Strategies for Fighting Poverty in Irrigated Agriculture

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The emerging environment for agri-business calls for a fundamental shift from the policies of the past that envisaged closing the demand-supply gap in agricultural production. It is essential that future strategic interventions for agricultural development in general and irrigated agriculture in particular, are oriented more toward value addition to the agricultural output so that the farmer produces not for the mass market but for value enhancement at every stage in the value chain. This paper conceptualizes three possible strategies that could contribute to relentless search for value-addition through knowledge and information flow in irrigated agriculture.

INTRODUCTION

In the wake of the process of economic reforms set in motion by the Government of India in July, 1991, a regional workshop was organized by the Food and Agricultural Organization and the Association of Food Marketing Agencies (AFMA), in 1992 at New Delhi. While inaugurating the workshop, Dr. Balram Jakhar, the then Union Minister for Agriculture, Government of India informed that "All the State Governments have been advised to strengthen their organizational structure at the field and operational level and specially the extension machinery so as to transfer the technology to the farmers at the field. Special effort is also directed to encourage farmer-owned organizations which would help in cutting out the middlemen and thus provide opportunities for better remunerative prices to the farmers and lower cost to the consumer. Our own experience and all the world over has been that the fruit/vegetable sector can best be developed and protected only through well organized and managerially competent, farmer-based institutions and organizations. Our experience of Grape Growers Federation in Maharashtra is a fine example of farmers turned exporters. This helps to ensure higher profitability from production to marketing and exports."

Almost ten years down the reform path, the above observation seems more relevant than ever before. A vast country of sub-continental size like India, with marked regional diversities in soil types, agro-climatic environment, resource endowment, cropping patterns, farmer profiles and population density,

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1. Tail-end farmers are generally smallholders.
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8. Mere availability of water is not enough. Water availability with credit facility is the real requirement of poor farmers.
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is bound to reflect variance in economic and agricultural development among various regions. These regional differences in agricultural development tend to get accentuated further because of the varying levels of investment in development infrastructure and differences in adoption of technological innovations. Hence, the impact of high yielding varieties of seeds and fertilizer-intensive technology of the late 1960s and 1970s on the regional pattern of agricultural development has been criticized as much for developmental imbalances as has been appreciated for reducing the country's dependence on large-scale imports of food-grain through PL480. In the same spirit, even as we continue to negotiate the more challenging task of alleviating poverty in the less-endowed irrigated-dry and dryland areas within the agricultural sector, it is necessary to look at strategies that can help release the irrigated farming community from the pangs of poverty.

There is undoubtedly less uncertainty and hence lesser risk in managing irrigated farming, which positions the irrigated farmer in a more privileged position relative to his counterparts engaged in dry land and rain-fed agriculture. Hence approaches to tackling poverty in irrigated agriculture will have to reflect an enlarged focus from mere production and productivity so important in dry land agriculture to relentless value addition across the entire value-chain in irrigated agriculture. It is in this context that a firm and widely agreed strategic agenda for value enhancement in irrigated farming assumes great significance. Given the fact that the irrigated farmer has access to such a valuable resource as water, the strategies for value addition leading to improved returns from irrigated crops, should place knowledge at the center of all development efforts.

INDIA'S STRATEGY FOR AGRICULTURE DEVELOPMENT IN RETROSPECT

Before attempting to strategize for the future, it is a basic tenet of strategic management to look back in retrospect at the past strategic initiatives and their outcomes. Indian agriculture has had a chequered history. After a prolonged period of stagnation in the first half of the twentieth century, as Bhalla, G. S. and Singh, G. (2001) point out, "its rate of growth accelerated from 0.37 percent per annum during 1901-04 to 1940-44 to 2.68 percent per annum during 1949-50 to 1996-97". No wonder it always evokes a mixed response as Rangarajan, C. (2001) observes, "The progress of Indian agriculture since independence is, in many ways, impressive. The output of food grains which stood at around 50 million tones in the early 1950s has risen to 200 million tones as of last year. This is a fourfold increase as compared with an increase in population of 2.5 times. In fact, planning for agriculture has been an outstanding example of indicative planning in this country. Agriculture is a sector where millions of farmers take their independent decisions.

However, when self-sufficiency in food was set as the goal, the government sought to create conditions in which farmers would take such decisions in their own interest which would help in achieving the policy objective. Agriculture thus provides a successful experiment of policy influencing private behavior to achieve public goals. Striking as may be the performance of Indian agriculture in the last five decades, as the saying goes, "we have miles to go before achieving self-sufficiency in food-grains at higher levels of per capita consumption. Besides, we are yet to reach, in relation to several crops, productivity levels that have been achieved elsewhere."

