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UNDER-UTILIZATION OF LAND—CLIMATIC OR INSTITUTIONAL FACTORS?

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Though the subject of cropping pattern and cropping intensity has received some attention by agricultural economists, non-cropped agricultural land (other than barren or uncultivable and forest lands) has hardly received any attention. Current fallows, 'other fallows', culturable (or cultivable) waste and grazing or pasture lands come under this category. In this paper, we are concerned only with the first three, which are taken here as characterizing under-utilization of land, omitting grazing land and pastures. It is generally taken for granted that there is little scope for further utilization of land (in the sense of extending cropped area and area under forests and tree crops), instead of examining it. The paper tries not only to assess the magnitude of under-utilization of land but also to examine the possible factors behind the same. The whole question of under-utilization of land has hardly been explored so far despite its importance in a country with so much land hunger and poverty in the rural sector.

Fluctuations in production could occur both through fluctuations in area sown and in yield per hectare following climatic factors. A recent study showed that rainfall—taking also into account its seasonal deviations from respective normals—could explain only a limited part of the variation in yields per hectare over time.[1] Allocation of land by the cultivator is also subject to a decision-making process. A hypothesis could be advanced that in the event of a drought, cultivation may be abandoned to some extent in the affected areas because of the risk of loss of investment on current inputs. This factor may also reduce fluctuations in yields per hectare, though total production may fall in the process. If this is the only factor affecting under-utilization of land, we should expect little of it in normal years. There should also be perhaps little difference between drought-prone and other regions during normal years in this respect. Moreover, this factor can affect only current fallows. There is a case, therefore, for examining not only the magnitude and nature of under-utilization of land, but also the variation therein across regions and over time.

The scope of this paper is limited to explaining the level of under-utilization of land (current fallows, other fallows and culturable waste) in Karnataka and Maharashtra. The districts of both States are pooled together for analysis. Not only are the two States contiguous, their drought-prone regions are also contiguous. Together, they present an adequate

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1. *Cf.* M. V. Nadkarni and P. K. Ghosh, "Instability in Rainfall and Agricultural Yields in a Drought-Prone District (Tumkur)", *Indian Journal of Agricultural Economics*, Vol. XXXIII, No. 2, April-June 1978.

representation of both drought- and non-drought-prone districts. The choice of the two States is explained by the fact that we are engaged in a detailed study of yield uncertainty in agriculture of the two States, and the present paper could be considered a by-product of the same.

After explaining the data base and approach of our study and assessing the magnitude of under-utilization of land in India as a whole and also in Karnataka and Maharashtra, and trends therein, we shall first see if the proportion of current fallows, other fallows and culturable waste could be said to be significantly higher in drought-prone districts than in others. We may also see here how far variation in these proportions across districts can be explained. This is done for 1970-71—a normal year. Secondly, we shall see whether rainfall can explain the variation in current fallows over time. Since 'other fallows' and cultivable wastes are defined respectively as fallows for over 1 to 5 years and over 5 years, they are not expected to show much fluctuation over time and hence are not analysed here. Thirdly, we shall analyse the behaviour of current fallows over size classes of operational holdings.

We have used the land utilization data from the Season and Crop Reports of the respective States (SCR) and also from the Census of Agricultural Holdings 1970-71 (Census). At the national level, we have taken the figures from the Directorate of Economics and Statistics, Ministry of Food and Agriculture. There is an important difference between SCR and Census data, particularly in reporting 'culturable waste'. The SCR gives separate figures for 'other fallows' (land kept fallow for more than one year upto 5 years), 'culturable waste', 'land under miscellaneous tree crops' and 'grazing land and permanent pastures'. The Census figures for Karnataka combine all these under 'culturable waste'. The Census figures for Maharashtra, however, are available separately for cultivable waste. Even in other respects, the SCR and Census figures do not tally well. Census figures cover areas within holdings, whereas SCR figures cover other areas as well. We have, therefore, used mainly the SCR figures, except in studying the behaviour of current fallows across size classes of holdings for which only the Census figures are available. The inquiry across size classes of holdings had to be limited only to current fallows, because of the mixed character of 'culturable waste' reported in the Census for Karnataka.

MAGNITUDE OF UNDER-UTILIZATION

It would be instructive to first assess the magnitude of under-utilization of land as seen from land under current fallows, other fallows and culturable waste. Table I presents these figures along with net sown area for the country as a whole and also for Karnataka and Maharashtra. We have selected two normal years—1960-61 and 1970-71, and one subsequent drought year—1972-73. The level of under-utilization of land declined from 24 to 20 per cent in the country between 1960-61 and 1970-71, which increased again to 23.4 per cent in the drought year of 1972-73. Culturable waste accounts for the largest chunk of this land, followed by current fallows. Both in Karnataka and Maharashtra, the extent of under-utilization of land is less than in the country as a whole in normal years, but came close to the all-India average in the drought year. In 1970-71, 17 per cent of cultivable land was not utilized in Karnataka, the proportion being even lower in Maharashtra at 15.1 per cent. The proportion increased to 21.2 per cent in Karnataka and 23.1 per cent in Maharashtra during the 1972-73 drought. We also find that both in normal and drought years, current fallows accounted for the largest chunk of such land in Karnataka, whereas it was so only in the drought year in Maharashtra.

