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STATUS OF IRRIGATION DEVELOPMENT IN KERALA - AN ANALYSIS

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Abstract : Area irrigated by all government sources showed significant growth rate of 0.47 per cent during the period 1977-1991. The private sources of irrigation like private wells and private tanks showed positive and significant growth rates. The overall growth rate of net irrigated area was only 3.22 per cent. Inter-temporal growth rates for two periods which showed differential growth trends were worked out using a Kinked Exponential Model with single kink point. Net irrigated area showed higher growth rate of 3.69 per cent in Period II (1984-85 to 1990-91) compared to 2.75 per cent in Period I (1976-77 to 1983-84).

Key words : Irrigation development, Kinked Exponential Model.

INTRODUCTION

The Agricultural Development Policy Document (1992) identified development of irrigation as the most important strategy for increasing agricultural production. The plantation crops like coconut, arecanut, pepper and cardamom have proved to be highly responsive to irrigation. At present, in Kerala, only coconut and arecanut arc irrigated to a considerableextent.

The source-wise irrigation scenario in Kerala showed that over the years, the contribution of all the sources except private tanks, private wells and other sources was on a steady decline. Identification of ideal sources of irrigation and management strategies need a thorough understanding of present status of irrigation development. But studies focusing on this aspect are limited. Hence, this study was taken up.

MATERIALS AND METHODS

Growth rates were worked out both for total net area under irrigation as well as for source-wise irrigation, in order to study the pattern of irrigation development in Kerala.

Many studies using irrigation statistics of Kerala concluded that the data prior to 1975 are not much reliable. Joseph (1983) after analysing the irrigation statistics from various sources available in Kerala, concluded that only the Timely Reporting System (TRS) estimates are reliable but available only after 1970's. Kannan and Pushpangadan (1988) expressed their doubts on the authenticity of the irrigation statistics, since the figures of net area irrigated showed a sharp decline in 1975-76. Hence, in this study the growth rates were worked out using 15 years data from 1976-77 to 1990-91.

The period under study 1976-1991 showed a general increase with regard to the net area under irrigation. But graphical representation of data showed that the growth pattern showed distinct phases of moderate growth (1976-77 to 1983-84) and relatively faster growth (1984-85 to 1990-91). Hence, in addition to the growth analysis for the entire period, growth rates were estimated for two sub-periods, Period I (1976-77 to 1983-84) and Period II (1984-85 to 1990-91), in order to facilitate better interpretations.

The usual technique for estimating growth rates in the subperiods of a time series is to fit separate exponential trend lines by ordinary least squares (OLS) to each segment of the series. These trend lines are likely to be discontinuous. These discontinuities between

Table 1. Net area irrigated by different sources of irrigation in Kerala, ha

Sl. No.	Sources	Year		
		1976-77	1984-85	1990-91
1	Government canals	92,125	94,339	1,04,265
2	Private canals	4,763	3,809	3,691
3	Government tanks	7,950	3,385	2,514
4	Private tanks	21,540	34,623	46,438
5	Government wells	1,988	912	745
6	Private wells	19,884	32,610	64,933
7	Minor & lift irrigation	46,496	32,628	22,403
8	Other sources	30,308	68,392	88,380
9	Total	2,25,054	2,70,698	3,33,369

Table 2. Compound growth rates of area irrigated by different sources of irrigation in Kerala (1977-1991)

Sl. No.	Sources	I (1977-1984)	II 1985-1991)	Overall (1977-1991)
1	Government canals	0.51*	0.43	0.47*
2	Private canals	-3.32*	-1.68	-2.50**
3	Government tanks	-8.35**	-6.11**	-7.23**
4	Private tanks	5.56**	5.48**	5.52**
5	Government wells	-5.51	-6.20	-5.85**
6	Private wells	7.73*	12.81**	10.27**
7	Minor & lift irrigation	-3.51**	-6.18**	-4.85**
8	Other sources	12.41**	6.49**	9.45**
9	Total	2.75**	3.69**	3.22**

Test of significance was done using Y test
* Significant at 5 per cent level
** Significant at 1 per cent level

segments of a piece-wise regression can be eliminated via. imposition of linear models. This approach yields kinked exponential functions. This could provide a better basis than conventional estimates for inter-temporal and cross-sectional growth rate comparisons (Boyce, 1986).