If one has to encapsulate India's strategic orientation toward agricultural development in the post-independence period, it is best possible by looking back at two distinct phases,

as Bhalla, G. S. and Singh G. (2001) suggest— the pre-green revolution (1949-50 to 1964-65) and post-green revolution (1967-68 to 1996-97) periods. In the pre-green revolution period, the two main planks of agricultural policy were land reforms and large investments in irrigation infrastructure (Bhalla, G.S. and Singh G. 2001). This did contribute to breaking the stasis that had gripped Indian agriculture earlier in the century, as the growth rate of all crops rose to 3.15 percent per annum between 1949-50 and 1964-65 from less than half a percent in the preceding five decades.

The agricultural development strategy in the post-green revolution period, " since the mid-1960s, centered around the enlargement of irrigation, stepped up use of fertilizers and adoption of improved varieties of seeds" (Rangarajan, C. 2000). The advent of this seed fertilizer technology in the late 1960s ushered in the green revolution which changed the face of Indian agriculture for good. Initially, the benefits of this new wave of agricultural development were confined to the irrigated areas of Northwestern parts of India, notably, the States such as Punjab, Haryana and Western Uttar Pradesh, but other states did catch up subsequently leading to a more balanced spread of agricultural growth. Well, it is not difficult to infer from the above that the tone and tenor of the strategies have so far been clearly directed toward pushing the productivity frontier taking advantage of irrigation facilities wherever available. Given the commitments that India has to fulfill as a member of the World Trade Organization (WTO) under the 'Agreement on Agriculture' (AOA) and the pressures emanating from the global marketplace, the strategies for the future need to go far beyond productivity increases.

PERSPECTIVES FOR THE FUTURE: A TRI-PRONGED STRATEGY

While the need to augment crop yields further is by no means less urgent in the current scenario, it is equally or perhaps more important to temper future strategic interventions with sharper attention to the changing market preferences and the consequent demands on knowledge intensity and competitiveness of Indian agriculture. Here, the brunt of these demands is likely to be almost entirely on the irrigated farmer since the pattern of irrigated cropping in India has so much in common with the product-mix traded globally. It is, therefore, not merely a question of alleviating poverty in irrigated agriculture but strategizing for its fundamental competitiveness in the world market. Three broad strategies are discussed below in approaching this vital issue of competitiveness of irrigated agriculture and its future growth.

SUSTAINABLE STRATEGIC PARTNERSHIPS

The developments sweeping the corporate sector at large in recent years offer many useful lessons to policy makers and development analysts in realizing the potential benefits that well-chosen and sustained partnerships can offer, in irrigated agriculture. As Hutt, D.M. et al. (2000) suggest, the history of any alliance reveals periods of optimism and doubt, cooperation and conflict and a host of forces that advance or threaten the future prospects of one or more partners. In the agricultural sector in India, there have been isolated cases of successful partnerships, for example, between industry and farmers (see box 1) but the linkages between farmers and industry are far from strong.

Box 1. Lessons from the Pepsi Experience(NCAER 1996).

Irrespective of the outcome of the Pepsi experiment, it is worthwhile to recapitulate what we consider to be the main reasons behind the success of the tomato paste production at this firm. For one, the extension work of their field staff has been remarkable. If another firm is to replicate the success of this firm, an important first step would be to retain an assiduous field staff which interacts almost on a daily basis with farmers. The main input of the staff would be to ensure that the seedlings are being planted at the appropriate time, and fertilizer and pesticides application occur at the right time, and in the right quantity.

The extension work thus performed assures that the right quantity of tomato is produced. This quantity includes not just the demand of the processing plant, but also ensures that enough surplus is created so that the farmer is not lured to sell on the open market the quantity apportioned for Pepsi. Such a step is absolutely essential in making a success in contract farming, because the contracts with farmers, as stated earlier, are not legally binding. Therefore, if a firm wishes to ensure the steady supply of raw material to its factory, a quantity which is in excess of its own demand must be grown. Assuring sufficient amounts to meet the needs of the consumers, through extension work, has therefore been yet another step taken by Pepsi which is essential to keep prices of the raw material under control.

But most importantly, the role of extension work in making the contract farming operation a success is to provide the farmer with the assurance that the firm will buy the stipulated quantity of tomato. This, in turn, reinforces the stabilizing effect on both prices as well as quantity supplied to the plant.