TABLE I—MAGNITUDE OF FALLOWS AND CULTURABLE WASTE: INDIA, KARNATAKA AND MAHARASHTRA

(*thousand hectares*)

	Year	Net sown area	Current fallows	Other fallows	Culturable waste	Total cultivable*
	(1)	(2)	(3)	(4)	(5)	(6) (cols. 2+3+4+5)
India	1960-61	133199	11639	11180	19212	175230
		(76·0)	(6·6)	(6·4)	(11·0)	(100)
	1970-71	141161	11190	9072	15165	176507
		(80·0)	(6·3)	(5·1)	(8·6)	(100)
	1972-73	137600	15240	9290	17410	179540
	(Drought)	(76·6)	(8·5)	(5·2)	(9·7)	(100)
Karnataka	1960-61	10188	835	513	656	12192
		(83·6)	(6·8)	(4·2)	(5·4)	(100)
	1970-71	10248	811	672	615	12346
		(83·0)	(6·6)	(5·4)	(5·0)	(100)
	1972-73	9808	1395	644	594	12442
	(Drought)	(78·8)	(11·2)	(5·2)	(4·8)	(100)
Maharashtra	1960-61	17879	1196	1218	933	21226
		(84·2)	(5·6)	(5·7)	(4·4)	(100)
	1970-71	17668	823	820	1490	20801
		(84·9)	(4·0)	(3·9)	(7·2)	(100)
	1972-73	16060	2579	1018	1235	20891
	(Drought)	(76·9)	(12·3)	(4·9)	(5·9)	(100)

Compound Rates of Growth (in per cent) per annum between 1960-61 and 1970-71

India		+0·6	—0·5	—2·1	—2·4	+0·1
Karnataka		+0·1	—0·3	+2·7	—0·7	+0·1
Maharashtra		—0·1	—3·8	—4·1	+4·8	—0·2

*Excluding land under miscellaneous tree crops and forests.
(Figures in brackets are percentages to col. 6.)

Source: For India, Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India; for Karnataka and Maharashtra, respective Season and Crop Reports.

Net sown area has increased over the sixties in India as a whole; there has been only a little increase in Karnataka, but a little decline in Maharashtra. The increase in net sown area in India has been mainly at the expense of culturable waste, and to some extent of other fallows both of which have declined. In Karnataka, on the other hand, the decline in current fallows and culturable waste has almost been offset by an increase in other fallows. In Maharashtra, the decline in current fallows and other fallows has been offset by an increase in culturable waste.

Immediate adjustment to a severe drought is, as expected, seen in terms of an increase in current fallows, which is more conspicuous both in Karnataka and Maharashtra than in the country as a whole. In Maharashtra, particularly, the proportion of current fallows more than trebled between 1970-71 and 1972-73.

UNDER-UTILIZATION OF LAND ACROSS DISTRICTS

The 44 districts in the two States, leaving aside Greater Bombay, could be classified into three categories: Drought-prone, Non-drought-prone and Mixed. The Irrigation Commission (1972) has identified drought areas talukawise using multiple criteria of normal rainfall, frequency of its failure, irrigation, etc. The districts having a majority of its talukas as drought-prone are taken as drought-prone, whereas the districts where there are no such talukas are taken as non-drought-prone. The districts which have only a few drought-prone taluks belong to the mixed category, where obviously heterogeneity is much greater than in the other two categories. In all, we have 14 districts under drought-prone category, 23 under non-drought-prone and 7 under mixed category.

We may study here the variation in the proportion of current fallows, other fallows and cultivable waste across the districts classified into the three categories referred. For this purpose, 1970-71—a normal year—has been selected. In a widespread drought, even a relatively non-drought-prone district may be affected and we can study the variation over time separately (in the next section). This section would enable us to examine how far drought-prone districts differ from others, and whether the districts within a category present a homogeneous picture at least in a normal year.

Table II presents the proportions referred for each of the districts in the two States and also the average proportions and their coefficients of variation within each category. We can see that there is no significant difference between the three groups in respect of 'other fallows', but a notable difference arises between drought-prone and non-drought-prone districts both in the case of current fallows and cultivable waste, particularly in the latter. The direction of this difference, however, is opposite. While the proportion of current fallows is higher in the case of drought districts, the proportion of cultivable waste is even more distinctly higher in the non-drought-prone districts. On the whole, due to the weightage of culturable waste, the non-drought-prone districts have the highest under-utilization of land (*viz.*, 19.6

TABLE II—UNDER-UTILIZATION OF LAND: DISTRICTWISE (1970-71)

(Percentages of Current Fallows, Other Fallows, Culturable Waste and Total Under-utilization to Total Cultivable Area)