In this study, a Kinked Exponential Model with single kink point was used for computing the growth rates.

The following regression equation was used :

(i) In Y = $a_1d_1 + a_2d_2 (b_1d_1) + b_2d_2) + u$
where, $d_1 = 1$ for 1976-77 to 1983-84
$= 0$ otherwise
$d_2 = 1$ for 1984-85 to 1990-91 $= 0$ otherwise

The discontinuity is eliminated by a linear restriction at the break point, K.

$a_1 + b,K = a_2 + b_2K$

From the restriction,

(ii) $a_2 = a_1 + b_1K - b_2K$ and $d_2 = 1-d_1$

Substituting (ii) in (i)

In Y = $a_1d_1 + (a_1 + b_1K) d_2 + (b_1d_1 + b_2d_2)t + u$
$= a_1d_1 + a_1(1-d_1) + b_1 (d_1t + d_2K) + b_2 (d_2t - d_2K) + u$

(iii) In Y = $a_1 + b, (d_1t + d_2K) + b_2(d_2t - d_2K) + u$

This model was used for the estimation of the growth rates throughout the analysis. Obviously, b, will be the first period growth rate and b_2 will be the second period growth rate. Information regarding net area under irrigation, source-wise irrigation etc. with regard to the State were collected from various Government publications.

RESULTS AND DISCUSSION

The net area irrigated by different sources of irrigation showed that among the government sources only government canals (major and medium irrigation projects) showed an improvement during the period under study. On the other hand, all the private sources of irrigation showed considerable increase (Table 1). The total net area irrigated increased from 2,25,054 ha in 1976-77 to 3,33,369 ha in 1990-91.

It could be seen from Table 2 that the area irrigated by all government sources (tanks, minor and lift irrigation) showed significant decline except in the case of government canals which showed a marginal increase of 0.47 per cent during the period 1977-1991. The decline during this period was from 1988 ha to 745 ha for government wells, from 7950 ha to 2514 ha for government tanks and from 46,496 ha to 22,403 ha for minor and lift irrigation. The government canals showed a marginal increase of area, i.e., from 92,125 ha to 1,04,265 ha.

When the total period was divided into Period I (1977 to 1984) and Period II (1985-1991) based on the differential trends in growth pattern noticed, even in the case of government canals, the growth rate was lower and not significant in Period II than Period I.

There are several possible reasons for the comparatively lower growth rate of area under major and medium projects (government canals). The area under these systems was mainly intended to improve productivity of rice or to take an additional rice crop. Much of the uncultivated lands are not brought under cultivation even though irrigation facilities have been developed. Moreover, conversion of paddy lands into garden lands had also affected the area under rice. As such, there is a reduction in incremental benefit in respect of the area falling within the ayacut. Another problem faced by the irrigation department in pursuing new projects was that the reservoir area to be found either from the reserve forests or hilly areas already occupied for a long time. Submergence of hilly tracts planted with high value plantation crops could increase the cost components of the new projects. On the other hand, the less remunerative rice crop could not compensate the losses in monetary terms, even though it could not be strictly compared against cash crops from the point of view of food self-sufficiency.

Another problem with regard to the major and medium projects was the inefficient water distribution system resulting in wastage of water which otherwise should have been used in extending the area under irrigation.

Net area irrigated by government tanks also showed a decline of 7.23 per cent per annum (Table 2). The decline was found to be slower in Period II than Period I, possibly due to the rehabilitation measures taken up periodically as a result of the various rice development schemes implemented by the Department of Agriculture and minor irrigation works taken up by the Minor Irrigation Department. At present government tanks and ponds could irrigate only about 2514 ha of rice fields by flow irrigation.

Government wells had shown a sharp decline of 5.85 per cent during the period 1977-1991, because of the improper maintenance. The decline was to an extent of 5.51 and 6.2 per cent in Period I and in Period II, respectively (from 1988 ha in 1976-77 to 745 ha in 1990-91).