It may be worthwhile to contrast this extension work with that of a domestic firm also involved in the production of tomato paste. This firm has also attempted contract farming, although with considerably less success. One of the reasons has been that the entrepreneurs do not always carry through the contract on the agreed terms of price and quantity. As a result, the farmers are rather unwilling to continue contract farming with this firm. Hence, the role of continual communication and assurance in contract farming cannot be understated.

Research focused on increasing tomato yields has also been a significant reason for the success of the operations at Pepsi. Intensified efforts at R & D have helped the firm procure raw materials in the quantity and quality desired. Another fallout of increased yields which has contributed to the success of this operation has been that farmer incomes have gone up. It has been estimated that on an average, the per acre income of farmers (net of price paid for seedlings and fertilizer) is approximately Rs. 1,000-1,500 during the tomato season. That the farmers return year after year to contract with Pepsi gives a clear indication that their financial situation has improved since they began working with this firm. This aspect of contract farming must be kept in mind if one has to sustain operations over a long period of time.

Finally, it is worth stating that the operations set up by Pepsi at Zahura, while successful in the context of contract farming, incurred financial losses which amounted to about Rs. 4 crores per annum on an average during the first three years of its operations, and is expected to break even only in the current financial year (Abhiram Seth). While a firm of the financial clout of Pepsi can afford to bear the losses for several years, the same will most probably not hold true for a medium sized domestic firm.

However, most elements of this experiment would have to be emulated, particularly with regards to contract farming. Such essential factors include, for one, working in close connection with the farmer, for another, honoring the contract established between the two parties as an essential step towards establishing a positive working relation with the farmer. Most essentially, however, the firm must attempt to increase the farmers' incomes, preferably through yield augmentation, if it wishes to be successful in contract farming.

This applies to both the linkage between the industry engaged in supply of inputs to the farmers as well as the industry segments that procure agricultural output from the farmers. How could such linkages be successfully forged not only between industry and farmers but also with other stakeholders like the Government, Nongovernmental Organizations (NGOs), Research and Academic Institutions to facilitate a vivid understanding of the market demands and assemble the apparatus needed to satisfy them.

INSTITUTIONALIZING FARMERS' NETWORKS

A wealth of literature surrounds the subject of accelerated economic progress through networking. Though large organizations seem to have benefited more from networking, it is the small and medium enterprises and farmers who can perhaps derive the best mileage by forming and sustaining networks. Organizations like Xerox Corporation, General Electric and International Business Machines are often cited as examples of success in unleashing the collective creativity within them through formation of strategic networks and strategic communities. It is common knowledge among the agricultural extension community that farmers are gregarious by nature and are amenable to influence leaders and innovators. Training and involving the youth as change agents and network instruments for faster diffusion of knowledge could be explored (see box 2).

Box 2. Disseminating knowledge on sustainable irrigation in Brazil (World Development Report 1998/99).

In many countries the irrigation sector is the largest water user accounting for up to 80 percent of consumption. It is also a wasteful user because of poorly maintained infrastructure, inefficient technology, and negligent management. Low-value crops are often grown with expensive irrigation water that could be put to better use on higher value crops or outside agriculture altogether. In addition to the high cost of governments of subsidizing irrigation systems, widespread irrigation contributes to drainage and salinization problems and groundwater pollution, and thus to the abandonment of formerly fertile land.

Often the problem is that knowledge about appropriate technology is likewise inefficiently distributed. A counter example comes from a World Bank project in the Formosa irrigation district in Brazil's northeastern state of Bahia. When the project started, farmers in the local water user association were reluctant to adopt efficient water management options, such as water-saving sprinkler systems and higher-value crops. Water changes did not cover operation and maintenance costs, and the system was unsustainable.

In 1995, an analysis of the reasons for the limited interest in change led to an emphasis on involving the farmers' children and thus to Projeto Amanha (Project Tomorrow). A vocational school was founded to teach the younger generation about better irrigation, new agricultural techniques, and plant nursery management. With 120 students per class, the school has expanded to offer classes on sewing, furniture building, and beef and poultry production. Students also learn how to run saw mills and repair tractors. The school has 100 hectares of land planted with high-value crops for educational purposes. With the revenues from all these activities, it is self-sufficient.

