irrigation and it should be targeted to resource poor farmers.

People's participation: People's participation in micro-planning and implementation is a prerequisite for the success of IWDP and increasing RUE.

Research and extension systems: Both the systems should work in close coordination to promote cost and water saving (or resource conservation) technologies, promoting system diversification for increasing water use efficiency and profitability.

Product price and exports: Withdraw minimum support price (MSP) for early transplanted rice because it overexploits groundwater. Control virtual export of water by assessing the export competitiveness based on water use and associated externalities, besides cost of production.