ABSTRACTS OF Ph. D. THESES

Gogoi, Bharati, 1988. Impact of Irrigation on Agricultural Development in Old Kamrup District of Assam, Assam Agricultural University, Jorhat. *Major Advisor* : P.D. Saikia.

Irrigation is an important and crucial input, which has a profound impact on agricultural development of an agriculturally backward state like Assam. This study was undertaken in erstwhile Kamrup District of Assam to examine the impact of irrigation on agricultural production. A total sample of 200 beneficiary households, of which 100 households were under medium irrigation schemes and 100 households under minor irrigation schemes, were selected randomly from the sample district. Upto 1983 (reference year of the study), no major irrigation scheme had been completed in the same district. For comparative analysis, 50 non-beneficiary households (control group) were also selected from the vicinity of selected irrigation schemes. The data were collected through personal interview method using specially designed schedules.

The principal crop of the sample area was rice. The farmers also grew wheat, oil-seeds, jute, pulses, potato, coriander and vegetables. Comparative analysis of yield rates of the same set of crops grown by both beneficiary and control-group farmers showed that almost all crops grown under irrigated condition had better returns than the crops grown on un-irrigated land. Yield rates of crops grown by control group farmers showed that beneficiary farmers received additional production of 553, 156 and 57 kg. per hectare from local varieties of *Ahu* rice, HYV *Sali* rice and local varieties of *Sali* rice. The additional yield per hectare from irrigated wheat, oilseeds, jute, pulses, potato, coriander and vegetables of beneficiary farmers was 651, 338, 174, 97, 1004, 241 and 1077 kg, respectively.

The findings of the study suggest that impact of irrigation on agricultural development in the sample district was positive. Even though irrigation had not been able to change the cropping pattern of the sample area appreciably except for introducing HYV *Ahu* rice cultivation in irrigated fields during Autumn season, the "acreage effect" of irrigation had been significant with increase in the index of crop intensity as reflected in double and multiple cropping in the sample areas. In short, as a consequence of cumulative effect of increased crop intensity, adoption of HYV *Ahu* rice cultivation and enhanced yield rates of all irrigated crops there had been an

augmentation in the total volume of agricultural production in the sample areas. Further, introduction of irrigation had increased the level of onfarm employment in the sample area. Hence, it may be inferred that had there been an accelerated rate of irrigation development in Assam, its benefits would have been quite wide spread resulting in development in the agricultural sector of the state to a great extent.

Singh, Anand Kumar. 1990. Level of Adoption of New Technology and Resource Productivity in Agriculture in Eastern U.P. Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad. *Major Adviser* : R.P. Singh.

The study examines the extent of adoption of new technology, the level of income, its distribution and employment and the resource use efficiency on different sizes of farms.

Four stage stratified random sampling technique was adopted to select the district, block, village and cultivators. A sample of 194 farms was selected comprising of 114 farms below 1 ha; 36 farms of 1-2 ha; 25 farms of 2-3 ha and 19 farms of 3ha and above were setected. Crucial inputs included in technology adoption were seed, irrigation and manures and fertilizers. Level of technology adoption varied with respect to the size of farms as well as with respect to crops. It was found that only 20-60 percent of the recommended level of technology was adopted by 71, 81, 76, 80 percent farms in the case of paddy, wheat, gram and maize respectively. For farms as a whole 75 percent farms adopted recommended technology. It was also observed that adoption was high (about 70-90 percent farms) in case of medium and large categories. Distribution of technology indicated that for almost all crops, technology distribution was equitable in case of large and medium farms. On the other hand, high variation in the adoption of new technology was observed among small and marginal farms.

The employment (mandays) for marginal farms was below 125 man days and the income from such farms varied up to Rs. 6000 per year, while for large farms it was between 250-625 man days and income of over Rs. 9000 per year was generated. A high association between income and employment was established by using chi-square test.

The coefficients of Cobb-Douglas type of production function relating to manures and fertilizers, irrigation, seed and human labour were generally positive and significant.

Chandra, Dinesh, 1991. Economic Analysis of Different Irrigation Systems in Ghaziabad District of Uttar Pradesh. Indian Agricultural Research Institute, New Delhi. *Major Advisor* : Ikbal Singh.