Drought-prone (14 districts)					Non-drought-prone 23 (districts)				
Name	CF (per cent)	OF (per cent)	CW (per cent)	Total	Name	CF (per cent)	OF (per cent)	CW (per cent)	Total
Ahmednagar	1·8	2·9	2·7	7·4	Akola	1·4	3·2	1·9	6·5
Bangalore*	9·3	0·5	3·5	13·3	Amraoti	2·0	2·0	2·9	6·9
Bellary*	5·1	2·4	4·8	12·3	Belgaum*	6·4	2·5	1·8	10·7
Bijapur*	3·1	2·0	0·5	5·6	Bidar*	9·5	11·6	2·6	23·7
Bhir	5·4	4·4	5·6	15·4	Bhandara	1·0	1·0	9·8	11·8
Chitradurga*	14·4	11·7	7·2	33·3	Buldhana	1·5	1·3	5·4	8·2
Gulbarga*	6·5	1·5	1·7	9·7	Chandrapur	3·2	2·2	11·6	17·0
Kolar*	11·8	4·7	4·0	20·5	Chikmagalur*	8·2	7·1	10·2	25·5
Mandya*	5·5	2·0	14·8	22·3	Coorg*	2·0	1·5	24·8	28·3
Mysore*	3·9	8·7	7·4	20·1	Dhulia	3·4	1·4	1·6	6·4
Nasik	8·0	3·4	3·6	15·0	Jalgaon	2·2	1·1	2·4	5·7
Raichur*	6·8	5·7	1·3	13·8	Kolaba	2·7	14·9	23·0	40·6
Sholapur	6·4	5·8	4·0	16·2	Kolhapur	5·4	7·4	13·4	26·2
Tumkur*	15·1	8·5	10·2	33·8	Nagpur	2·8	1·5	6·4	10·7
					Nanded	5·2	0·7	5·6	11·5
					N. Kanara*	2·9	6·9	10·8	20·6
					Parbhani	5·3	2·3	6·8	14·4
					Ratnagiri	1·8	14·8	41·0	57·6
					Shimoga*	5·0	13·6	11·0	29·6
					S. Kanara*	11·0	6·1	24·7	41·8
					Thana	6·3	3·1	17·3	26·7
					Wardha	1·9	1·1	4·5	7·5
					Yeotmal	3·7	5·1	3·4	12·2
Average for districts	7·4	4·6	5·1	17·1		4·1	4·9	10·6	19·6
Coefficient of variation (per cent)	54	70	76	50		65	96	93	69

(Contd.)

TABLE II (Concld.)

Name	Mixed (7 districts)			
	CF	OF	CW	Total
	(per cent)			
Aurangabad	4·1	2·5	3·1	9·7
Dharwar*	2·2	1·9	0·8	4·9
Hassan*	14·7	8·1	7·8	30·6
Osmanabad	7·7	3·3	5·8	16·8
Poona	1·2	4·1	9·4	14·7
Sangli	7·6	6·1	4·6	18·3
Satara	1·5	9.0	11·6	22·1
Average for districts	5·5	5·0	6·2	16·7
Coefficient of variation (per cent)	88	56	60	50

* Karnataka districts (others are in Maharashtra).
CF = Current fallows; OF = Other fallows; CW = Cultivable wastes.
Note:—Districts underlined fall outside Normal Deviates, under drought-prone and non drought-prone categories. This is not tested for mixed category and 'Total'.

Source: Calculated from the Season and Crop Reports for 1970-71.

per cent), followed by drought-prone areas (*viz.*, 17.1 per cent), with mixed districts close by (*viz.*, 16.7 per cent). Because of the reverse direction of difference in the two components, the difference between drought-prone and non-drought-prone districts gets reduced in respect of total under-utilization of land. To understand the problem of under-utilization, therefore attention has to be given to its components, rather than to the total. Drought areas seem to attempt at maximizing cultivated land by minimizing culturable waste, but in the process are forced to keep current fallows high. This may involve a rotation of cultivation on such lands, being left fallow in one year and cultivated next year, rather than keeping them fallow for long. On the other hand, non-drought-prone areas would rather prefer to keep such lands fallow for long or uncultivated, concentrating on cultivation of only relatively fertile lands. There could thus be a relation of substitution between the two categories of under-utilized land. Drought-prone areas in the process have perhaps developed a greater flexibility to adjust to the variation in rainfall, as it is easier to adjust current fallows than other categories. The above pattern, however, is only on the basis of averages, and does not hold good for several districts.

