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Development of Tubewell Irrigation in India

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To

My Family

Foreword

The present work focusses on the economics of tubewell irrigation which has expanded at a rapid rate since the mid-sixties in India.

The author first gives a brief account of the history of tubewell irrigation since the turn of the century with a view to understanding economic factors militating against the adoption of tubewell technology in pre-Independence days. Temporal trends since 1951, especially with regard to indivisible nature of investment in a tubewell, are closely examined for each major part of the vast Indo-Gangetic alluvium, namely, Punjab, Haryana, West U.P., East U.P., Bihar and West Bengal. The author takes up the question why the development of tubewell irrigation slows down as one moves eastwards in the Indo-Gangetic plains. The comparative economics of tubewell vis-a-vis dugwell is also examined. Empirical materials relating to returns from private and public tubewells are critically evaluated in the institutional context of each region. The danger of overdevelopment of tubewell irrigation, with its deleterious impact on water-yield and the water table, is highlighted towards the end of the monograph.

According to the author, the principal factor militating against the diffusion of tubewell technology during the first half of this century was its high indivisibility in Indian farm conditions. Thus, tubewell irrgation in pre-plan days was feasible under public aegis, as was amply demonstrated by successful development of public tubewells in West U.P. in the thirties. In the wake of developmental planning that contributed towards easing numerous constraints of the Indian economy, tubewell indivisibility witnessed substantial reduction, thereby inducing many farmers to invest in their own tubewells. This inducement was reinforced by the advent of HYV seeds and progress in land consolidation, rural electrifica-

tion, institutional credit etc. Since different regions of the Indo-Gangetic alluvium differ in respect of infrastructural development, especially land consolidation, the author finds that the degree of indivisibility varies from region to region. Thus, minimum size of land holding for which investment in an individually-owned tube-well could prove a viable proposition in the mid-seventies was 16 acres in West Bengal, 11 acres in Bihar, 5 acres in East U.P. and 1.2 acres each in Punjab, Haryana and West U.P. This explains why explosive growth of private tubewells is confined to western parts of the Indo-Gangetic plains, where both small and large farmers have found tubewell irrigation superior to dugwell irrigation.

The author feels that in the absence of direct participation by the state, the vast groundwater resources of the east Gangetic plains may remain unexploited. In the absence of irrigation, small and medium farmers of this region can neither contribute to agricultural growth, nor share in the gains of developmental planning. Whatever little growth in agriculture is feasible with the expansion of private tubewells, may be accompanied by further accentuation of inequity in income and wealth. The author argues that public tubewell irrigation, which surmounts simultaneously the farm size and the land fragmentation disabilities, can promote growth without accentuating inequity. He cautions that benefit-cost approach to the question of exploiting groundwater resources under public or private aegis can prove misleading without due reference to distribution of land holdings and their fragmentation in space. More specifically, public tubewells would prove economically superior even in respect of growth-maximisation goal so long as the ratio of net additions to farm output from public and private tubewells is higher than the proportion of holdings above the threshhold value of tubewell indivisibility.

Two inherent problems of groundwater mangement are over-exploitation leading to a permanent lowering of the water table and mutual discord among the users of this common property resource. A changeover from dugwell to tubewell technology by farmers of low rainfall tracts accentuates this danger. Therefore, the state has to keep a close vigil on the water table in western parts of the

Indo-Gangetic plains, especially on the southern fringes lying in proximity to saline waters that can surreptiously damage groundwater resource in the event of a recession in the water table. Though the danger of over-exploitation is minimal in the east Gangetic plains—more so if the state plays a dominant role in tapping groundwater under its own aegis—the scope for mutual discord among users is greater in this region. On the one hand, the farm holdings are comparatively smaller here, and on the other hand traditional dugwells and tubewells coexist here. Consequently, tubewell owners can impose serious short-run, if not long-run, diseconomies on owners of traditional dugwells who are generally small and marginal farmers. If public tubewell system can be so efficiently organised that it can deliver water to small and marginal farmers at a cost below the cost of traditional well irrigation, dugwell owners may switch over to public tubewell irrigation.

There is much dissatisfaction with the preformance of public sector undertakings in the country, and the state tubewells are no exception in this regard. There is a widely-shared feeling that performance of public tubewells can be improved substantially if the state governments pay due attention to the management aspect of these tubewells. For instance, the problem of low utilisation of capacity of these tubewells can be resolved to an appreciable extent if these are spared from electricity supply cuts at the peak demand season. In order to achieve some degree of insulation against power rostering, one would have to think in terms of separate electric feeders for the public tubewells. But this additional investment would prove largely infructuous in the absence of an efficiently-run electricity supply system. This brings us to the general point that removing inefficiencies in one segment of an economy is no simple task when these are linked up with inefficiencies elsewhere in the economy, particularly in the infrastructural facilities. The task becomes all the more difficult when economic inefficiencies are aggravated by the serious erosion of ethical norms. This erosion cannot be neutralised merely by better economic management which itself is tied up with the problem of restructuring institutions and values.

This study, very painstakingly conducted over a number of years, should prove a valuable reading to irrigation economists and to irrigation planners. This is the first of a number of irrigation studies undertaken at the Institute. I hope this publication, alongwith other publications to follow on this theme, would enrich the meagre literature on irrigation economics in India.

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Institute of Economic Growth
Delhi-110 007

P.C. Joshi
Director

Preface

This monograph brings together the author's research work on tubewell irrigation in India. The research work commenced more than six years ago. Some of it was published in the shape of papers. About two years ago, both the published and unpublished material was put together in the form of a draft and circulated for comments. The study has been duly revised—and considerably condensed—in the light of comments received. In particular, the author is grateful to Dr. C.H. Hanumantha Rao for his comments and observations. Alongwith Dr. Suren Navlakha, he took keen interest in my studies relating to irrigation in general and tubewell irrigation in particular. Needless to add, I alone am responsible for the views expressed in this monograph.

As for research assistance, I acknowledge with thanks the help from Niraj Kumar. Finally, Nazim Kazmi provided competent programming assistance in processing the data, for which I am grateful to him.

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B.D. Dhawan

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Chapter 1

Introduction

Contrary to the general impression, the water resources of India are far from bountiful. Infact, these are quite inadequate in relation to our land endowment. For about 140 million hectares under cultivation the utilisable irrigation potential, measured in terms of gross irrigated area, is placed at 112 million hectares, of which half is already tapped. If the land is to be double cropped for meeting the growing food needs of the Indian population, the irrigation potential may barely protect 40 percent of the crop area against rainfall deficiency. Without tremendous improvement in the art of water storage, conveyance and utilisation in the field, double cropping of land appears to be an infeasible proposition, excepting some parts of India such as the east Gangetic plains and western coastal strip from Surat down to Malabar that are better endowed than the rest of India in the matter of water resources.

As against 72 million hectares that are irrigable by surfacewater schemes, the groundwater potential is reckoned at 260 billion cubic metres ie 26 million hectare-metres, which can provide irrigation to about 40 million hectare area. Ever since the commencement of development planning in 1951, when groundwater-irrigated area was about 6.50 million hectares, groundwater exploitation has proceeded at an accelerating pace. The annual incremental addition to groundwater irrigated area now is of the order of 1.25 million hectares (target for 1979-80) as against 0.18 million hectares during the First and Second Five Year Plan periods, 0.44 million hectares during the Third Plan, 0.80 million hectares during the Fourth Plan and 0.83 million hectares during the Fifth Plan. Thus a little less than half the groundwater potential had been exploited by the end of the Fifth Plan period.