The present study was undertaken during 1987-88 in the Ghaziabad district of Uttar Pradesh to examine productivity, resource use efficiency, existing cropping patterns, income and employment and to optimise use of farm resources on different irrigation systems, using different irrigation devices.

The data collected related to the physical and monetary inputs used and output realised for different crops and prices of farm products and inputs. The existing productivity of different irrigation systems was examined by tabular analysis and resource use efficiency was examined by regression analysis. The optimisation of farm resources was done with the help of linear programming technique. The results of optimization were compared with the existing situation to derive some useful conclusions and to suggest policy prescriptions.

In the existing situation, there was no uniform cropping pattern followed by the farmers on all the irrigation systems. The yield of almost all the crops was highest on canal-cum-diesel tubewell farms followed by canal-cum-electric tubewell farms, diesel tubewell farms, electric tubewell farms and canal farms. The most critical factors were seed, fertilizer and irrigation whose uses were found efficient and they showed positive contribution to productivity on almost all the irrigation systems. Sugarcane occupied the highest area during *kharif* season and wheat during *rabi* season in all the irrigation systems. Sugarcane, wheat and jowar green fodder together occupied more than 50 per cent of the total cropped area on all the irrigation systems. The total human labour per hectare employment was found to be highest (359 man days) on canal cum diesel tubewell farms followed by canal cum electric tubewell farms (317 man days) diesel tubewell farms (221 man days), electric tubewell farms (179 man days) and was lowest (144 man days) on canal farms. The per hectare net returns were maximum (Rs. 16957) on canal cum diesel tubewell farms and lowest (Rs. 9837) on canal farms.

On optimization of farm resources, a significant change in the cropping pattern was observed. The optimization shifted the cropping pattern towards more profitable crops and it increased the cropping intensity also on all the irrigation systems. Optimization suggested efficient and increased use of human labour on all the irrigation systems. The optimal increase in human labour was 6.94 per cent on canal farms, 20.55 per cent on electric tubewell farms, 13.72 per cent on diesel tubewell furms, 22.95 per cent on canal-cum-electric tubewell farms and 19.77 per cent on canal-cum-diesel tubewell farms. This resulted in increased per hectare net

returns on all the irrigation systems. The increase in the net returns on all the irrigation systems in optimal plan over existing plan ranged from 36 per cent to 49 per cent.

The policy prescriptions suggested by the study were investment in minor irrigation scheme, conjunctive use of surface and ground water, construction of micro reservoirs, strengthening of credit agencies and gearing up of the extension agencies to implement the development plans which can save water losses and increase the water use efficiency in the command area.

Gaikwad, N.S. 1991. Relative Economics of Multiple Cropping Systems in the Scarcity Zone of Western Maharashtra, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra. *Major Advisor* : R.E. Waghmare.

The present study has been undertaken to examine the economics of major multiple cropping systems that are adopted by the farmers in the scarcity zone of Western Maharashtra. The study is based on the data collected under the Cost of Cultivation Scheme sponsored by the Government of Maharashtra. The study covers a total sample of 182 holdings for 1983-84 and 173 holdings for 1984-85 spread over 42 clusters of villages randomly selected in three districts, viz., Ahmednagar, Pune and Solapur.

The study concluded that the two cropping systems, involving unirrigated crops both in *kharif* and *rabi* seasons, viz., (i) bajra-jowar and (ii) bajra-gram did not give any profit. However, the latter was a little better than the former in terms of returns. In the cropping systems involving bajra unirrigated in *kharif* followed by either *rabi* jowar irrigated or wheat irrigated, the latter cropping system gave higher profit (Rs. 63 21/ha.) as compared to the former cropping system (Rs.-174.59/ha). The cropping system involving bajra irrigated in *kharif* followed by either irrigated jowar or gram or wheat in *rabi* season gave a net profit ranging from Rs. 120.77/ha to Rs. 172.56/ha, the highest being in the cropping system involving bajra irrigated in *kharif* followed by gram irrigated in *rabi* season. On comparing the cropping systems involving wheat irrigated preceeded by either bajra irrigated or hybrid jowar irrigated in *kharif* the net profit was the highest (Rs. 1150.76/ha) in the cropping system involving hybrid jowar irrigated in *kharif* and wheat irrigated in *rabi* season. The cropping system comprising irrigated groundnut in summer preceded with either irrigated *rabi* jowar or irrigated wheat showed net profit of Rs. 621.33/ha and Rs. 448.89/ha, respectively.