A perplexing feature of the table is that within a category, the variation in the proportions (as can be seen from coefficients of variation in the table) is not negligible. An attempt was made to check how many observations fall outside the range of Normal Deviates. If more than 5 per cent of observations within each category fall outside the range of normal deviates, the distribution cannot be said to be normal and the group cannot be said to be homogeneous.[2] This was checked only for drought-prone and non-drought-prone districts, as the mixed category consists of heterogeneous districts and is also very small. In respect of current fallows, all drought-prone districts fall within the normal deviates, but only two non-drought-prone districts—Bidar and South Kanara—fall outside, having abnormally high current fallows. The difference of means test could, therefore, be applied and showed significant difference between averages for drought-prone and non-drought-prone districts in respect of current fallows even in a normal year. Heterogeneity in the group is, however, very high both in respect of 'other fallows' and 'cultivable waste', both for drought and non-drought districts. None of them represented a normally distributed sample, as many more than 5 per cent of the observations turned out to be extreme values, as can be seen from the districts underlined.

The results, particularly for 'other fallows' and culturable waste make any simple generalisation difficult. Though, on the average, the proportion of culturable waste is significantly higher in non-drought-prone areas, there are nearly 8 districts in the category with significantly low proportions (below normal deviates) of culturable waste. It would, therefore, be more meaningful to analyse the behaviour of districts taking individual observations rather than study group behaviour alone.

Regression equations were tried, taking the cross-section observations of all 37 districts (excluding the mixed category)—separately for proportions of current fallows, 'other fallows' and culturable waste (during 1970-71). Three explanatory variables were taken for each equation. Normal annual rainfall (X_1) was taken as an indicator of drought-proneness of a district.[3] Since the frequency of failure of rainfall was highly correlated (negatively) with normal rainfall, it was not taken as an extra variable. The proportion of net irrigated to net sown area was taken as an explanatory variable (X_2) to see if it tends to increase under-utilization of land. This can happen if availability of irrigation leads to a concentration of efforts in irrigated areas at the expense of other areas. Cultivation of relatively infertile lands may be abandoned by small farmers who may either concentrate on their irrigated portions (if they have any) within their limited resources or may go in search of hired employment particularly if irrigation has pushed up wage rates in

2. The extreme value test was conducted to see how many of the observations converted to standard scores fall within a range of 1·96 times the standard deviation, under standardised normal distribution.

3. Since the correlation coefficient between normal rainfall and rainfall during 1970-71 itself was as high as 0·974 and the same between normal rainfall and rainfall during the prevailing months of May and June of 1970-71 was also almost equally high at 0·972 it mattered little which of these was taken to represent the rainfall variable.

the region. Big farmers may also concentrate more on irrigated land, instead of cultivating all their land. This hypothesis is tested here on the basis of cross-section data, and is also tested below on the basis of time-series data. The proportion of land operated by holdings above 4 hectares was taken as the third variable (X_3). The intensity of land use has been found to decline as the size of holding increases from several micro level studies including farm management surveys. We could, therefore, expect the proportion of under-utilization in a district to be higher, higher the proportion of land operated by relatively large holdings.

Except for the equation for culturable waste,[4] our exercise did not give statistically significant results. None of the explanatory variables turned out to be significant in the equation for current fallows. The R^2 was high and significant only in the equation for culturable waste. But even in this equation only one explanatory variable emerged as statistically significant (with 't' value as high as 7.16), *viz.*, normal rainfall. The sign, however, was positive. With a hundred mm. higher rainfall, the proportion of culturable waste was also found to be higher by 0.8 percentage point. The positive relation between rainfall and culturable waste obtained here is consistent with the higher proportion of the latter in the non-drought-prone districts than in drought-prone districts observed earlier. Though R^2 was very low in the equation for 'other fallows', rainfall emerged as significant here too (though only at 10 per cent level), but again with a positive sign. With a hundred mm. higher rainfall, 'other fallows' were higher by 0.16 percentage point. Surprisingly, neither of the remaining two explanatory variables emerged as significant in any of the three equations. Neither the area under irrigation nor the definition of what constitutes a large holding is strictly comparable or uniform across districts, which perhaps explains their being statistically not significant here.

The positive and statistically significant relation of rainfall with the proportion of culturable waste (and even to some extent with the proportion of 'other fallows') needs to be explained. If we look upon rainfall only as a climatic factor, the relation would hardly look logical. But it is not rainfall alone, but its interaction with its institutional and economic setting which operates here. The hypothesis which we advanced above about the role of irrigation seems to operate in the case of rainfall across regions. In regions with good rainfall, there appears to be a strong tendency to concentrate on more fertile land and abandon cultivation in relatively less fertile land. The dominant character of agriculture of such regions is that of intensive cultivation; whereas in regions with low rainfall, people are forced to practise

4. The equation obtained for the proportion of culturable waste as the dependent variable (Y) was as follows (with 't' values in brackets):

$$Y = 3\cdot771 + 0\cdot008X_1 - 0\cdot064X_2 - 0\cdot066X_3 \ldots\ldots R^2 = 0\cdot675$$

$$(0\cdot532) \quad (7\cdot164) \quad (0.524) \quad (0\cdot818)$$

The remaining two equations are not presented as they did not give statistically significant results.