The school has turned the project around. The water user association which administers Projeto amanha, now has both older and younger members and is recovering between 80 and 100 percent of the irrigation district's operation and maintenance costs. The young people have convinced their parents to try new technologies and to plant high-value crops. One 1996 graduate reported that, before the project, his mother and eight siblings had barely survived by planting beans on their 15-hectare plot. Now he has started to grow high-value mangoes, bananas, and passionfruit, in the process increasing his family's net annual income 30-fold, from about US$400 to US$12,000.

Organized networks of small farmer groups on a large scale which is often described as 'Large Scale Small Group Activity,' among weak farmers in irrigated areas could also help them in moving from a laggard to adaptive and further on to a innovative phase in diversifying their product mix through diversified cropping pattern and improved quality of their farm output. Such small farmer groups also lend themselves well to problem-solving exercises in matters of pest management, land reclamation etc. The transaction costs of obtaining new information about availability of better and more effective agricultural inputs, superior crop husbanding practices, processing possibilities and marketing opportunities decline when farmers are organized into small manageable groups. In the context of privatizing agricultural extension services and promoting farmer-centered extension services, the prospects of organizing farmer networks should be fully exploited.

CLOSING KNOWLEDGE GAPS— LEVERAGING INFORMATION TECHNOLOGY (IT)

While networking has proved to be a powerful strategy in increasing the knowledge levels as also enabling the farmers to exploit opportunities in their environment, information technology is yet another lever that could be used to close knowledge gaps that have a critical bearing on agricultural productivity, quality and markets. While the Brazilian example underlines the importance of youth participation, one would not be hard pressed to imagine how much more progress could be achieved, if information technology is utilized as a support system for knowledge diffusion.

Information problems lead to market failures and impede efficiency and growth. Development thus entails the need for an institutional system that improves information which is the life blood of all markets and creates incentives for effort, innovation, saving, and investment, and enables progressively complex exchanges that span increased distances and time. The exploding capacity and plummeting costs of communications technology could greatly expand the potential for both the acquisition and the absorption of knowledge. The efforts being made in states like Andhra Pradesh and Madhya Pradesh in India to promote the Internet revolution through broad band optic fibre networks across both urban and rural areas is illustrative of the significance being attached to IT in the context of agricultural and rural development.

CONCLUSION

Clearly, the unfolding scenario in the global business environment emphasizes that a strategic thrust on productivity is necessary but not sufficient for the long-term growth of irrigated agriculture. What is at hand is not merely the problem of combating poverty among irrigated farmers but ensuring their competitiveness in the global marketplace as the irrigated cropping pattern in India resembles so closely the globally traded agricultural product-mix. Farmers

need to look at newer and more innovative ways of relentlessly seeking and adding value to the agricultural output in pursuit of higher returns, through a blend of knowledge-intensive and market-driven strategies.

REPORT ON WORKSHOP DISCUSSIONS

INAUGURAL AND TECHNICAL SESSION

The India national workshop for the proposed "Pro-Poor Intervention Strategies in Irrigated Agriculture in Asia: India" was held on 25 June 2001 in Hyderabad, India. The workshop was organized by the Administrative Staff College of India (ASCI) in collaboration with the International Water Management Institute (IWMI). The workshop was held at ASCI in Bella Vista, Hyderabad. Attendance included a wide range of experts from government, academic, and nongovernmental organizations. Co-chairs for the workshop were Dr. K. V. Raju, Dr. Tushaar Shah from IWMI-India, and Dr. Mahdusudan Bhattarai from IWMI.

The inaugural address was given by the Secretary of the Ministry of Water Resources, Dr. Shri B. N. Navalawala. Dr. Navalawala stated that poverty alleviation has been the primary objective of development planning since India's independence. In line with this, the government has been a key player in the development of India's water resources. While India has been able to achieve food security, they still have much to do in the fight against poverty. Dr. Navalawala highlighted the fact that hunger perpetuates poverty. Problems facing irrigation in India include low levels of public investment and poor maintenance of rural infrastructure. Previous efforts have primarily involved subsidized inputs and output price supports. The sustainability of the positive achievements is uncertain, as the subsidies have come at the cost of other infrastructure investments. In addition, growing food demand will place further strain on the agricultural sector. Current policies for water resources have rarely balanced the goals of efficiency, equity, and ecological integrity. Dr. Navalwala expressed the idea that the objective should be to optimize output per unit of water rather than per unit of land. The planning strategy should focus on conservation-oriented approaches in light of the growing water scarcity. Achieving irrigation management that provides equitable distribution of water in marginal areas is possible, but requires more attention that responds to the local conditions of poverty.