The production function analysis indicated that the productivity of human labour was higher in the cropping system involving bajra unirrigated-gram unirriga-

ted as compared to bajra unirrigated jowar unirrigated system. The productivity of manures and fertilizer and irrigation in the cropping system involving bajra unirrigated-wheat irrigated was higher than the system involving bajra-unirrigated-*rabi* jowar irrigated.

The cropping system *rabi*-jowar irrigated-summer groundnut irrigated involved a higher use of resources, viz , human labour, bullock labour, manures, fertilizers and irrigation to secure maximum output as compared to the system involving wheat irrigated in *rabi* followed by irrigated groundnut in summer.

The study finally suggests that the multiple cropping systems involving irrigated crops are more paying and provide scope for further utilization of modern inputs for increasing productivity and also creating additional employment potential for human labour.

Lal, Roshan, 1991. Technological Progress in Haryana Agriculture : A Regionwise Analysis. Indian Agricultural Research Institute, New Delhi. *Major Advisor* : R.P. Singh.

Technological breakthrough in Haryana agriculture has brought about significant shifts in production, productivity and cropping pattern. The farming in the state, however, is characterised by difference in output and productivity performance among various regions and over time periods. Proper diagnosis of the forces which account for these differences is important for designing ways and means to iron out sueh differences. Therefore, this study attempts to analyse the changes and sources of change in input, output and productivity over the years and across the regions in the state.

The main objectives of the study were to measure output and productivity changes in agriculture over the period 1951-52 to 1986-87 in different regions in Haryana, to study the differences in total factor productivity between regions, to identify sources of differences in agricultural output between regions and to suggest measures for rapid technological progress.

The state was divided into four agro-climatic regions. District-wise time series and cross section data were collected. The data of two or more distrtcts were clubbed for obtaining regional information. An index number approach and a total factor productivity model along with composite indices of infrastructure and adoption of new technology were employed in the study. Divisia Index number method was used to aggregate individual outputs and inputs.

The major findings of the study are as follows :

Due to disparate rate of growth of different crops, there was structural change

in agricultural production. All the regions of the state have witnessed significant but uneven growth in agriculture. Hence, planners, policy makers and researchers must give a fresh look to the strategies of crop production to overcome the imbalances in the food-basket of the state.

The growth in total factor productivity, both at state and regional levels, which was positive in the pre-green revolution period turned out to be negative in the post-green revolution period. The high growth in the modern inputs was not accompanied by adequate output growth and hence negative growth in total factor productivity was observed. To bring about rapid growth in output, the growth in modern inputs viz., fertilizer, irrigation and farm mechanisation should be accompanied by appropriate infrastructural backing including vast and effective extension network.

The growth in infrastructure and adoption of new technology were the major sources of growth in agricultural output. However, there existed a great degree of variation in the growth of infrastructure, adoption of new technology and agricultural productivity. This suggests reallocation of State funds for faster development of infrastructural facilities particularly in the regions lagging behind in agricultural development.

The State has the economic, technical and administrative capacity to follow such a path of rapid growth with redistribution. What is required is a determined and sustained political will to execute such a programme of guided change.

Mathur, V.C. 1991. Fertiliser Consumption in India : A Marketing Perspective. Indian Agricultural Research Institute, New Delhi. *Major Advisor* : Praduman Kumar.