extensive cultivation to maximize output as intensive cultivation has relatively less scope here. It is for the same reason that we found a higher proportion of culturable waste in non-drought-prone districts on the average than in drought-prone districts. But the choice is not restricted perhaps only between intensive cultivation of selected areas and extensive cultivation of larger areas within the confine of the agricultural sector. With a more prosperous agriculture, the non-drought-prone or high rainfall regions have also a better basis for a more diversified economy. Owners of land have a choice to invest either in some non-agricultural avenue of earning or in the cultivation of relatively less fertile land owned. This choice could very well result in some of the land being unused. In spite of other land hungry people being present, such lands have no prospect of being transferred to them when they have no purchasing power and when the owners of land look upon it as an asset for future use in spite of its present under- or non-utilization. In the drought-prone regions, however, the scope for such a choice is relatively limited, resulting in a higher proportion of land being cultivated, though this might also result in a relatively higher proportion of current fallows on the whole.

Perhaps the role of institutional factors would be highlighted if we probe into extreme cases of under-utilization of land. Ratnagiri in Maharashtra has the dubious distinction of having the highest proportion of cultivable waste, *viz.*, 41 per cent. Coorg and South Kanara in Karnataka come next with nearly 25 per cent of the same, and Kolaba in Maharashtra comes very near with 23 per cent. Such a high under-utilization cannot be attributed solely to physical characteristics when other high rainfall districts like North Kanara and Chandrapur have much lower under-utilization. It is true that many high rainfall districts are in coastal or hilly regions with undulating terrain and often have soils which do not have good moisture-retaining capacity. The possibility of raising second crops is limited in many areas of such districts. But this does not explain why land should be left fallow altogether for several years at a stretch. Besides, what prevents them from being brought under afforestation at least ? Could it be their private ownership?[5] There is of course a provision in the statute, at least in Karnataka, whereby any privately cultivated land which is left uncultivated for two consecutive years without a good cause can be taken over. It is doubtful how far the provision is effective in practice.

More than the climatic factors, institutional factors may explain why a particular district has higher under-utilization than another with similar agro-climatic features. How far cultivable land is owned by non-residents and non-cultivating classes like traders, hoteliers, white-collar workers or even factory workers, army and police personnel needs to be investigated. Such a phenomenon may or may not be reflected in leasing out of land. Instead of leasing out (due to the fear of tenancy legislation), such classes may just keep

5. We have no data to show how much of cultivable waste and other fallows are privately owned and how much by the government.

their land idle hoping to use it after retirement or to sell it at a higher price when urbanisation makes its demands on land. It may be noted that districts with high under-utilization of land like Kolaba, Ratnagiri and Thane are close to Bombay and many people owning land in these districts take up jobs in Bombay. Similarly, it needs to be investigated how far plantation owners and non-cultivating classes own under-utilized land in Coorg. South Kanara is particularly known for a high proportion of leased-in land, which indicates the significant presence of a land owning class not interested in self-cultivation. However, there is a need to investigate if many of the landlords concerned—who may be non-resident—are also having considerable under-utilized land which is neither leased out nor self-cultivated, due to their interest in other occupations. No doubt, we have now little data to prove all this, though those who are familiar with these districts cannot easily rule out these factors. It is the presence of such factors which accounts for a relatively high number of extreme values observed in Table II.

TIME VARIATION IN CURRENT FALLOWS

An attempt is made here to see how far the time-series variation in current fallows can be explained. The period taken is from 1955-56 to 1975-76 (21 years). Only four districts are selected for the purpose, *viz.*, Tumkur and Chitradurga from drought-prone areas, and South Kanara and Bidar from non-drought-prone areas. They have the highest proportion of current fallows in their respective categories. It may be noted that none of these districts shows any clear and significant trend in current fallows, but there is a significant fluctuation in the same nevertheless, as seen from the coefficient of variation (CV) over time. Chitradurga has the highest (among the four) CV at 50.5 per cent, followed by Bidar (33.6 per cent), Tumkur (30.3 per cent) and last South Kanara (20.2 per cent). Four rainfall variables were tested in addition to the percentage of net irrigated to net sown areas (X_1).[6] Of the rainfall variables, annual rainfall for the previous year has been dropped here as it did not turn out to be statistically significant in any equation. This would mean that crop failure in the previous year (if it is determined by rainfall in that year) does not necessarily increase current fallows in the succeeding year. Though crop failure may cut into the investible resources of farmers, they still seem to try to cultivate the normal portion of land. The other explanatory variables used were: annual rainfall (in mm.) for the year concerned (X_2), rainfall (in mm.) during May and June (X_3), and rainfall (in mm.) during July and August (X_4). The last two were used as alternatives to X_2. The results of the equations using X_2 are presented only where the variable turned out to be significant. Since none of the variables turned out to be significant in any equation for Tumkur, the results for the districts are not presented here. The equations obtained for other districts are presented in Table III.

6. It may be noted that X_1, X_2, etc., stand for different variables in different sections of the paper, since the variables used are not the same.