The minor and lift irrigation sources formed the second largest source of irrigation, irrigating about 22,403 ha (1990-91) compared to 1,04,265 ha irrigated by major and medium irrigation projects.

Table 3. Area irrigated in Kerala (source-wise), ha

Year	Govt. canals	Private canals	Govt. tanks	Private tanks	Govt. wells	Private wells	Minor & lift irrigation	Other sources	Total
1976-77	92125	763	7950	21540	1988	19884	46496	30308	221054
1977-78	95775	4866	6446	24202	1611	22340	41906	31038	228184
1978-79	97827	5335	5240	26567	1310	10218	39358	29364	229523
1979-80	101207	5350	5176	26270	1294	24250	37529	29678	230753
1980-81	99697	5299	4038	26479	1010	24443	33702	43606	237974
1981-82	101000	5000	4000	27040	1000	24960	34000	43000	240000
1982-83	104321	4356	4393	30923	878	26125	36154	51594	258744
1983-84	100445	3574	4045	31561	1900	29286	33937	60788	265536
1984-85	94339	3809	3385	34623	912	32610	32628	68392	270698
1985-86	96646	4004	3597	40265	1225	36443	30948	83209	296337
1986-87	96494	4574	3662	40829	766	44458	29978	78503	299264
1987-88	100155	4287	3178	41724	797	50319	26536	81165	308159
1988-89	103816	3999	2693	42618	827	56180	23094	83826	317053
1989-90	103680	3570	2429	44575	713	63446	22371	89144	329928
1990-91	104265	3691	2514	46438	745	64993	22403	88380	333369

With regard to minor irrigation, the main categories include small diversion weirs and regulators across water exclusion structures to facilitate the cultivation of low-lying lands particularly during summer. Government owned and operated lift schemes are confined to river pumping, mainly concentrated in the bigger rivers which are in most cases linked to summer discharges from hydel schemes. This category showed a decline of 4.85 per cent per annum and the decline was found to be more in Period II compared to Period I.

The problem involved in the case of minor and lift irrigation projects was the high cost of maintenance compared to the cess collected. Because of the inadequate maintenance, several works have become defunct and require extensive reconstruction to make them effective.

Government sources had shown a very dismal picture with regard to the growth in area under irrigation during the past 15 years. In 1976-77 the area irrigated by governmental sources was 1,48,559 ha (66.01 per cent of total area irrigated) and the area irrigated by private sources was 76,495 ha (33.99 per cent). In 1990-91, the governmental sources irrigated an area of 1,29,927 ha (38.97 per cent) and the private sources irrigated 2,03,442 ha (61.03 per cent). Since irrigation in the public sector involved considerable public investment, critical evaluation of the functioning of these projects is of utmost importance to the state. Private sources of irrigation such as private

tanks, canals, wells and other sources showed significant positive growth rates except private canals which showed a negative growth rate of 2.50 per cent per annum.

Private wells were the only source of irrigation which showed substantial increase of 10.27 per cent (the area increase was from 19,884 ha in 1976-77 to 64,933 ha in 1990-91). The growth rate was comparatively high in Period 11 (12.81 per cent) compared to Period 1 (7.73 per cent). The extension of area under irrigation from this source could be attributed to the extension efforts made by the State Department of Agriculture and the increased credit facilities made available by the agricultural development branches of the banks and co-operatives, with a view to promote production of garden land crops by way of providing irrigation facilities. These incentives by way of subsidies, credit facilities for digging wells and installation of pumpsets have had a positive impact of expansion of irrigation from this source.

Irrigated area by private tanks showed an almost uniform trend during the two periods under consideration, 5.56 per cent during Period 1 and 5.48 per cent during Period 11. The growth rate for the entire period was worked out to be 5.52 per cent.

Net irrigated area showed an increased growth rate in Period II *(3.69* per cent compared to 2.75 per cent in Period I). The growth rate for the study period, 1976-77 to 1990-91, was 3.22 per cent. During this period, the net irrigated area has increased from 2,25,054 ha to 3,33,369 ha. The trend showed that the area under private sources of irrigation was increasing at a rapid rate than the government sources and the area irrigated by private wells recorded the highest growth rate.

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