Fertiliser consumption in India increased from a mere 0.8 million tonnes in 1965-66 to 11 million tonnes in 1988-89. This increase in fertiliser consumption *per se* is quite impressive. However, per hectare fertiliser consumption in India is quite low when compared to other countries including some neighbouring developing countries. Also, there exist considerable variations in the levels of fertiliser consumption and crop productivity between districts and states within India. Thus there is still considerable scope for increasing per hectare as well as total fertiliser consumption by tapping the unexploited economic potential of fertilisers by promoting their use on hitherto unfertilised and under-fertilised areas and converging the farmers' potential demand for fertilisers into effective demand. This means that in addition to agro-economic and agronomic factors, future growth in the consumption of fertilisers will depend to a great extent on behavioural, institutional and market-

ing factors. Hence fertiliser marketing efforts will play an important role in increasing fertiliser consumption in India.

The present study examined the behavioural factors influencing farmers' fertiliser use practices and purchase decisions, factors affecting fertiliser consumption at the district level, the composition and spread of fertiliser retail outlets and Government fertiliser marketing policies. To achieve the various objectives, primary data of about 3000 farmers on fertiliser purchase and use collected under the Divisional project "Marketing Problems of Small and Marginal Farmers in India", and secondary district and State level data on fertiliser consumption, gross cropped area, irrigated area, HYV area, major crop area, soil fertility status, rainfall, number of cooperative, private and total fertiliser retail outlets, promotion and indices of economic and infrastructure development, collected from various sources were utilised.

Stepwise cross-section regression analysis was performed using district level data to estimate the influence of various factors, especially fertilizer availability and level of economic development on fertiliser eonsumption. In order to examine the factors influencing the spread of fertiliser retail outlets, a simultaneous equations model was formulated and estimated with the help of two stage least-squares technique.

Microlevel evidences revealed that wheat, maize, groundnut, cotton, jutc and sugarcane were the highly fertilised crops whereas in other crops, especially oilseeds and pulses, area fertilised were low. Around 74 per cent of the cultivators were found to be fertiliser users but even among them the incidence of discontinuous use of fertiliser was high, especially in the districts of the Eastern States. Non-availability of irrigation water, inadequate credit facilities, untimely availability of fertilisers and non-availability of the desired type of fertiliser were found to be the main reasons for discontinuous fertiliser use. Nitrogen was mainly purchased in the form of straight fertilisers while phosphorus and potash were purchased in the form of complex fertilisers. Convenience and ready availability emerged as the main considerations in farmers' choice of location and agency of fertiliser purchase. Most farmers preferred to buy fertilisers in their own or nearby villages and from private dealers. Fellow farmers and fertiliser dealers were found to bc important sources of information on fertiliser practices.

District level analysis of factors influencing fertiliser consumption indicated that gross cropped area, irrigated area, level of economic development and the availability of fertilisers significantly influence fertiliser consumption. The influence of availability through private fertiliser supply sources on per hectare fertiliser consumption was greater than that of the availability through cooperative fertiliser sources as the private dealers were a source of timely and adequate supply.

Wide inter-State variations were observed in the density of retail outlets. Growth in private retail outlets was higher than in cooperative outlets. The number of total retail outlets was positively correlated with total fertiliser consumption, high yielding varieties area and irrigated area. Total fertiliser consumption was found to significantly influence the spread of total retail outlets in all the States except Kerala and Punjab.

While the basic objective of reaching fertilisers to each village of the country can be well achieved by the Government's fertiliser distribution policies, the implementation of the Block Delivery Scheme needs to be modified for different regions before implementation depending upon local conditions. Also, the policy of differential margins, with lower margins for private dealers, is not conducive to the spread of private retail trade in interior areas. The Government's fertiliser price policies have helped keep fertiliser prices favourable for farmers and also generated a healthy climate for the fertiliser industry.

It is suggested that to improve consumption of fertilisers, marketing efforts should be directed towards converting non-fertiliser users into users and promoting fertiliser use in the presently under and un-fertilised crops and areas. Constraints to continuous use of fertilisers such as untimely and non-availability of right type of fertilisers must be eliminated and efforts must be made to bring about change in farmers' attitude towards fertiliser use. Incentives, in the form of higher margins should be provided to the private trade especially in areas where fertiliser consumption is low so that their retail outlets become economically viable. The dealers are an important source of information for farmers on fertiliser practices. This potential for spreading technical knowledge on fertiliser practices must be exploited by providing dealers with location-specific technical knowledge on fertiliser practices.