TABLE III—REGRESSION EQUATIONS FOR TIME VARIATION IN CURRENT FALLOWS

Eq. No.	Constant	X_1 (percentage of irrigated area)	X_2 (annual rainfall)	X_3 (May-June rainfall)	X_4 (July-Aug. rainfall)	R^2	DW
			Chitradurga				
1.	9·019*** (1·735)	+1·051* (5·330)	—	—0·333*** (1·974)	—0·024ns (1·259)	0·733	0·87
			Bidar				
2.	17·143* (4·347)	—1·824** (2·214)	—	—0·012ns (0·952)	+0·001ns (0·230)	0·240	1·62
			South Kanara				
3.	14·786* (5·126)	—0·0002ns (0·307)	—0·110** (2·066)	—	—	0·205	0·71
4.	15·933* (5·508)	—0·106*** (1·973)	—	—0·001ns (0·726)	—0·0004ns (0·447)	0·236	0·66

Note:—ns = Not significant; * Significant at 1 per cent level; ** Significant at 5 per cent level; *** Significant at 10 per cent level. (Figures in brackets are 't' values.)

The total explanatory power of the equations is not high except in the case of Chitradurga, the equation for which alone has a high R^2. Obviously, further research is required for many regions to better understand why current fallows fluctuate over time. Nevertheless, certain interesting features of their behaviour emerge from the equations fitted. These features can at least be treated as suggestive of hypotheses to be tested in further research, if not as definitive conclusions. Irrigation (X_1) turned out to be a significant variable in three out of four equations presented, but the sign was not consistent between districts. In Chitradurga, it had a positive impact on current fallows—an increase in the proportion of irrigation leading to an increase in the proportion of current fallows (see equation 1 in Table III). But in Bidar and South Kanara, it showed a negative impact (see equations 2 and 4). Our hypothesis regarding irrigation, advanced earlier, seems to be borne out in the case of Chitradurga—a drought-prone district, but not in the other two which are non-drought-prone districts. Only a further analysis in detail of the time-series data of many more drought- and non-drought districts, cross-checked further with a study of the behaviour of farms through field work, can enable us to generalise on the differential impact of irrigation as between the two types of districts. However, a difference is plausible. So long as a drought district does not have irrigation, it would try to do its utmost through extensive cultivation. But once there is irrigation on a farm, a possibility arises of using the limited resources intensively on irrigated portions, which could result in an increase in current fallows. An evidence on the tendency of farmers to concentrate on irrigated land within their limited resources and relatively ignore dry land in the process, was found in a farm level field study for Kolar district too (also a drought-prone district in South Karnataka like

Chitradurga).[7] In the non-drought-prone areas, however, irrigation seems to reduce current fallows. It may be recalled here that non-drought-prone areas have already an intensive cultivation to some extent, keeping their cultivable waste relatively high. An increase in irrigation helps them to further intensify their cultivation by reducing current fallows. It is interesting that whereas drought-prone areas seem to adjust their current fallows, the non-drought areas adjust their culturable waste in response to variation in irrigation and rainfall. An adjustment in culturable waste, however, can be reflected only in terms of cross-section data and not time-series data, as culturable wastes are by definition kept fallow for long periods of time and as such do not vary over time like current fallows.

Equations in Table III show that rainfall seems to have the expected negative impact on the whole on current fallows. In Bidar, however, rainfall did not turn out to be a significant variable. Whereas annual rainfall emerged significant in South Kanara, May-June rainfall turned out to be so in Chitradurga. July-August rain, however, was significant in none of the three districts. The negative relation between current fallows and rainfall over time is consistent with the fact noted earlier from cross-section data that on the average, drought-prone districts have a higher proportion of current fallows than non-drought-prone districts. But this relation is neither strong nor stable in the sense of prevailing in all districts, we have seen. Both in Bidar and South Kanara, which have relatively high proportion of current fallows, only about 20 to 24 per cent of the variation in current fallows is explained by rainfall and irrigation together, leaving a large part of the variation unexplained. Though in a severe drought year like 1972-73, there may be a sharp spurt in current fallows, there are significant variations in the same even otherwise. Non-availability of timely credit, unfavourable movements in the price of agricultural output and inputs, transfer of land to parties who prefer to keep it idle due to having other sources of income, uncertainty on account of land being declared as surplus under ceilings legislation but not yet acquired by the government, and such other factors perhaps may account for a larger part of variation in current fallows in many districts rather than rainfall and irrigation alone. The database needed to probe into these factors has to be improved both in terms of official statistics and through field surveys.

CURRENT FALLOWS OVER SIZE CLASSES OF HOLDINGS

It is important to know who among the farmers tend to keep a high proportion of fallows. The Census of Agricultural Holdings (1970-71) gives us a clear picture of the distribution of current fallows over different size classes of operational holdings. Unfortunately, however, the Census does not show the distribution of current fallows between owned area and leased-in area.