Dr. Madhusudan Bhattarai of IWMI made the next presentation giving the broad background of the proposed project. His presentation was entitled "Study on Pro-Poor Intervention Strategies in Irrigated Agriculture in Asia." The presentation began with a brief history of IWMI and a review of specific research themes within IWMI. Dr. Bhattarai then introduced the project. Motivations for the project are based upon the history of agricultural and rural development in the Asian region. While great progress has been made, benefits from irrigation remain highly skewed in their distribution and performance remains generally poor. These conditions have led to persistent poverty within irrigated areas. Therefore, the project will initially conduct research in order to identify the linkages between irrigation performance and poverty. Then from these finding potential intervention strategies in irrigation will be identified that have a positive impact on poverty alleviation.

The next presentation was made by Dr. K. V. Raju concerning India's proposed work plan for the study. Dr. Raju established that the remaining areas of poverty in existing

irrigation schemes was due to inequitable distribution of water caused by poor management, among other factors. Dr. Raju briefly discussed the background of water resources and irrigation in India. Compounding the existing management problems is the rapid rise of competition for water resources. These conditions call for a more elaborate set of interventions that provide the incentives and mechanisms necessary to realize a more equitable distribution of water, in order to further alleviate poverty. These interventions should be flexible enough to respond to unique local conditions. He then presented the objectives, hypothesis, and methodologies for the research.

The next presentation was given by Dr. M. V. K. Sivamohan who discussed some issues concerning the research topic. General issues included the seriousness of poverty in India, evolution of the policy agenda to include environmental and poverty concerns, low performance of irrigation, degree of decentralization and market mechanisms, a widening gap between the haves and the have-nots, and integrated water resource management. Dr. Sivamohan then discussed country specific, macro-level, and meso-level issues.

In the pre-lunch session, there were six brief presentations. Dr. Wani presented ICRISAT's watershed work. Mr. Pangare presented India PIM's work. Dr. Sithapathi Rao presented the experiences of IRDAS, a Hyderabad-based NGO with irrigation reforms in the state. Dr. Jasween Jairath, a social scientist who has written on Andhra reforms and is now associated with SaciWATER, presented a new capacity building initiative for South Asia.

In particular, Dr. Rao defined the poor as those who did not have adequate access to equitable water supplies or lack the capacity to utilize the water they did receive. Dr. Rao stated the importance of establishing appropriate systems to ensure access to reliable and equitable water. He further stated that the principal responsibility of the irrigation agency is to assess water availability and to allocate it equitably. Water tariffs should be put in place in such a manner that the costs of operations and maintenance are covered. Farmer should be encouraged to adopt an integrated farming system to supplement their income. This ties in with extension activities that would also transfer technologies to the water user associations. Another aspect that Dr. Rao mentioned was the strengthening of infrastructure to facilitate marketing activities. Finally, management needs to be the recipient of capacity building activities at both the government and WUA levels.

BRAINSTORMING SESSION

The post-lunch session discussion focused on two issues: [a] exploring alternative hypotheses/ propositions about poverty-impacts of surface irrigation systems; and [b] alternative interventions in system design, institutions, system management, and water use with the potential to enhance the positive poverty impacts of irrigation.

The major theme for question 'a' regarded the fact that surface irrigation systems confer maximum benefits to mid-reach farmers. It was stated that head-reach farmers tend to suffer from self-inflicted waterlogging and salinity, while tail-end farmers suffer from a lack of access to irrigation water. Some participants argued, albeit without supporting data that the tail-end areas tend to be populated by the poor, whereas the head reaches are controlled by the well off. It was finally decided to treat this as a researchable hypothesis.

The issues were raised concerning the plight of farmers located within command areas who neither get irrigation water, nor get access to new development schemes outside the command area. Moreover, in some systems, they even have to pay levies charged on canal irrigators. Here there is a clear case of inequity; but it is not clear if a poverty issue is involved since even the 'uncommanded' farmers can be large and affluent ones. The culmination of this discussion addressed the problem of determining an operationally meaningful definition of poverty for the ADB project's specific context. The majority suggestion was to use the "level of water deprivation" as a surrogate for poverty in irrigation systems.

An insightful remark was made that canal systems attract rural poverty from the surrounding areas. Irrigation schemes in Punjab and Haryana have seen an influx of rural poor from Bihar looking for wage labor. Therefore, a headcount of the people residing in the command may ignore the "imported" poverty. Mr. Bhogale pointed out that analysis should not be in terms of command areas of irrigation systems but, rather, the irrigation scheme's "zone of socioeconomic influence." This area may extend beyond the command area in to the downstream as well as the catchment areas.