7. See N. D. Kamble, Abdul Aziz and Others, "Economics of Well Irrigation", in Institute for Social and Economic Change: Impact of Irrigation—Studies of Canal, Well and Tank Irrigation in Karnataka, Himalaya Publishing House, Bombay, 1979; also, V. M. Rao, "Linking Irrigation with Development: Some Policy Issues", *ibid* and in *Economic and Political Weekly*, Vol XIII, No. 24, June 17, 1978.

We cannot also know how much of the current fallows are owned by non-resident or non-cultivating classes. Only micro level surveys of households can enable us to have some idea of this problem. The Census, however, clearly establishes the fact that the proportion of current fallows increases significantly with the size of operational holdings. Taking the country as a whole, the proportion of current fallows to the total cultivated land (*i.e.*, net sown area and current fallows, but excluding other categories) was 4.6 per cent among holdings upto one hectare, but it increased to 10.6 per cent among holdings with 50 hectares and above. In Karnataka, the corresponding proportions were 4.2 and 12.4 per cent respectively. The differnece is even more conspicuous in Maharashtra, where the proportion increased from 1.5 to 9.7 per cent between the same size classes.

An exercise was carried out to explain the proportion of current fallows to the total cultivated land (as defined in the preceding para) in different size classes of operated holdings (Y), for the same four districts selected in the preceding section. The explanatory variables were: average operated area in hectares in the size class concerned (X_1), and percentage of net irrigated to net sown area in the size class concerned (X_2). Linear equations were fitted separately for each district, and also for the data of all the four districts pooled together. To represent the district characteristics, total rainfall in the year 1970-71 in the district concerned was used as an additional variable (X_3) in the pooled regression. The question of this variable does not arise in the equations for individual districts. Each district had only 12 size classes which are our observations. Pooled regression enabled us to see what picture emerged on the whole, taking the advantage of larger degress of freedom in the process. The results are presented in Table IV.

TABLE IV—REGRESSION EQUATIONS FOR VARIATION IN CURRENT FALLOWS ACROSS SIZE CLASSES OF OPERATED HOLDINGS

Eq. No.	District	Constant	X_1 (size of operated area)	X_2 (percentage of irrigated area)	X_3 (district rainfall)	R^2
1.	Chitradurga ..	10·02	+0·370* (8·26)	+0·192** (2·26)	—	0·887*
2.	Tumkur ..	12·87	+0·547* (5·70)	—0·191ns (0·66)	—	0·780*
3.	Bidar ..	16·87	+0·378* (10·34)	—2·245ns (1·71)	—	0·930*
4.	South Kanara ..	6·66	+0·196* (4·21)	—1·181ns (0·65)	—	0·663**
5.	Pooled for all four districts ..	12·01	+0·369* (11·16)	+0·147*** (1·77)	—0·0032* (7·63)	0·807*

Note:—As in Table III.

The equations show that even after isolating the influence of irrigation, the proportion of current fallows increases significantly with an increase in the size of operated area. The variable (X_1) had a positive and statistically significant impact in every equation. The magnitude of the coefficient, however, varied from 0.55 in Tumkur (*i.e.*, the proportion of current fallows increased here by 0.55 percentage point following an increase of one hectare in the size of operated area) to 0.20 in South Kanara. On the whole, the coefficient was 0.37 (in the pooled equation). Obviously, in the context of the present institutional setting, the big size of a holding comes in the way of full utilization of land. Another disturbing feature of the results is that an increase in the proportion of irrigation tends to increase—rather than decrease—current fallows, even across operated holdings. However, this result was obtained only in Chitradurga (equation 1) and in the pooled regression (equation 5). In the remaining three equations, the sign was negative and also statistically not significant. A lack of consistency in the sign as between equations would show that the role of irrigation need not be uniform in all areas, as we observed earlier in connection with the time-variation in current fallows. It may be recalled that irrigation had the same positive impact on current fallows over time in Chitradurga (*cf.* Table III, equation 1) as here. In Bidar and South Kanara too, the sign of the coefficients for irrigation is negative here as it was in Table III, but they are not statistically significant. The direction of the impact of this variable may not of course have a universal validity and is subject to a large deviation across regions and over time. But our exercises do point to a very real possibility for irrigation to have some undesirable impact too, unless care is otherwise taken to ensure full use of operated land—irrigated or dry.

Not much can be said about X_3 here as it merely represents a characteristic of only the four districts involved; its coefficient cannot be interpreted as representing the influence of rainfall in general. The high significance of the variable representing district characteristic and also a lack of consistency in the sign of particularly X_2 as between the equations for districts would suggest that we cannot derive generalisations valid for all regions, and that regional or local factors can play an important role in determining the utilization of land. These local factors may have much to do with the institutional setting and even a climatic factor like rainfall and a 'physical' factor like irrigation have to interact with the institutional setting before they have an impact on the utilization of resources.

CONCLUDING REMARKS

The scope of the paper is limited to under-utilization of land in a narrow sense. Under-utilization of land can also arise on account of low cropping intensity and low irrigation intensity, and also on account of cultivating low yield crops instead of potential high yield crops. Grazing land and pastures are also hardly used for any planned fodder raising to maximize their utililty; very often, there is little to graze in these lands. We have not gone into these aspects of under-utilization.

Even limiting ourselves to narrow aspects of under-utilization of land, we find we have to seriously revise our oft-held presumption that there is little scope for further utilization of land. For a country like India with so much under-employment in agriculture, it is paradoxical that even in a normal year over 20 per cent of cultivable land is neither utilized for crop cultivation nor for grazing, and not even for forestry. It is even more paradoxical that culturable wastes are found to be higher in regions of higher rainfall. In districts like Ratnagiri, Kolaba and South Kanara, 40 to 57 per cent of the cultivable land is not utilized. Whereas drought-prone districts seem to practise extensive cultivation, the non-drought-prone districts seem to be cultivating land more selectively, leaving large tracts of land unutilized in the process.

Not much light can be thrown on the problem if we try to explain this phenomenon only in terms of physiographic and climatic factors. One of the greatest ironies of Indian agriculture today is that while the vast majority of small farms continue to be non-viable, the bigger farms have not been intensively using their land to maximize agricultural production. This cannot be explained merely in terms of lack of irrigation. Our results show that even irrigation can produce negative results at times unless proper care is taken to see that all the land in the gross command of irrigation is utilized optimally. There is need for further research to examine the factors and motivations governing under-utilization of land. Though there has been extensive research on the economics of crop production and crop pattern, we know comparatively precious little on the question of aggregate land use, though this is a very important question in the context of the so-called pressure of population on land in India. Village studies will have to give greater attention than in the past to the ownership of non-cropped land, so that we can know whether its owners are non-resident and have main occupations other than crop cultivation. The major factors behind under-utilization of land may have to be found through an analysis of political economy of agriculture within the larger context of the entire economy. Such an analysis will have to find what makes fuller utilization of an important source like land uneconomical for its owners and what makes them to continue to possess it nevertheless. It is also to be noted here that what is uneconomic for a person need not be so for another, as different persons have different sets of choices open to them. What is significant here is that even though the choice may be subject to individual decision-making within the context of private ownership and management of resources, the decision has much wider social implications beyond the context of an individual decision-making household. We should seriously examine what social action could be taken to prevent wasteful under-utilization of such a valuable resource like land.

APPENDIX

Basic Data Used for Equations in Table IV

Size class (hectares)	X_1	X_2	Y	X_1	X_2	Y
		Bidar			Tumkur	
Below 0·5	0·29	4·45	7·58	0·26	34·62	7·00
0·5-1·0	0·76	5·08	6·04	0·73	19·11	7·36
1·0-2·0	1·47	4·33	6·95	1·45	11·87	9·41
2·0-3·0	2·44	4·18	7·75	2·40	10·55	9·78
3·0-4·0	3·44	4·33	8·51	3·42	10·21	10·25
4·0-5·0	4·44	3·67	9·70	4·40	9·63	12·09
5·0-10·0	7·02	3·39	11·24	6·74	10·15	14·16
10·0-20·0	13·51	3·65	14·41	13·17	10·31	20·99
20·0-30·0	23·59	3·66	16·83	23·67	10·27	28·33
30·0-40·0	33·56	4·30	17·19	33·88	11·20	36·67
40·0-50·0	43·88	4·91	27·79	43·74	12·19	37·28
50·0 and above	68·13	5·23	29·26	67·89	11·52	40·56
		Chitradurga			South Kanara	
Below 0·5	0·29	47·89	19·92	0·26	20·32	1·72
0·5-1·0	0·76	28·91	15·71	0·74	21·47	1·29
1·0-2·0	1·48	16·24	14·11	1·42	21·35	1·69
2·0-3·0	2·38	13·87	12·45	2·39	21·42	2·46
3·0-4·0	3·44	13·90	10·77	3·40	20·52	3·54
4·0-5·0	4·40	12·59	12·34	4·39	19·46	4·57
5·0-10·0	6·90	12·86	13·01	6·62	21·63	4·84
10·0-20·0	13·34	11·31	19·91	12·90	23·82	5·62
20·0-30·0	23·55	10·71	24·72	23·34	21·96	6·26
30·0-40·0	33·92	10·42	27·18	33·55	21·49	17·86
40·0-50·0	43·82	9·98	30·26	44·27	32·29	8·13
50·0 and above	66·35	10·40	32·38	66·86	17·65	13·33

Y = Proportion of current fallows to total cultivated land (net sown area + current fallows).
X_1 = Average operated area in hectare in the size class concerned.
X_2 = Percentage of net irrigated area to net sown area in the size class concerned.
X_3 = Rainfall in 1970-71 (May to April) is: Bidar 945 mm., Tumkur 714 mm., Chitradurga 571 mm. and S. Kanara 4,942 mm.

Source: For X_1, X_2 and Y, Census of Agricultural Holdings in Karnataka 1970-71, Agricultural Commissioner, Karnataka, 1974; for X_3—Bureau of Economics and Statistics, Government of Karnataka.