Concerning question 'b', much was said about how to make surface irrigation more efficient and reliable, but not much was offered concerning how to make it pro-poor. An undercurrent was that institutional reform and participatory irrigation management (PIM) are a panacea for all problems of canal irrigation. Alternatively, it was countered that while institutional reforms in Andhra Pradesh may improve operating efficiency, collection performance, and even water productivity, there is no indication that it will help poor people get more out of irrigation. Some (like Mr. Patil and Lele) suggested that the new dynamic and political economy unleashed by the reforms gave the village leaders control, which may even lead to further exclusion and water deprivation of the poor.

Other points raised from the discussion that can be tied to further development of the research work under the ADB Project include:

1. Dr. Bhogale, from WALMI, Aurangabad, suggested that if irrigation systems are made "simple and stupid," then they could shed the oppression of technocracy and become more accessible to the poor and the disadvantaged. For example, Dr. Bhogale discussed the Mazalgaon scheme in the Giakwadi system near Aurangabad where automation has improved the system performance and access to the poor. This seemed like a contradiction, as a computer-run system might be more inaccessible and mystical to the poor than a "simple and stupid" system. However, it would be useful to examine the Manzakgaon system to gain understanding of how the poor relate to it.

2. A related point was that design changes through physical interventions produce better equity outcomes in terms of water deprivation within the design command. Under the World Bank supported National Water Management Program (NWMP), physical design changes were made in several Indian surface irrigation systems (e.g., cross regulators replaced sluice gates; limited automation was introduced; upward communication was improved). One explicit objective was to improve

spatial equity. It would be interesting to analyze whether the NWMP actually achieved better spatial equity.

3. S. N. Lele suggested that as systems become more rule-bound and less subject to the whims of local functionaries, it is likely that the poor will benefit more from them. He referred to work by S. A. Dabholkar, a Kolhapur mathematician, that it is possible with good land and water resources to create public-sector-bank-clerk level household income from 1/10th of a hectare. That is 1 square foot of foliage with 8 hours of leaf area exposure to sunshine produces 3 grams of dry matter per day, which was Dabholkar's crop-per-drop equation.[1]

4. Water rights were discussed within the context of whether they can produce more equity and equitably shared "water deprivation." Lele and Patil observed that a notion of local water rights and associated obligations might begin to emerge only when a community invests in producing new water. They cited the example of Ozar village near Nasik in Maharashtra where three WUAs began to use drainage water from canals to recharge aquifers by constructing check dams. Since groundwater users are not always WUA members, they began charging for groundwater use by farmers. Initially, the farmers resisted the charge, but then the WUAs threatened to stop damming the drainage water for use as recharge, the notion of paying for groundwater was accepted and internalized.

5. The point was raised that surface irrigation can empower local communities and give them greater freedom when irrigation design integrates decentralized local water storage under local community control. Mr. Sarma pointed out that the Pochampad project in Nagarjun Sagar in Andhra Pradesh fills up 300 tanks in the command, which makes two irrigated crops per year possible. It would be useful to examine if this system is more equitable than the conventional flow irrigation systems.

6. Another point was made regarding the *warabandi* system. It was suggested that the *warabandi* system (popular in the Indus basin in Pakistan Punjab and the Gang canal in Sri Ganganagar in Rajasthan and in Indian Punjab) has better equity in irrigation access than compared to the *sejpali* system (popular in Western and Southern India). An important issue for research would be an examination of the difference of water deprivation in design command under *varabandi* compared with the *shejpali* system.

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[1]Dabholkar (who wrote "Plenty for All", Mehta Publisher, Pune: Ramya) was one of the few barefoot scientists who charged farmers a fee of Rs 15 for every lecture he gave. He eventually bought a Fiat car for himself from the fees farmers paid to him. He is widely considered the father of the grape-orchard revolution that is being widely adopted in parts of rural Maharashtra. Regrettably, he passed away 4 months ago and has left few working sheets on a life full of farmer experiments that he guided.

Overall, it seems that the ADB project needs to be designed to capture the diversity of system designs, institutions, operations management, and conditions found in surface irrigation in India. This approach will be required to reach the meaningful and insightful conclusions that ADB is expecting the project to produce. If the study is limited to a single system in Andhra Pradesh and a single system in Gujarat, then this may not capture enough variety of situations to carry out meaningful policy analysis.

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